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**Air Pollution: A Cause of
Concern for Plants**

by

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Air pollution: A cause of concern for plants

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The world is facing strong negative effects of globalization and industrialization, weakening the critical balance between ecosystem stability and socio-economic development. Apart from increasing pressures of global climate change, deforestation and shifts in land use pattern, air pollution is emerging as one of the major factors influencing agriculture and natural ecosystems. Ecosystem dynamics is regulated by different biotic and abiotic factors, which are the keys for maintaining ecosystem structure and function. Compared to other stresses, air pollution impacts are both local to regional and are directly toxic to plants and animals (Mukherjee and Agrawal 2018). Air quality influences vegetation by altering species composition and structure, rate of decomposition, growth and morphology, physiological processes, leaf functional traits and foliar bioaccumulation of toxic chemicals.

Air pollutants and their sources

Pollution of air by anthropogenic activities is a noticeable feature of urban and industrial systems particularly in developing countries. The airborne pollutants of major concern include toxic atmospheric gases such as sulphur dioxide (SO₂), oxides of nitrogen (NO_x), volatile organic compounds (VOCs), ozone (O₃) and carbon monoxide (CO); particulate matter (PM₁₀ and PM_{2.5}) and its components such as polycyclic aromatic hydrocarbons (PAHs), black carbon (BC), toxic elements such as lead (Pb) and fluoride (F); photochemical oxidants and acid deposition. Most of the airborne substances are primary pollutants released directly from stationary and mobile sources, whereas secondary pollutants are formed in the atmosphere by chemical transformation of primary pollutants. Based on PM₁₀ and PM_{2.5} data, Asian countries are found to be highly polluted with PM₁₀ values above 100 µg m⁻³ in India (WHO 2016). The major reasons for high PM levels in developing countries are increases in vehicular density, quality and density of roads and non-compliance of emission standards. Although biomass burning is a traditional practice but its intensity and level have been tremendously increased in recent times due to strong economic pressure on farmers in lack of proper disposal plan of crop residues. Even in urban areas biomass is frequently burned in lack of proper disposal facilities. Ambient air particulate matter is regulated by source complexity, short and distant transport sources, associated meteorological and atmospheric factors. Fine PM levels in Varanasi city exceeded the daily mean 24-h national CPCB and WHO standards for ~75 and 93 % of monitoring days, indicating the alarming status of PM pollution in this area. Traffic is the major local source contributing maximally to high PM level followed by paved road dust and local combustion activities. For long range transport, the north-western part of India is the most contributing source region for higher PM_{2.5} mass to Varanasi city.

Emissions of sulphur (SO₂, SO₄²⁻) and nitrogen-related (NO_x, NO₃⁻, NH₃, NH₄⁺) compounds into the atmosphere over industrialized regions in Europe, North America and Asia have significant adverse effects including widespread acidification of the Earth surface and groundwaters with associated biological consequences, acidification of soils, increased rate of corrosion of buildings and monuments and formation of secondary air pollutants, such O₃, that are toxic to all life forms. Historical trends have shown a decline in PM in most regions of the world, but levels are still critical in most of the Asian tropical countries (Mukherjee and Agrawal 2017b; WHO 2016). In Delhi, SPM and PM₁₀ values have been continuously

exceeding the standards in the last decade with a steep rise in PAHs, the products of fossil fuel combustion known for its carcinogenic nature.

Black carbon formed due to incomplete combustion of fuel, biomass burning, vehicular and industrial activities are mostly measured in PM_{2.5} range and major portion of BC is made up of carbon (60%) with contribution of various aromatic compounds. BC is known for its strong radiative forcing with a stronger global warming potential than CO₂. VOCs are emitted from combustion of fuels with short to long-term adverse health effects. NO_x is a primary air pollutant formed during combustion of fuels by the oxidation of atmospheric nitrogen within the fuel at high temperature. NO_x denote the total concentrations of NO and NO₂ which are interconvertible in presence of sunlight and other atmospheric gases especially O₃. Traffic is known to be the most significant source of NO_x. SO₂ is considered as one of the major harmful gases to plants as well as to public health. Major sources of SO₂ are coal-fired power plants and industries. CO is a colorless and odorless gas which is produced by the incomplete combustion of fossil fuels. Major sources of ambient CO are vehicular emissions and biomass burning. Gurjar et al. (2016) observed decreasing trend of SO₂ in India due to a decrease in the content of sulphur in coal and diesel, whereas increasing trend for NO_x was attributed to increasing number of vehicles Tropospheric O₃ is a secondary air pollutant formed by photochemical reactions of NO_x, CO and VOCs and is very important from both atmospheric and biological perspectives. O₃ influences the oxidation capacity of the atmosphere as it acts as a primary reactant and also due to its ability to produce hydroxyl radicals after photolysis, which play a very crucial role in the cycling of other trace gases in the atmosphere.

Effects of air pollutants on plants

Airborne pollutants can affect ecosystems in two major ways: (1) by direct toxicity and (2) indirectly by changing soil nutrient availability. Dust particles, aerosols and other air pollutants are directly adsorbed on the large leaf surfaces of vegetation which ultimately influence plant function and structure. The deposition of PM on the leaf surface causes blockage of solar radiation by shadowing the leaf surface, altering the pigment synthesis and the photosynthetic rate. Air pollutant-stressed plants are more vulnerable to pest and fungal attack.

Foliar injury symptoms: Air pollutants such as SO₂, O₃ and fluorides damage the leaves of plants. Chronic injury occurs on exposure of plants to low concentration of SO₂ at which the rate of accumulation of the ions is slow. The cells oxidize the sulphite ions and injury does not occur until sufficient sulphate ions get accumulated. This type of chronic injury is characterized by a general chlorotic appearance of the leaves. Brownish necrotic streaks confined to the middle and upper laminar regions of monocot leaves and needle necrosis in conifers result due to chronic SO₂ exposure. The acute injury, however, results due to absorption of lethal quantities of SO₂ as full grayish green water-soaked areas which later converts as marginal or inter-veinal areas of dead tissues. In most plant species, these injuries upon drying or becoming dead or necrotic areas fall out leaving a ragged appearance to the leaf. In case of severe injury, abscission layer develops at the base of petiole causing premature fall of leaves. Fluoride damages the edges of plants as brown or black pigmentation. Being a strong oxidant, O₃ causes several types of symptoms including chlorosis and necrosis. The common symptoms associated with O₃ exposure include flecks (tiny light-tan irregular spots less than 1 mm diameter), stipples (small darkly pigmented areas approximately 2-4 mm diameter), bronzing and reddening. O₃ damage on leaves appears as mottled spots which may be yellow, black or brown. If the damage by O₃ is severe enough, the plant drops its leaves altogether.

Effects on ecosystem: Emissions of air pollutants alter the natural biogeochemical cycles, decomposition, nutrient balance and soil fertility. Decomposition is affected by deposition of N, nutrients and toxic elements by air pollution, which alter soil properties by changing the foliar chemistry of trees. Changes in species richness, dominance, evenness, density and

dominance are the first markers of a shift in biodiversity. Significant negative correlation between SO₂ concentrations in air and species diversity of herbaceous communities in the dry tropical environment has been reported. A decline in species diversity at sites with higher pollution load was reported around point sources and urban centers. The dominance of pollution tolerant compared to pollution sensitive plants at polluted sites indicated a strong effect of air pollution on herbaceous and tree diversity.

The successful survival of a species in the polluted area may be due to adequate biomass formation and their suitable structure, the ability to survive the lasting impact of pollutants and ability to reproduce under the pollution stress. The increasing O₃ concentrations have also been implicated as one of the factors contributing in forest decline affecting the forest productivity linked to direct economic losses (Royal Society 2008). Concurrently, O₃ poses a threat to semi-natural ecosystem including grasslands, reducing the primary productivity of wild plants as well as species biodiversity. Apart from the productivity losses, second tier O₃ effects include changes in herbivory pattern and alterations in plant interactions with diseases, pests and insects. Infection of a foliar pathogen on trembling aspen increased under elevated O₃ due to the changes in the leaf surface properties (Karnosky et al. 2005). Elevated O₃ also affected the performance of forest pests, due to changes in plant chemistry or the increased abundance of natural enemies. The chronic exposure to tropospheric O₃ stimulates the carbon fluxes from the primary to secondary metabolic pathways, leading to the synthesis of secondary products which are responsible for alteration in forage nutritive value, phytopathology, natural enemy interaction and may perhaps promote establishment of invasive species (Rai et al. 2015). Ozone also affects competitive ability in different species which in the long term results in changes in the species and genetic composition as well as functioning of semi natural plant communities or ecosystems with impacts on nutrient cycling and carbon sequestration (ICP Vegetation 2014).

Effects on growth and morphology: Both biotic and abiotic stress tolerance in plants depends upon the ability of the plant species to regulate between growth and defense response. Higher allocation of energy in defense response may lead to lower growth, which results in changes in morphological characteristics. Reductions in growth parameters such as height, diameter, leaf and root biomass, leaf area and whole plant biomass were recorded at sites with higher air pollution load. Reductions in basal diameter, canopy area, root-shoot ratio and plant biomass were also recorded in polluted environment. Significant effects of pollution load in form of increase in the number of vascular bundles were reported, although no effect was observed in cortex, epidermis and pith tissues. Leaf structure, geometry, leaf epidermal length, cuticle thickness, phyllotaxy of leaf, height of the plant, canopy size, nature of the tree and leaf forms determine plant response to higher dust pollution. Dust accumulation was more in plants with smaller height compared to taller plants. Reductions in leaf area, length and width of stomata, length of the stomatal pore, and stomatal density around point sources of pollution were reported (Mukherjee and Agrawal 2017b).

Effects on plant physiology: For proper growth and development, plants have to regulate their function according to variations in environmental conditions. Regulating physiological activities in accordance with environmental conditions provides a plant to maximize the resource utilization and maintain the growth process. Variations in physiological activities such as photosynthesis, stomatal conductance, respiration, transpiration and photosynthetic efficiency are known under air pollution stress conditions. Reduction in photosynthesis rate in plants at polluted site compared to control indicates the influence of air pollution in damaging stomata and pathways related to light and CO₂ fixation. In contrast, enhancement in photosynthetic rate as well as stomatal conductance in some plants at sites with higher pollution load suggests compensatory response by increasing photosynthetic rate in response to pigment degradation and high carbon utilization of the test plant at higher pollution load (Baek and Woo, 2010; Mukherjee and Agrawal 2017b).

Transpiration rate was declined at polluted forest sites due to damage to leaf and deposition of dust particles at the stomatal surface. Carbon assimilation declined at higher pollution load, whereas stomatal conductance remained unchanged. Traffic-related pollutants in high concentrations modified plant physiology through altering the stomatal response such as decline in stomatal size, but an increase in stomatal frequency was found. Significant negative effects of O₃ exposure on RuBP carboxylase activity and photosynthesis rate have been reported (Rai et al. 2015)

Effects on leaf functional traits: Leaf functional traits such as leaf mass per area or specific leaf area, tissue thickness, leaf area, foliar C and N contents, photosynthetic pigments, antioxidants and relative water content vary in relation to the pollution load along with environmental conditions. Therefore, these characteristics provide the opportunity to correlate the variations in relation to changing environment under natural conditions. The increases in antioxidants and defense-related metabolites are the primary response of plants against air pollution stress. Increases in foliar cysteine content and ascorbic acid at higher traffic pollution load have been reported. Reductions in chlorophyll a, b and carotenoids contents indicate a decrease in productivity at a higher load of air pollutants. A similar trend was also observed for foliar protein content indicating inhibition in protein synthesis or damage to existing protein although percent reduction in protein content was lower than the photosynthetic pigments indicating more sensitivity of pigments to air pollutants (Mukherjee and Agrawal 2017b). Dust contains many organic and inorganic compounds which on entry into plant tissues cause increases in reactive oxygen species (ROS) and primarily damage to the membrane and pigments. Increases in chlorophyll a, chl a/b ratio and foliar F, N and S concentrations at polluted site compared to control have been reported. The increase in pigment concentration is attributed to increasing leaf N content, indicating utilization of atmospheric NO_x and NH₄⁺ in N assimilation. A decrease in the size of starch grains in plant leaves indicates consumption of stored carbon at the expense of defense response at polluted sites.

Mukherjee and Agrawal (2016, 2018) conducted a long term study on trees growing at different pollution load in parks of Varanasi city. Among the leaf functional traits, non-enzymatic antioxidants (proline, polyphenol and AsA content) were found to be most responsive to air pollutants, whereas resource utilization parameters (LDMC, SLA and LMA) were least responsive. PM and O₃ were identified as the most critical air pollutants, which accounted to maximum variability's in most of the leaf traits followed by SO₂ and NO₂. Trees with deciduous nature, compound leaf form, medium to small canopy size and round/oval canopy are more tolerant to air pollutants. An increase in thickness of cell wall in response to pollution load in plants has been implicated to increase in defense-related metabolites to protect membrane damage. Increase or maintenance of leaf biomass allocation and cellular turgidity was found at higher pollution load in tolerant plant species. The responses and tolerance of different tree species against air pollutants were influenced by combination of both tree characteristics and variations in leaf functional traits.

Foliar bioaccumulation: Plants have the ability to accumulate, detoxify and concentrate pollutants that enable them to tolerate harsh environments (Mukherjee et al. 2016). Distinct spatial-temporal variations in foliar accumulation and enrichment factor for elements were found with varying pollution load and plants also vary in their bioaccumulation potential. *Psidium guajava* was found to be a useful species for bio-monitoring of toxic elements. Even high bioaccumulation was recorded in pioneer compared to emergent species, which may be due to higher physiological activities in the former species. Higher bioaccumulation was also found due to extensive forest fire which increases the atmospheric load of certain elements. The order of PAH accumulation was maximum in leaves followed by bark, twigs, stem and wood in plants.

Tropospheric ozone compromising efforts to increase crop production

During the last few decades, tropospheric O₃ has become one of the widest spreading toxic pollutants around the globe (IPCC 2014) with negative impacts on humans, animals and plants. Transport sector contributes significantly to emissions of O₃ precursors. Apart from being a pollutant of concern in cities, ground level O₃ is more a problem of rural and remote areas. Background O₃ concentrations have risen from an estimated pre-industrial concentration of 10 ppb to average summer concentrations varying from 30 to 50 ppb in mid-latitudes of the northern hemisphere and O₃ episodes reaching 100 ppb (Mills et al. 2018). Monitoring reports of O₃ in suburban and rural areas of Asia also showed that mean monthly O₃ concentration now commonly reach up to 50 ppb (IPCC, 2014). Microclimatic conditions and availability of O₃ precursors are the two prime factors responsible for O₃ formation. One of the most prominent O₃ precursors is NO_x. VOCs play a prominent role in the process by which 'free radicals' convert NO into NO₂ and NO₂ then breaks again into NO and O leading to the continuation of this cycle. The formation of O₃ in India is predominantly controlled by NO_x indicating a positive correlation between O₃ and NO_x concentration.

Ozone concentration in different regions of India: Being located in sub-tropical region, Indian subcontinent encounters fairly high O₃ concentrations. Seasonal variation of O₃ displayed a maximum concentration of 40–50 ppb in summer and winter season at the urban sites and similar levels were observed at rural site in spite of less emission of precursors in western Maharashtra (Debaji and Kakade, 2009). While at a high altitude mountain site had comparatively less O₃ formation (30–40 ppb) (Debaji and Kakade 2009). Monthly AOT40 as high as 36 ppm h was reported over Pune (Roy et al. 2009). AOT40 is a concentration based critical levels for crops and is calculated as the mean hourly O₃ concentration accumulated over a threshold concentration of 40 ppb. AOT40 of 3 ppm h accumulated over three months was considered to be critical above which O₃ can cause significant yield losses. There are also episodic emissions from various social activities in India such as fireworks set off during the festival days.

IGP is one of the most polluted regions of the world in terms of gases and aerosol loading which contributes to O₃ formation (Ghude et al. 2014). The highest trend of O₃ increase (3–5.6 %) per decade has been observed over the densely populated IGP region whilst increasing trend of 1.2–2 % per decade has been observed for southern regions of India (Lal et al. 2012). The monitoring carried out at Varanasi showed decadal increase as during Kharif season lowest seasonal mean (33.6 ppb) was in the year 2005 and highest (51.0 ppb) was in the year 2017. For Rabi season, seasonal mean varied from lowest value of 38.3 ppb in 2002–2003 to highest of 56.5 ppb during 2016-2017. It is also evident that there are higher O₃ concentrations during the reproductive phase of the plant life in comparison to the vegetative in both the seasons, which perhaps cause major yield reductions in IGP.

Mechanism of action: Ozone gains entry inside the leaves through stomatal pores. Upon reaching the intercellular spaces, it rapidly generates reactive oxygen species (ROS) and also reacts with components of the leaf apoplast causing oxidative stress. As a result, antioxidant defense system is triggered which plays a decisive role of keeping ROS levels under control, thereby maintaining cellular redox balance. Oxidative stress due to enhanced ROS production under O₃ stress triggers an array of complex antioxidant system which may be enzymatic or non-enzymatic. In plant tissues, many phenolic compounds such as flavonoids, polyphenols and tannins are also potential antioxidants, acting as ROS scavenging compounds. Ozone is also very well known to cause reduction in photosynthesis. Thus under O₃ stress, induced metabolic pathways, reduction in photosynthetic proteins, impaired reproductive development and accelerated senescence conclusively lead to decreased carbon assimilation and alterations in its partitioning resulting in lower accumulation of biomass in plants, reductions in yield and modification in crop quality (Singh and Agrawal, 2017).

Yield losses due to ozone: The relative regional yield loss in developing countries of East Asia (India, Pakistan and Bangladesh) in year 2000 was 8–27 % for wheat, 3–13 % for soybean and 3–8 % for maize based on the M12 (Mean 12 h) or AOT40 metrics used for O₃ exposure (Avnery et al. 2011). A model based study suggested that yield losses of 5–20 % for important crops may be common in areas experiencing higher O₃ concentrations and concluded that (Emberson et al. 2009). Mills et al. (2018) estimated that ozone reduces wheat yield by a mean of 9.95 % in the northern hemisphere and 6.2% in southern hemisphere, corresponding to some 85 million tonnes of lost grain. Total production losses of developing countries including India and China are higher than those in developed countries. Debaji (2014) estimated the yield losses of two major crops (winter wheat and rabi rice) due to surface O₃ and indicated that relative yield loss (RYL) of the mean total production per year was 5 to 11 % (6–30 %) for winter wheat and 3–6 % (9–16 %) for rice using M7 index. Sinha et al. (2015) estimated the O₃ induced yield losses based on AOT40 metrics for wheat, rice, cotton and maize in Punjab. RYL ranged from 27–41 % for wheat, 21–26 % for rice, 9–11 % for maize and 47–58 % for cotton. Rice cultivars Saurabh 950 and NDR 97 showed 10.2 % to 15.9 % yield reduction under ambient O₃ compared to filtered (Rai and Agrawal 2008) Later, Rai et al. (2015) taking up similar rice cultivars reported that number of grains showed less reduction in NDR 97 than saurabh 950 but more reduction in test weight was recorded in former than the later.

Most of the investigations have been carried out with wheat under ambient or elevated levels of O₃, where O₃ led yield losses occurred due to impaired gas exchange, increased loss of energy in defense activities, reduced growth, accelerated senescence, decline in viability of pollens and harvest index. A reduction of 20.7 % was found in yield of wheat cultivar M 234 grown in OTCs ventilated with ambient air (40.6 ppb O₃) as compared to filtered chambers (Rai et al. 2007). The dwarf cultivar with higher yield potential was more sensitive to O₃ than tall cultivar with lower yield potential. A study performed on maize cultivars differing in nutritional quality of the kernels showed 4–13.8 % reductions in weight of kernels plant⁻¹ under elevated ozone.

Other major economically important crops were also found to respond similarly under the prevailing O₃ stress at IGP. Agrawal et al. (2006) reported that yield of mung bean plants was lowered depending on the concentration of pollutants at different sites of Varanasi as compared to reference site. Ozone exposure of 70 and 100 ppb led to reductions in yield of *Glycine max* cultivars and the newly developed cultivar was more sensitive to O₃ compared to the older. In the biomonitoring study with mung bean cultivars, reductions were found in yield, and the dose-response analysis indicated towards highest sensitivity for HUM-1 and least for HUM-23 (Singh and Agrawal 2017). Yield losses due to ozone have been ascribed to various yield components in different crops, including reductions in individual seed weight, reduced spikelet number, enhanced spikelet fertility, and reduced panicle or pod number with associated reductions in harvest index.

Future prospects of development of ozone tolerance: The derivation of dose–response relationships for 52, 18 and 44 genotypes of soybean, wheat and rice, respectively has shown that there is clearly scope for the breeding of ozone tolerant varieties (Milles et al. 2018). The traits that could contribute to improved ozone tolerance and, including potential tradeoffs and synergies for effects of other stresses that can co-occur with ozone. The first order leaf traits for ozone tolerance are associated with ozone entry and are stomatal conductance that controls ozone uptake. This trait will reduce leaf transpiration, which would be beneficial for water conservation under drought conditions, but may reduce yield under heat stress by limiting evaporative cooling. Similarly, reduced transpiration has the potential to limit uptake of nutrients from the soil. The second order of leaf traits include antioxidant metabolism and pathways involved in programmed cell death (PCD). As a first line of defence, high levels of apoplastic ascorbate mitigate ROS formation against ozone stress. Breeding for high levels of antioxidants will also be beneficial to cause synergies with other types of abiotic stress

tolerance, including for drought and heat, both of which are associated with oxidative stress. Programmed cell death is an important pathway of pathogen response in plant leaves, controlled by the interplay of ROS, signalling cascades and plant hormones (Kangasjarvi et al., 2005). Breeding for ozone tolerance could thus be a strategy with tolerance to pathogen, heat, drought and nutrient deficiency in crops.

Ozone is known to have a greater negative impact on roots than shoots hence root traits may provide ozone stress tolerance. Fine roots may be the new frontier of future root research in relation to O₃ due to greater influence of O₃ on fine roots. Traits that contribute to robust root systems will be of benefit across a range of abiotic stresses. Maintaining high values in harvest fraction and high crop quality despite ozone stress forms an important breeding target. Ozone can affect multiple quality traits in seed crops, including protein and starch concentration, as well as visual appearance. In many cases, increases in seed protein concentration despite losses in protein yield are observed.

Concluding remarks

The risk assessment of air pollution is limited in the country in terms of field studies under in situ conditions. Long term field studies using pollutant exclusion and FACE techniques need to be conducted in a coordinated manner in different parts of the country to calculate the crop yield loss assessments due to air pollution. Fumigation experiments to develop dose response functions of pollutants separately and in combination are required. Monitoring of air pollutants in different parts of the country is concentrated only in urban centers. Hence there is a need to have monitoring centers spread over rural and semi urban areas of the country. More detailed national studies are necessary to explore high and low risk zones of air pollution in different regions of the country to develop control policy for reducing pollution burden. Air pollution is also a major source of heavy metals in form of particulate and dusts, which accumulate at toxic levels in the edible portions of plants. Identification of tolerance of tree species to different air pollutants with leaf functional traits and tree characteristics is useful in urban biodiversity conservation and further assessment of ecosystem services and pollution removal potential of tree species.

The social and economic implications of yield losses from air pollution is potentially much greater due to the need to increase crop productivity to meet the demands of growing population and much greater importance of agriculture in the national economy. The inferior quality of produce does not provide required nutrients and energy to the human population. Thus human health is not only affected directly through inhalation of air pollutants, but also due to poor quality food intake which make them further susceptible to diseases.

Ironically, in India, the air quality standards are based on human health only, not on vegetation response. So the policies undertaken at increasing food production and food security must take steps to reduce the impacts of air pollution on crop plants. The environmental policy issues may include revision of air quality standards, cost benefit analysis, urban planning and local environmental impact assessment to take the issue of air pollution and agriculture into account. While reducing the polluting gases from vehicles and industry that react to form O₃ is the most effective long-term solution, but some practical, shorter-term actions may be:

- Screening of existing crops for their tolerance to ozone
- Timing of irrigation to avoid periods when there are high ozone levels.
- Breeding new varieties of crops that cope with ozone better and will have high productivity in an increasingly warmer climate
- The development of agrochemicals that can protect crops from ozone and other threats such as drought and heat stress but do not have a toxic effect on the environment

References

- Agrawal, M., Singh, B., Agrawal, S.B. et al. (2006) *Water Air Soil Pollut.* 169, 239.
- Avnery, S., Mauzerall, D.L., Liu, J., Horowitz, L.W. (2011) *Atmos. Environ.* 45, 2297–2309.
- Baek SG, Woo SY (2010) *Photosynthetica* 48, 23–29.
- Broberg MC, Feng Z, Xin Y et al. (2015). *Environ Pollut.* 197, 203-213
- Debaje SB, Kakade AD (2009) *J Hazard Mater.* 161, 686–700
- Debaje, S.B. (2014). *Sci. Pollut. Res.* 21, 7329–7338.
- Emberson LD, Buker P, Ashmore MR, Mills G (2009). *Atmos Environ.* 43, 945- 1953.
- Ghude SD, Jena C, Chate DM et al. (2014) *Geophys. Res. Letter* 41, 5685-5691
- Gurjar BR, Ravindra K, Nagpure AS (2016) *Atmos Environ.* 142, 475–495.
- ICP (2014) *Air Pollution: Deposition to and impacts on vegetation in (South-) East Europe, Caucasus, Central Asia (EECCA/SEE) and South-East Asia*
- Kangasjarvi, J., Jaspers, P., Kollist, H. (2005). *Plant Cell and Environment*, 28, 1021–1036.
- Karnosky DF, Pregitzer KS, Zak DR, et al. (2005) *Plant Cell and Environment* 28, 965–981
- Lal DM, Ghude SD, Patil SD, et al (2012) *Atmos Res.* 116, 82–92.
- Mukherjee A, Agrawal SB, Agrawal M (2016) *Plant Responses to Xenobiotics.* Springer Singapore, pp 177–210
- Mukherjee, A., Agrawal, M. (2016). *Bull. Environ. Contam. Toxicol.* 96, 1–6.
- Mukherjee, A., Agrawal, M. (2017). *Environ. Chem. Lett.* 15, 283–309.
- Mukherjee, A., Agrawal, M. (2017). *Reviews of Environ Contamn and Toxicol* 244, 5–51.
- Mukherjee, A., Agrawal, M. (2018). *Ecotoxicol. Environ. Saf.* 152, 42–54.
- Rai R., Agrawal, M. (2008). *Sci Total Environ.* 407, 679- 691
- Rai R., Agrawal M. (2014) *Envi Sci Pol Res.* 21, 1039-1053
- Rai R Agrawal M Choudhary KK Agrawal SB et al. (2015). *Ecotox Environ Safe.* 112, 29- 38
- Rai, R., Agrawal, M., & Agrawal, S. B. (2007). *Atmospheric Environment*, 41, 9543–9554
- Rai, R., Singh, A.A., Agrawal, M., Agrawal, S. B., (2016) In: U. Kulshrestha and P. Saxena (Ed.), *Plant Responses to Air Pollution*, Springer-Verlag, Germany, pp. 165-195.
- Roy SD, Beig G, Ghude SD (2009) *Atmos Chem Phys.* 9, 5253–5260
- Singh AA, Agrawal, S. B. (2017) *Environ Sci Pollut Res.* 24, 4367–4382
- WHO, 2016. WorldHealth Organization. May 2016. Accessed date: 9 May 2018

SECTION OF BIOLOGICAL SCIENCES

INVITED TALKS

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SECTION OF BIOLOGICAL SCIENCES

1. Isolation of entomopathogenic fungi *Beauveria bassiana* from *Helicoverpa armigera* used for mass production

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Formulation based on entomopathogenic fungi *Beauveria bassiana* has a wide host range of insect pathogenic fungus and environmentally safe. It has potential and many beneficial properties of this practice reached the application on a commercial scale through high yield and low-cost production which used in insect pest management. In the present study, isolation of entomopathogenic fungi *B. bassiana* from *Helicoverpa armigera* was done. For mass culturing of fungi, different liquid medium used for study the dry mycelial weight to produce best fungus spore and mycelium in liquid medium and to use them directly after homogenizing and formulating to find out the best artificial medium for mass culturing of *B. bassiana*. The study concluded that it grows well on a wide range of media. Out of different media tested, an excellent biomass was recorded in malt extract (mycological peptone) broth (1.76g) followed by Richard's medium (1.18g), potato dextrose broth (0.51g), Sabouraud's dextrose broth (0.43g), malt extract (dextrose peptone) broth (0.35g), Czapek's dox broth (0.31g) and potato carrot broth (0.19g) respectively. Mass production was done using white rice shows growth of fungus rapidly. All the grains were fully colonized within 10 days after inoculation and drying was done at 15 days after inoculation. By microscopic study, the cultures observed that *B. bassiana* was pure with the spores' weight 9.32 g on rice. Therefore, rice can be used as potential growing substrates for mass production of entomopathogenic fungi.

2. Identification of lead compounds as inhibitors of hypertension variant GRK4 α A486V: A molecular docking and simulation study

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Salt sensitive hypertension, an inability to maintain sodium and water homeostasis due to increased salt intake is most common among all types of hypertension. Renal dopamine system regulates approximately 50% of sodium-water homeostasis in the kidney. Yet none of the available drugs target renal dopamine system. The intrarenal activation of dopamine pathways helps in the prevention and development of hypertension. The activity of Dopamine is, in turn, downregulated by GRK4 which phosphorylate the Dopamine receptors rendering them unavailable for the binding of Dopamine. Single Nucleotide Polymorphism (SNP) in GRK4 causes a disturbance in renal dopaminergic system leading to the high blood pressure. In this study, virtual screening study was performed to find out potential inhibitors of hypertension variant Grk4 α -A486V. The natural compounds from different databases such as AfroDb, Analyticon, Npact database, Nubbe natural products, Princeton natural products were downloaded and natural product database was created of size 17068 using Phase Schrödinger. Further, MD simulation studies were performed to identify most stable receptor-ligand complexes. The identified inhibitor may be used as a lead compound for discovery of antihypertensive drugs.

3. Existence of NOS/NO system in testis and its relation with reproductive activity in the common carp, *Cyprinus carpio*

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Nitric oxide has been known as a modulator of reproductive system. Its signaling plays an important role in spermatogenesis and steroidogenesis. Demonstrations of NO/NOS system in testis are restricted to the catfish only. Since fishes exhibit wide range of reproductive mode and mechanism under specific ecological niches, there is a need to expand such study in number of other fishes so that a generalized as well as evolutionary aspect of NOS/NO system could be traced. Therefore, attempts were made to investigate the expressions of different forms of NOS in testis along with NO content in testis and serum. Relation of testicular NO with circulating and testicular testosterone was also observed. The different form of NOS like eNOS, nNOS and iNOS were detected in different cell types (interstitial cells, seminiferous tubules and germ cells) of the fish testis. Circulating and testicular testosterone levels were significantly high in the immature carp than the mature carp, while NO was low in immature testes than mature testes. The pattern of variation in NO Level in the serum was almost similar to that of the testicular NO variation. Thus, testicular NO appears to play role in regulation of spermatogenesis and steroidogenesis of the common carp.

4. Suppression of bovine COX-2 transcription in *in vitro* cultured endometrial stromal cells by RNA interference and its effect on prostaglandin production

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The aim of this study was to evaluate the effect of COX-2 siRNA on prostaglandin production and expression of COX-2 and AKR1B5 mRNAs in bovine endometrium. The stromal cells were grown to confluence at 37°C in presence of 5% CO₂ for 3-4 days. The cells were then treated with three COX-2 siRNA duplexes (siRNA A, B and C). After 24 h of transfection, medium was replaced with RPMI-1640 with 10% FBS-DC and incubated overnight. Thereafter the cells were stimulated with vehicle and PMA for 6 h. After 6 h, culture supernatant was collected for measurement of prostaglandins. Out of three siRNAs, siRNA C decreased production of PGF_{2α} by about half and PGE₂ by three fold. To determine the effect of suppressive concentrations of COX-2 siRNA C, 25, 100 and 500 ng of COX-2 siRNA C were introduced into stromal cells. The production of PGF_{2α} decreased with increase in doses of siRNA C. Analysis of enzymes associated with PGE₂ and PGF_{2α} biosynthesis indicated that decreased prostaglandin production was coupled with decrease in COX-2, AKR1B5 and cPLA2 expression. Introduction of 25, 100 and 500 ng COX-2 siRNA into cultured stromal cells reduced COX-2 mRNA expression in dose dependent manner. These results suggest that gene silencing by COX-2 siRNA is a means of analyzing the function and expression of COX-2 gene in endometrium.

5. Societal relevance of mango fruit metabolomics research

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Mango (*Mangifera indica* L.) is one of the oldest cultivated tropical fruits. It is popularly known as 'The King of Fruits'. India is the largest mango producer, contributes >30% of total global production and exhibits a large number of cultivars. Each mango cultivar displays a characteristic combination of properties. Analysis of the selected mango cultivars revealed several metabolites in

the ripened fruits (terpenoids, lactones, furanones, etc.). Within these cultivars, Alphonso attracts national and international market due to its distinct flavour, attractive colour, low fibre pulp and long shelf life. Alphonso cultivation is concentrated in a 700-km long, narrow coastal belt of western India (*Konkan*). However, Alphonso fruits exhibit geographic variation in the flavour within *Konkan*. To get chemical insight volatiles were studied in the ripening fruits of Alphonso from three cultivation locations within Maharashtra *viz.*, Dapoli, Deogad and Vengurle. Our finding on ripe fruit analysis from these localities suggests that Deogad (Ratnagiri) fruits had lower content of terpenes and higher content of lactones and furanones compared to Dapoli and Vengurle. This metabolite profiling of Alphonso mango fruits helped farmers to successfully file geographical Indication application. The authors have characterized and patented several genes involved in biosynthesis of these metabolites from Alphonso.

6. Comparison of salinity tolerance of two barley cultivars based on growth and biochemical characterization

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India has 6.73 M ha salt-affected soil including coastal area, of which 2.5 Mha lies in the Indo-Gangetic plain (IGP; National Remote Sensing Agency, 2008). Major reasons for expanding salinity in agricultural lands are high evapotranspiration, poor irrigation practices and excess of fertilizers with high salt index. Therefore, the objective of this study was to assess the response of two cultivars (RD2552 and HUB113) of barley (*Hordeum vulgare* L.) to the salinity of irrigation water during the period December, 2015 to March, 2016. The experimental design was completely randomized, with treatments arranged in 2 x 2 factorial scheme, constituted of two cultivars and two levels of irrigation water salinity (40 and 100 mM NaCl), with 3x3 replicates. The levels of oxidative stress induced in both the cultivars were in proportion to the NaCl concentration with 100 mM NaCl being more damaging than 40 mM. HUB113 displayed more membrane damage along with higher concentration of reactive oxygen species. 40 mM NaCl induced ionic stress in HUB113 but osmotic stress in RD2552 as is reflected with better maintenance of osmolytes in later than former. HUB113 with higher induction of antioxidative enzymes could maintain a better growth and yield than RD2552 at both the salinity levels.

7. Effect of zinc oxide nanoparticles and salicylic acid on cut flowers of *Calendula officinalis* L.

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The present study deals with the effect of zinc oxide nanoparticles (NPs) and salicylic acid (SA) on the cut flowers of *Calendula officinalis* L. Salicylic acid and nanoparticles were effective in controlling the petal senescence by reducing the protein breakdown, specific activities of protease and peroxidase, lipid peroxidation and the amount of total sugars. However, salicylic acid was the most effective followed by ZnO NPs in extending the vase life of *Calendula officinalis*. The longevity of *Calendula* flower was elevated by salicylic acid and zinc oxide nanoparticles due to alteration in morphology and some metabolic activities *viz.* protein, sugar, flavonoids, anthocyanin contents and antioxidant activity. The present study showed that the salicylic and zinc oxide NPs were effective preventing the shrinkage of flowers. The best result was obtained with salicylic acid followed by zinc oxide nanoparticles. The overall parameters *viz.* flower diameter, dry weight, protein and antioxidant activity were affected in the treatments and sharp rise in sugar content during senescence was observed.

8. Algal based biofuel for a future prospect

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The current scenario of renewable biofuel production is inadequate to overcome the high urge for fossil fuels and to fulfil the need of existing fuel demand. In several studies it has been found that microalgae can deliver a sustainable and harmonizing biofuel platform with some important advantages and in contrast to other biomass feedstocks, microalgae show a number of significantly superior benefits as a raw material for biofuel production. This study revealed on algal biomass conversion methods into various biofuel products such as biodiesel, syngas, biogas and bioethanol etc. However, microalgal cultivation for biofuel production is a costly process and from an economic outlook, the large-scale production of biofuels from microalgae achieves a somewhat less appealing status, due to the requirement of large quantities of water, inorganic nutrients like N and P and the CO₂. The applicability of algae can be determined through the classification of algae for its applications, the technical approaches and their strengths and drawbacks and the future perspectives of algae-based technologies. Here, the authors emphasis on whether the nutrient-rich ash and flue gas generated in biomass power plants could be used as a nutrient source for culturing *Chlorella spp.* to make the cultivation process of biolipids, a trendy and cost-efficient manner. It is estimated that the algae-based biofuel will be acceptable in the upcoming decades and potentially dominate over 75% of the world's economy.

9. Genetic variation in physiological response at population level of Jamunapari goats

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Heat stress is a major problem in livestock which is influenced by different climatic condition so it is necessary to develop different strategies to make better for maintaining production performance. The aim of this work was to analyze the genetic variation in physiological response at population level in Jamunapari goats. The physiological parameters were recorded at different period with THI (Temperature Humidity Index). The THI range varied from 82.00 to 92.08 during hot period, 49.96 to 59.68 during cold period and 65.32 to 74.00 during thermo-neutral period. The two contrasting (HST and HSS) phenotype were identified on the basis of RR and HR. RR and HR was significantly different ($P < 0.01$) between heat stress-susceptible and tolerant phenotype. The RR and HR of kids and adult was significantly different ($P < 0.01$) between in heat stress-susceptible and tolerant phenotype. Age by period and age by phenotypes interaction had significant ($P < 0.05$) on RR and HR. The heritability of RT, RR and HR were 0.18 ± 0.058 , 0.077 ± 0.044 and 0.307 ± 0.076 respectively in combined data set. The h^2 estimate was significant for both hot and cold period. Similarly heritability was analysed separately for age group. The genetic correlation between RT and HR was high and positive during hot and cold period as well as in combined data set. Our finding indicates that phenotypic difference can be heritable.

10. Identification of tolerant tree species to establish green belts around the urban rural gradient

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Recent urbanization has significantly altered the air quality in both urban and rural environments. Recent studies have identified significant increases in the Particulate matter (PM) and Ozone (O₃) in both urban and rural environments in Indo-Gangetic Plains of India. Considering this information, a comprehensive study was performed to identify tolerant tree species to establish green belts around

the urban-rural gradient in India. Eighteen trees species were biochemically and morphologically assessed to identify their tolerance against PM and major gaseous pollutants. PM and NO₂ were identified as major air pollutants which influenced trees in the urban environment, whereas O₃ was identified as major air pollutant influencing plant response under rural environment. More than 60% of trees showed significant tolerance to rural and urban air quality. Trees such as *Albizia lebbek*, *Cesalpinia sappan*, *Psidium guajava* and *Ficus religiosa* showed higher resistance to all the pollutants at both urban and rural environments. *Delonix regia* showed the maximum response to O₃. Trees having higher non-enzymatic antioxidants, higher membrane integrity with deciduous nature, compound leaf form, medium to small canopy size were more tolerant to air pollutants and are suggested to be grown in areas around urban-rural gradient to purify the local air quality and pollution abatement.

11. Curcumin based drug formulation by encapsulating nanoparticles

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One of the emerging areas of herbal drug formulation is to use of nanoparticles which has now become a great impact on disease diagnosis and treatment. Nanoparticles can be biologically synthesis to provide safe, environmental friendly, cost effective and non-pathogenic treatment for diseases. Encapsulation of drugs with nano particles enhanced the pharmacological and therapeutic properties of drugs. Turmeric has been used from ancient times for its anti-oxidant and anti-inflammatory properties. Rhizomes of *Curcuma longa* Linn. contain a bioactive phenolic substance curcumin which is used in the treatment of various diseases. It is used to treat various pathological conditions like cancer, cardiovascular diseases, Alzheimer's disease, neurological disorders etc. It has been found that the biological activity of curcumin significantly increases by nano formulation. The use of nano medicine derived from plants provides increase in bioviability by reducing toxicity. So the use of nanoparticles derived from biological methods has proven beneficial in the treatment of many diseases like asthma, cancer, cardiovascular diseases, neurological disorders etc.

12. Scrutiny of heavy metal contamination in sediment of river Ganga via ecological indices

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The present investigation includes a systematic analysis of heavy metal contamination in sediment of river Ganga at Allahabad district of U.P, India. All the sediment samples were collected on a seasonal basis for the measurement of Zn, Cr, Cd, Pb and Cu to assess the pollution level. Results revealed that the concentration of heavy metals were ranged between 36.12 to 88.75 mg/kg for Zn, 42.41 to 109.52 mg/kg for Cr, 0.12 to 0.48 mg/kg for Cd, 3.91 to 20.42 mg/kg for Pb, 8.42 to 45.90 mg/kg for Cu in pre-monsoon, monsoon and post-monsoon seasons. CF illustrates an anthropogenic input in river sediment which fell in the moderate degree of contamination as in the decreasing order of Cd>Pb>Cr>Zn>Cu while CD and PLI of the sediment was found highest at site 2 while lowest at site 4. Experimental findings revealed that the river sediment is less contaminated with toxic heavy metals during the study period, but it may be degraded sediment quality in near future due to increasing anthropogenic inputs in the river, hence proper management strategies are necessary to control direct dumping of wastewater into the river.

13. Evaluation of different substrates for growth, yield and nutritive value of *Hypsizygus ulmarius* (blue oyster mushroom)

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Mushrooms are large reproductive structures of edible fungi. They are non-green and spore bearing fruiting bodies of fungi which produce above ground on soil or on its food source (substrate). Blue oyster mushroom (*Hypsizygus ulmarius*) is one of the important edible mushrooms. An experiment was carried out to investigate the cultivation of *H. ulmarius* on different substrates (wheat straw, paddy straw, card board, wheat straw + paddy straw, card board + wheat straw, paddy straw + wheat straw + banana leaves + card board). The objective of this study was to evaluate the best alternative substrate that would support the growth of oyster mushroom, produce maximum yield with highest biological efficiency and nutritional content. A total of six treatments replicated eight times were taken under the complete randomized design for the experiment. The minimum time taken for spawn run (14.50 days), pinhead formation (18.37 days) and fruiting body formation (23.12 days) was recorded in wheat straw (control). Maximum average pileus width (7.30 cm) was observed in the treatment combination of paddy straw + wheat straw and length (8.67 cm) of wheat straw (control) and stipe size (7.05 cm) in card board. Maximum number of fruiting bodies (179.87), maximum yield (1027.36 g) and biological efficiency (155.60 %) were recorded in treatment combination of paddy straw + wheat straw. Maximum protein content was recorded in paddy straw (27%) whereas maximum carbohydrate content was recorded in wheat straw (40 %).

14. Biotechnological production of L (+) Lactic acid from sugarcane bagasse

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Lactic acid (2-hydroxypropionic acid) is an organic hydroxyl acid with an asymmetrical carbon atom. Lactic acid can be produced either by fermentation or by chemical synthesis. Lactic acid is mostly used in the cosmetic, pharmaceutical, probiotics and chemical industries and has received increased attention for use as a monomer for the production of biodegradable and biocompatible poly (lactic acid). Lactic Acid Bacteria (LAB) are a group of Gram-positive bacteria, non-respiring, non-spore forming, cocci or rods, anaerobic bacteria that produce lactic acid. The four standard *Lactobacillus* strains acquired from the National Collection of Industrial Microorganisms (NCIM), at National Chemical Laboratory Pune India, for their potential of lactic acid production. India produces over 250 million tones sugarcane per year, and 34% produced sugarcane bagasse. Sugarcane bagasse, which is a complex material, is the major by-product of the sugar cane industry. It contains about 50% cellulose, 25% hemicellulose and 25% lignin. Due to its abundant availability, it can serve as an ideal substrate for microbial processes for the production of value-added products. The solid state fermentation studies had the overall maximum lactic acid production of 55.15g/l with co-culture on sugarcane bagasse bed material.

15. Anthelmintic efficacy of coumarin-based trisubstituted methanes

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Helminthiasis is a menace affecting both man and his livestock. With the danger of emergence of resistance to anthelmintic drugs, the need for new anthelmintics is a prime requisite. Herein, a series of compounds constituting biologically active coumarin and pyrimidine moieties were synthesized

and tested for their anthelmintic activity. The compounds were prepared by one-pot multicomponent reaction of equimolar mixture of reactants. The synthesized compounds were tested against *Syphacia obvelata* and *Raillietina echinobothridia*, in an *in vitro* experimental setup. The test parasites were exposed to 200 and 800 µg/ml concentrations and were monitored for paralysis and mortality. The anthelmintic efficacy of compounds was compared with standard reference drugs Albendazole and Praziquantel. Among the tested compounds, a few derivatives show better efficacy and others comparable to that of reference drugs. The study also revealed that *para* isomers showed greater efficacy than the *ortho* isomers. The tested compounds possess significant anthelmintic effects, and hold a future scope to be pursued for detailed *in vivo* anthelmintic efficacy studies, toxicity studies and mechanism of action.

16. Gene expression profiling of weedy rice biotypes in response to drought stress tolerance

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Weedy rice can be regarded as biosimilar to cultivate and wild rice, and therefore is also create problem for its management in rice crop. Adverse effects of water deficit on rice cultivars have been documented by many researchers in India or elsewhere. Locally adapted germplasm have been shown great resilience against adverse environmental conditions like water deficit and salinity. Weedy rice can be a good genetic source for developing drought-tolerant as well as weed-competitive rice cultivars. Objective of this study was to evaluate the gene expression and identify their functions in controlling ROS levels in weedy rice. A total 44 entries were examined including 41 entries of weedy rice and one wild rice along with two cultivars. Entries were evaluated for tolerance to PEG-induced stress at the seedling stage. Based on the screening results, three weedy rice accessions WR-23, WR-27 and WR-30 performed well under drought stress condition. Best performing biotypes were selected for gene expression analysis along with check cultivars. Total RNAs were isolated from selected germplasm and used further for cDNA synthesis. The RT-PCR analysis was done using 13 gene-specific primers. The analysis indicates possible involvement of these genes in tolerance mechanism against drought stress. Results showed that drought-tolerant weedy rice that could be a more suitable genetic resource for the development of rice cultivars having enhanced drought tolerance. Our research provided a background to identify genes responsible for drought stress tolerance and weedy rice can be explored for rice improvement using molecular approaches such as marker-assisted breeding methods.

17. Green synthesis of silver nanoparticles using *Madhuca longifolia* var. *latifolia* (Roxb.) A.Chev. leaf extract and their antibacterial activity

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The immense potential of nanobiotechnology makes it an intensely advance area in applied biological sciences. Green nanoparticles synthesis techniques for pharmaceutical applications are desired because of their biocompatibility and lack of toxic byproducts. This study focuses on *in vitro* effect of green synthesized silver nanoparticles on bacteria. Aqueous plant leaf extract was used for silver nanoparticles synthesis. Suitable concentration of Silver Nitrate (AgNO₃) solution was standardized (0.1mM) for silver nanoparticles synthesis. The synthesized nanoparticles were confirmed through physicochemical characterization (XRD, FTIR, Fe-SEM and EDX). Then the

different concentration of silver nanoparticles was applied on different bacteria like *Bacillus thuringiensis*, *Pseudomonas aeruginosa* (MTCC 1688), *Bacillus cereus* (MTCC 1272), and kept in the incubator with appropriate temperature. The zone of inhibition of the each concentration of silver nanoparticles was measured.

18. Molecular markers and their use in animal genetics

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Advances in molecular biotechnology have introduced that development and use of molecular markers for the exploitation and identification of DNA polymorphism is a revolutionary impact in the field of molecular genetics. The presence of various types of molecular markers present and their differences in principles, methodologies and applications still need careful consideration in selecting more useful marker. Popular genetic markers in the animals community include Allozymes, Mitochondrial DNA, Restriction Fragment Length Polymorphism (RFLP), Random Amplified Polymorphic DNA (RAPD), Amplified Fragment Length Polymorphism (AFLP), Microsatellite, Expressed sequence tags (ESTs), and Single Nucleotide Polymorphisms (SNPs) markers. Consequently, more accurate genetic information can be obtained to better understand existing animal genetic resources. This review will help us better understand the characteristics of different genetic markers and the genetic diversity of animal genetic resources.

19. Okra boon to the diabetes

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Okra also termed as ladies finger, it is a flowering plant in the mallow family. Its scientific name is "*Abelmoschus esculentus*" and also "*Hibiscus esculentus*". Ladies finger is a popular green pod vegetable cultivated throughout the tropical, subtropical and temperate climates around the world. Ladies finger contains dietary fiber, vitamin A, vitamin C, vitamin K, thiamin, vitamin B6, folate, calcium, magnesium, phosphorus, potassium, manganese, protein, riboflavin, niacin, iron, zinc, copper, alkaloids, carbohydrates, flavonoids, phenols, terpenoids, tannins, and sterols. It is low in sodium, Saturated fat and cholesterol, thus an ideal diet for human consumption. Health Benefits: controls diabetes, prevents heart ailments, prevents cancer, helps you lose weight, improves immunity, fights asthma, improves mental faculties, aids in fighting constipation, strengthens bones, good for pregnant women, dandruff and lice treatment, skin pigmentation. Okra has anti-diabetic properties, Based on multiple studies confirming Okra as a potent blood glucose-lowering (or anti-diabetic) food. The superior insoluble fiber contained in okra is believed to help stabilize blood glucose by slowing speed of sugar absorption from the intestinal tract. Many people with diabetes have reported decreasing blood sugar levels after soaking cut-up okra pieces in water overnight and then drinking the juice in the morning. Roasted okra seeds, which have long been used in Turkey to treat diabetes, have also been studied and proven to have a positive effect on lowering blood sugar. Increased dietary fiber with intake of okra has been shown to promote better glycemic control and improve insulin sensitivity.

20. Bio-conversion of orange peel waste for bioethanol production: A low cost technology

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Orange peel wastes is widely known as to be beneficial to health, but so far is rarely used by the food industry. It acts as a potential feedstock for biofuel production but, their complication conversion into fermentable sugars is a major complication. They have to be pretreated physically, chemically, or biologically to be used by fermenting organisms for production of ethanol. Each agricultural substrate is a complex mix of cellulose, hemicellulose and lignin, bound in a matrix. Many microorganisms in nature are able to attack and degrade lignin, thus making access to cellulose easy. Current pretreatment research is focused towards developing processes which are mild, economical and environment friendly facilitating subsequent saccharification of cellulose and its fermentation to ethanol. Besides being the critical step, pretreatment is also cost intensive. The steam explosion pretreatment was determined which decrease the hydrolytic enzymes prerequisite and to segregate and retrieve the D-limonene. The hydrolysis process was carried out with three different fungi like *Aspergillus niger*, *Aspergillus fumigatus* and *Trichoderma reesei*. Finally, the fermentation carried out three ethanologenic yeasts, *Saccharomyces cerevisiae*, *Pichia stipitis* and *Canida shehatae* for bioethanol production. FTIR, XRD and SEM data of samples were investigated.

21. Implication of borewell water recharge technology in Noorpur village of Ghazipur, U.P.

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Population in India has grown multifold since its independence. Currently it has 1.22 billion population almost twice from 1951 is 62.44 million and by the year 2024, it would be leading the world in the terms of population. High demand of water for irrigation for agricultural need is prevalent across the country, which is expected to increase in the coming decades. In Ghazipur area where this research has been based, gets an annual precipitation of 189.22mm which is quite sufficient to meet all water needs of entire area for several years. According to a recent survey most of the urban areas would run out of water by 2023, soon followed by rural areas. Due to the prevalent use of bore-wells, groundwater level goes very low. According to various studies bore-well recharge of rainwater is an effective practice to maintain the groundwater level. This work will analyse the effectiveness of bore well recharge technology in solving the problem of water scarcity in the village-Noorpur of Ghazipur district in Uttar Pradesh through personal survey and data sampling. The outcome is water maintenance and cost cutting of irrigation through bore-well water recharge technology.

22.Environmental mercury from an industrial source, its accumulation in plants and possible reclamation by natural methods - a critical study

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Majority of the chlor-alkali industries in India adopt old process of using mercury as cathode in the electrolytic process. This has long since been discarded in Japan (recently in India) and in many other countries after the Minamata Bay mercury poisoning incident. This technology has been banned and by 2010, all mercury cell units are to be converted to membrane technology. M/s. Jayashree chemicals pvt. Ltd. situated at Ganjam only adopted the membrane technology over mercury cell process in 2012. Mercury was used in the electrolysis process and most of it finally goes out along with waste water (effluent, as cell & cell house washing, hydration chamber washing and compression chamber washing) and sludge; and ultimately enters into the environment. The grayish white solid waste (brain mud) which is dumped in pits in the nearby field at Ganjam contained large quantity of mercury. It was reported that mercury content to vary from 480 to 984mg/kg dry weight in the solid waste collected from different areas from in and around the industry and mostly at waste dumping sites. The physico-chemical analysis of the effluent at three points of the effluent canal showed significant variation in different parameters. The leachate chemicals leaching from the storage tank into Rushikulya River showed very high values. The 2013 reported data, indicated increase in mercury concentration in the effluent to $3.16 \pm 0.45 \text{ mg l}^{-1}$ when compared to the report of 1996, however, the mercury concentration decreased to $0.96 \pm 0.18 \text{ mg l}^{-1}$

in February, 2016. The decrease in mercury concentration was due to change in technology as no mercury was discharged. Whatever mercury was available was due to past deposition and present leaching from deposition, as huge amount of mercury was discharged in to the environment (mostly in to Rushikulya river and Rushikulya estuary) by the industry in the past 50-52 years. This environmental mercury can be recycled by available methods in Recycling technology. We can employ biotechnological methods of gene manipulation in bacteria and employing these hybrid bacteria for decontamination studies. This method is too risky and can cause havoc and devastations in open environmental conditions, where environmental parameters will play a crucial role. The best method available and I would like to suggest that plants starting from aquatic microscopic structure to terrestrial macroscopic structure can be exploited to find out possible ways for decontamination studies. Some plants show promise and provided better results in this endeavor. We must select and employ a technology which should be environment friendly and biofriendly.

23. Pollution transmission in river in relation to Fine-grained sediments and ecological implication

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Fine-grained sediments are a natural and essential component of river systems and play a major role in the hydrological, geo-morphological and ecological functioning of rivers. The present experimental data indicates that how anthropogenic activity has caused significant changes in the quantity and quality of sediments/alluvial within river systems, using examples of land use change and geochemical environment. Seven heavy metals namely Co, Cu, Cr, Ni, Cd, Zn, and Pb were examined from the freshly deposited river bed sediment on a seasonal basis for the assessment of fluctuation in 2016-2017 in the river terrain of Ganga in Allahabad. The heavy metal concentration ranged between 09.37-26.12, 2.16-09.14, 41.25-67.08, 13.29 -23.59, 0.19-0.28, 11.26-15.59 and 08.71-11.26 mg/kg for Co, Cu, Cr, Cd, Ni, Zn and Pb, respectively in different seasons. The highest contamination degree of the sediment was noticed as 5.23. Geo-accumulation index was noted between (0 and 2, class 2) which showed that sediment was uncontaminated to moderately contaminated and may have adverse effects on freshwater ecology of the river. Pollution load index (PLI) was found highest 01.25 it indicates that the river sediment/alluvial has a moderate level of contamination due to human settlement and agriculture activity. The ecological implications are also being incorporated in view of their religious and ecological importance for national rural development.

24. Applications of ZnO nanoparticles as catalyst in dissipation kinetics of atrazine herbicide in different pH water and soil under direct sunlight

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Studied the dissipation behavior of Atrazine herbicide under direct sunlight using Zinc oxide nanoparticles as catalyst. Zinc oxide nanoparticles are synthesized and characterized by scanning electron microscopy (SEM), X-ray diffraction (XRD), transmission electron microscope (TEM) and Fourier transform Infrared Spectroscopy (FT-IR). The experiment was conducted by spiking in three different aqueous buffer solutions having pH 4.0, 7.0 and 9.0 to give the uniform concentrations of T0-Untreated Control, T1 – Atrazine 50 % w/v @ 1 mg/L of water and T2-Atrazine 50 % w/v @ 2 mg/L of water. The spiked samples were kept under sunlight. The sampling occasions were 0, 6th, 12th, 24th, 48th, 72nd and 96th hour for acidic water (pH 4.0), neutral (pH 7.0) and basic water (pH 9.0). The collected samples were quantified using a validated high performance liquid chromatography with ultra Violet detector (HPLC-UV) at a wavelength of 254 nm with a flow rate of 1.0 ml/min, injection volume 5 µL, column oven temperature being 30°C, with mobile phase as acetonitrile: water (30:70 (v/v)) and phenomenex C18, 250 mm x 4.6 mm, 5µm column was used. The method has the limit of detection 0.03 mg L⁻¹ and the limit of quantification (LOQ) 0.05 mg L⁻¹ based on signal to noise ratio 3:1 and 10:1 respectively for all the molecules investigated. The

residues of Atrazine in aqueous buffer solutions dissipated to below the detectable level by 96th hour. The DT50 (Half Life) of atrazine was calculated by regression analysis from the dissipation data.

25. Investigating antidiabetic plant based compounds drugs for sustainable rural health development

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In India, the financial problem that the government could not pay such high costs for most of the free health services for rural areas peoples those facing health problems. The present study was carried out to evaluate the anti-diabetic potential by which perform on the basis of HPTLC analysis, antioxidant potential, enzymatic assay (alpha glucosidase and alpha amylase) of Myrtaceae family plant extract against in vitro models respective. Various characterizations were carried out by using CAMAG HPTLC System. To confirmatory test for scavenging free radical activity carried out by using flow cytometry study of adiposities to determine anti hyperglycemic potential by in *vitro* enzymatic assay. The extract showed significant antioxidant activity in all antioxidant assays when compared to ascorbic acid. Herein, the authors also established the in vitro model for diabetes and evaluated the therapeutic potential of guava extract against insulin resistant adiposities. The authors demonstrated that guava extract significantly reduces the Reactive Oxygen Species (ROS) levels. Additionally, guava extract reduces the ALT and GGT activity in a dose dependent manner. In addition enzymatic assay also performed antihyperglycemic inhibitory effect. The results of this research are promising thus indicating the utilization of the all (leaves, stem, fruit, seed, root, flower) part of the plants of Myrtaceae as a significant source of natural antioxidant to combat diabetes diseases and provide rural areas people's health benefits.

26. Seasonal variation in pyramidal neuron of dorsolateral forebrain of *P. krameri*

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Dorsolateral forebrain or Corticoid Complex (CC) in birds lies on the dorsolateral surface of the telencephalic pallium. It is divided into an intermediate corticoid area (CI) and dorsolateral corticoid area (CDL). Pyramidal neuron plays a critical role in object recognition, cognitive abilities, memory and spatial navigation. The present study enlightens some interesting fluctuations occurring in the pyramidal neurons of dorsolateral forebrain area of *P. krameri* in terms of dendritic thickness, spine density and spine morphology during breeding and non-breeding time period of birds. These parameters were observed to be greater during breeding time of bird indicating the fact that changes in season equally effect the neurons in general and pyramidal neurons in particular, for the present study.

27. Observation of multipolar neurons within dorsomedial forebrain of male and female *E. scolopaceus*

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It is thought that neural sex differences are functionally related to sex differences in the behaviour of vertebrates. Dorsomedial Forebrain or Hippocampal complex of birds is a narrow, curved strip of tissue which plays an important role in process of learning, memory formation, food storage, brood parasitism and spatial navigation. Five fields were recognized in the hippocampal complex: Medial

and lateral hippocampus, Parahippocampal area, Central field of the parahippocampal area and Crescent field. In the hippocampus of birds, the multipolar neurons were the main type of neurons. The morphological feature of multipolar neurons of dorsomedial forebrain has been studied with the help of Cresyl violet staining and Golgi impregnation method. These neurons had ovoidal or multiangular shaped soma. Four to eight dendritic branches arose from the medium to large sized soma and ran towards all direction. The higher spine density of female koel indicates its more activeness in comparison to their male counterparts. The higher values of spine density in hippocampus of female koel may be correlated with more specialized functioning of hippocampus like brood parasitic nature.

28. An optimized shoot differentiation protocol of *E. alba* (L.) Hassk for active biometabolites production: Cost control and sustainable development

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Higher plants are major source of natural products which are being used as pharmaceuticals, agrochemicals and food additives. Over exploitation and habitat destruction caused by human population have created serious threat to plant diversity of our country. Thus, conservation and sustainable use of plant diversity is essential to protect earth and meet the demand for future. The ability of plant cell, tissue, and organ cultures to produce and accumulate many of the same valuable chemical compounds as the parent plant in nature has been recognized almost since the establishment of *in vitro* tissue culture technology. *Eclipta alba* (Bhringraj) is one of the very important medicinal plants. The secondary metabolites derived from this plant have played an essential role as medicine since time immemorial. This study was performed to establish an efficient low cost *in vitro* shoot multiplication method in *Eclipta alba* for production of bioactive metabolites is established. Multiple shoot induction from the nodal explants cultured on 0.65% (w/v) agar gelled modified Murashige and Skoog (MS) medium having 3% (w/v) table sugar, 1.0 mg/l 6-benzyl aminopurine and prepared in tap water indicates that *in vitro* culture of *E. alba* could be established at low production cost. The *in vitro* differentiated shoots were dried and used for bioactive metabolite extraction using methanol as solvent. The compounds extracted from dried shoots showed presence of phenolics, flavonoids and free radical scavenging activity. Thus, this study showed that the *in vitro* regenerated shoots of *E. alba* is source of various bioactive compounds and could be exploited for production of therapeutic phytochemicals without disturbing nature.

29. Preventing disease through healthy environment

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This global assessment provides quantitative estimates of 'burden of disease' from environmental factors across the major categories of reported diseases and injuries. By focusing on the disease endpoint, and how various kinds of diseases are impacted by environmental influences, the analysis forges new ground in an understanding of interactions between environment and health. The estimates, in effect, reflect how much death, illness and disability could realistically be avoided every year as a result of reduced human exposures to environmental hazards. The results and conclusions of this assessment are of particular relevance to the health-care sector, where policies and programmes generally address specific diseases or injuries. A better understanding of the disease impacts of various environmental factors can help guide policymakers in designing preventive health measures that not only reduce disease, but also reduce costs to the health-care system. The findings also are highly relevant to non-health sectors, whose activities influence many of the root environmental factors – such as air, water and food quality, patterns of energy use, and patterns of land use and urban design – which affect health and behavior directly and indirectly. Along with

reducing disease burden, many of the same health sector and non-health sector measures that reduce environmental risks and exposures also can generate other co-benefits, e.g. improved quality of life and well-being, and even improved opportunities for education and employment. Overall, then, an improved environment also will contribute to achieving the millennium development goals. Diseases with the largest absolute burden attributable to modifiable environmental factors included: Diarrhoea; Lower respiratory infections; 'Other' unintentional injuries; Malaria and Filariasis.

30. Emergence and mobilization of antibiotic resistance through linked environment in a tertiary health care setting

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Antibiotic resistance and its wider implications present a growing healthcare crisis. Conventionally, the struggle against antibiotic resistance development has taken place in clinical, community, and in more recent years also agricultural settings. Recent research points to the linked environment as an important component for the emergence and transmission of resistant bacteria in health care locales. However, a deeper understanding of the routes that lead to clinical appearance of resistance genes is still lacking, as is the knowledge of environmental dispersal trail. This calls for focused studies on determining how resistance genes evolve, are mobilized, transferred and disseminated. Herein, the authors attempt to identify and molecularly characterize the resistant species among the resident bacteria isolated from various hospital surfaces, waste water and patient samples and the route that leads to transmission of these organisms, to and from a tertiary health care centre, via the community. Results indicate that isolates of *Klebsiella* followed by *Pseudomonas* and *E. coli* collected from different surfaces and waste water, showed the highest antibiotic resistance, while *Enterococci* followed by *Pseudomonas* and *E. coli* dominated the resistant bacteria in patient samples. Subsequently, the plausible route of transfer has also been ascertained.

31. Exploration of plant gum modifies innovation of technological manipulation

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Different technology recognized manipulation improved for scientific evaluation and lifestyle modification with the exploration of different Plant Gum viz *Acacia nilotica*, *Acacia catechu*, *Buchanania lanzan*, *Termanalia arjuna*, *Sterculia urens* and *Lannae coromandalica* in food and therapeutic application. Fermentation technology for maximum production and preservation of food are linked to potential health benefits with food additives and additional production of antibiotics in food and pharmaceutical application respectively. Time demand necessity specified for maximum food production and preservation for complete storage and distribution. Plant gum also addressed for diabetes control by Insulin therapy required for Medi Chew technology through chewing gum with extrusion technology to be applied to made gum for diabetic patients. Mastic gum is natural plant gum for making insulin chewing gum helpful for releasing insulin orally and regulates carbohydrates metabolism. Other trends defined "The Public Health and Well Being Act 2008" concerned exploration of plant gum for medicinal practices through analyzed antioxidant property and its activities evaluated some biological method associated wound healing activities, anti-ageing effect, immunity generation, reducing infections and prevent cellular ageing *in vivo*. Natural plant gum may take part to promote health remedy and also control of diabetic issues.

32. Exploring geospatial technology for the sustainable utilization of degraded lands for rural development

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A multi-criteria analysis (MCA) via analytical hierarchy process (AHP) was employed to explore the latest estimates of potential marginal and degraded lands (P_{ml}) of India and also to assess their suitability for bioenergy plantations based on a polyculture zonation technique (PZT). For this, land-use and biophysical parameters (elevation, slope, temperature, rainfall, soil type and effective depth) for P_{ml} identification was done in an ArcGIS environment using spatial analyst function. Ten bioenergy plant species were initially screened and out of which seven hardy-wood trees were further selected by PZT based on their wider ecological and climate suitability. Results depicted that India accounts for 45.13 million ha of P_{ml} with bioenergy plantation potential. The seven selected tree species have potential for 119 and 3.5 million ton y^{-1} of biomass and biofuel production. This strategy represents 2.6 EJ y^{-1} (equivalent to 730 TW h y^{-1}) of bioenergy production potential as well as a carbon sequestration potential of around 10.7 million ton C y^{-1} . Furthermore, utilization of degraded lands for bioenergy plantations will not only help in the revitalization of degraded system but also helps in promoting sustainable development in rural and remote areas of India and therefore many of the targets of UN-SDGs.

33. Women health and empowerment in rural India: Role of low-cost biodegradable sanitary napkins

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In rural India, the lack of knowledge and awareness about maturation leads to several chronic health issues. In rural areas, women and adolescent girls face many problems during their menstruation periods such as UTIs, RTIs, cervical cancer etc. This study aims to help these rural populations by providing them with low cost biodegradable sanitary napkins and creating awareness about menstrual hygiene and health as well as economically empowering them by providing them employment in proposed napkin manufacturing unit. The proposed sanitary napkins in this project are low cost, efficient and biodegradable which can be easily degraded the environment without adversely affecting it. The technology initiate with the help of biodegradable wood fiber and a set of four small machines which would be used to make cost-efficient napkins. This include de-fabrication unit which de-fabricate the raw wood fiber into the fine fiber to enhance the soaking capability of fibre, then core forming unit which shape it, then come sealing unit which seals the napkin and the last UV sanitizing unit which makes the napkin microbe-free. The main objective of aforesaid technology is to provide cost-efficient sanitary napkin to rural women on one hand and providing employment in rural areas on other hand by setting up this sanitary napkin manufacturing unit. So, this project would be a cost-effective, eco-friendly, commercially viable and would enhance the awareness in rural population which will help the Indian rural society towards sustainable rural development.

34. A herbal approach to mitigate the hyperglycemia, mycoses and diabetic complications

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Diabetes Mellitus (DM) perceived as a serious global health problem, may also lead to various opportunistic or secondary endeavor microbial infections. Present scenario aimed to identify the efficacy of *Lantana camara* (Panch-Tatva) against Diabetes (*in vitro* antidiabetic potential) and its complications (Opportunistic/systemic infection). India is a mega biodiversity country, still has a lot of potential unexploited forests, which have been implemented as potential source of therapeutic crude drugs and also used in folk medicine and traditional healing system around the world since very old times. Different plant preparations are mentioned in Ayurveda and other indigenous medicinal systems. In our investigation the hydro-methanolic plants extracts were screened for possible *in vitro* antidiabetic potential (α Glucosidase and α Amylase inhibition), free radical activity (DPPH, ABTS and Reducing Power methods), total antioxidant activity and antimycotic bioactivities (Zone Inhibition, Relative percentage inhibition and MIC_{50%}). Our data supports the ayurvedic concept that *Lantana Camara* could be potential novel/natural sources for further drug development or ethnomedicines for management of diabetes. So it is very essential to invent the crude drugs which have healing power for all the above hazardous.

35. Medicinal plants collection: Constraints and opportunities in rural areas

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Agriculture is a main source of economy in rural India. Villagers opt various agriculture based occupations for their livelihood. The endeavour to maintain constants source of income throughout the year, has always exercised the human minds since ancient time. One of the mode to generate income is also cultivation and collection of the medicinal plants available in the area. Medicinal plants are source of raw material for manufacturing of the medicines and allied products. Medicinal plants in trade are defined sector of commerce at national and global scenario. In India ayurvedic, unani, siddha and homoeopathic drugs manufacturing units are sustaining on availability of medicinal plant which are supplied by trading of medicinal plants from different areas. Medicinal plants for trade are resourced by cultivation or collection from forest or wildy grown habitats. Cultivation of medicinal plants need expertise and involves many factors ranging from suitable soil to harvesting of produce (agro-techniques). Collection of genuine raw material (medicinal plants) is less cumbersome. Moreover, it can be taken up by a landless villager. Although collection of medicinal plants is already in practice but it requires orientation of workers to opt 'Good Agriculture and Collection Practices'. Its implementation will ensure availability of genuine raw material and higher income returns to rural folks. In this deliberation various aspects of collection in collected raw material practices and value addition in material for betterment of both the ends viz collector and consumer are revisited.

36. Culture, kitchen and rural women: The roots of biodiversity

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The richness of culture and biodiversity is the result of intense struggle of local people over hundreds of years to sustain their livelihood. Biodiversity is the pillar of rural economy. It is valuable asset to the poor it. In rural societies, culture, food and women are integral to biodiversity evolution and conservation. Culture dictates what is sacred, what is desirable, what is beautiful, what taboo is and what wealth is. Thus a country that is poor in culture is likely to be poor in biodiversity and vice-versa. Women are the custodian of culture and play prominent role in management and conservation of plant biodiversity. Their efforts are reflected in carrying culture, in performing rituals, in celebration of festivals and in routine household activities. Women work in the kitchen for food selection, processing, preparation, preservation. Traditions are usually based on locally available plant and animal resources. Therefore link between food and biodiversity is self-evident. Research shows that the food is important not only for nutritional contents but also their emotional, realistic, spiritual and medicinal values. Unfortunately most areas have been overlooked. It is, however, rarely

considered that women are important to biodiversity conservation. Involving women in policy framing can be efficient way to conserve biodiversity preserve culture, eradicate poverty and for food security. Study focuses on socioeconomic importance of some wild plants rural area of Gwalior and role of women in exploration and conservation of local biodiversity.

37. Influence of photoperiodism on the production of steviosides and biosynthetic pathway gene expression in hairy roots of *Stevia rebaudiana*

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Stevia rebaudiana (Bertoni) - family Asteraceae is gaining a worldwide attention to biosynthesizes a group of natural sweeteners that are up to approximately 400 times sweeter than sucrose. *Agrobacterium rhizogenes* mediated transformation process has been practiced predominantly in *S. rebaudiana* for generation of “hairy roots”. These Hairy Root (HR) clones were studied to explore their undetected biosynthetic potentials towards diterpene glycoside (stevioside) synthesis. Growth kinetic analysis at different growth phases has been studied for both the light and dark grown HR clones, which demonstrated better growth cultivated under the dark condition. The total chlorophyll and carotenoids were noted to be higher in the light grown hairy roots than that of their dark grown counterparts. The decisive role of the rate-limiting gene expression in green hairy root towards successful stevioside synthesis has been first time elucidated in the present study, validated through RP-HPLC. The quantitative analysis (qRT-PCR) revealed the expression of the selected rate limiting gene (*UGT85C2*) of the metabolic pathway in the stevioside synthesizing light grown green hairy roots. These findings elucidated the vital role of *UGT85C2* in combination with photosynthetic proficiency of the studied HR cultures in regulating the biosynthetic pathway of *S. rebaudiana*. The present study gives an insight for an alternative approach for zero calorie stevioside production and opens a path for the bioreactor up-scaling.

SECTION OF BIOLOGICAL SCIENCES

38. Indian fisheries in the 21st century: A boon for national development and food security

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Indian fisheries have indeed come a long way. Fish production in India recorded almost four fold increase from 2.6 M.T. in 1983-1984 to more than 10.00 M.T. in 2014-2015 which is less than the present day requirement (about 13 M.T.) and the projected requirement by 2025 A.D. (16.0 M.T.). The above statistics shows that at least 6.0 M.T. increases in fish production is called for within eight years. Is this possible? Especially when all coastal fisheries are depleted or close to depletion, riverine fisheries have declined and aquaculture is developing at a slower pace. F.A.O. had estimated that there was a supply gap of about 25 M.T. of fish globally by the end of last century. This gap will increase to a tune of 37 M.T. and 67 M.T. respectively by 2025 and 2050 A.D. How to fill up this gap? There are certain similar more questions which we have to answer to meet protein requirements for the expected Indian population of about 1.3 billion by 2020 A.D. According to FAO this sector has provided employment to about 58.3 million people at global level. It fact 10-12% people are dependent for their livelihood on this sector at global level. In the present paper role of Indian fisheries as a tool for nutritional security, poverty alleviation generating new employment opportunities and its contribution in national development etc. have been raised and discussed.

39. Fatal diseases of shrimp: A threat to sustainable rural development

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During the last 3 decades, shrimp culture has grown rapidly to become a major global industry that serves the increasing consumer demand for seafood and has contributed significantly to socio-economic development in rural communities. Earlier, fisheries culture contributed just 4% to the worldwide production of sea food. In 2000, this has increased to 28% of which crustacean [majority of Shrimp and Prawn] culture represented 51% (FAO, 2002). The ecological disturbances and changes in patterns of trade associated with the development of shrimp farming have provided many pre-conditions for the emergence and spread of diseases. Shrimps are displaced from their natural environments, provided artificial or alternative feeds, stocked in high density, exposed to stress through changes in water quality and are transported nationally and internationally, either live or as frozen product. These practices have given opportunities for increased pathogenicity of existing infections, exposure to new pathogens, and the rapid transmission and trans-boundary spread of disease. As with other industries, aquaculture has risks, particularly diseases caused by viruses, bacteria and fungi. To date, 18 shrimp viruses have been reported, some of these include the White-Spot Syndrome Virus (WSSV), Taura Syndrome Virus (TSV), Yellow-Head Virus (YHV) and Infectious Hypodermal and Hematopoietic Necrosis Virus (IHHNV) etc. These pathogenic agents, singly or in combination, can kill up to 100% of infected shrimps and therefore result in great financial losses worldwide. Not surprisingly, diseases have devastating impacts on the shrimp production and livelihoods of farmers and their sustainable development.

40. Integrated management of root lesion nematode (*Pratylenchus thornei*) and vascular wilt (*Fusarium oxysporum* f. sp. *ciceri*) to avoid the loss in growth and yield of chickpea through conversion of suppressive soil to conducive soil

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Bundelkhand (BKD) region in central plains of India comprises of 13 districts covering six districts of MP and seven districts of UP. Among pulses, chickpea (*Cicer arietinum* L.) is one of the most important 'Rabi' pulse crops of Bundelkhand region. In this region the soil borne pathogens viz., *Fusarium oxysporum* f. sp. *ciceri*, *Rhizoctonia bataticola* and *Sclerotium rolfsii* have been found causing significant yield losses either singly or synergistically in combination with nematodes as pre-disposing factor. Root infection by plant-parasitic nematodes has been shown to affect host resistance to some *formae speciales* of *F. oxysporum* and thus, the occurrence of plant-parasitic nematodes along with *F. oxysporum* f. sp. *ciceris* in soil used for chickpea production is of great concern. The lesion nematode *Pratylenchus thornei* is described as a major limiting factor in chickpea production in many countries of the world. To overcome these constraints which are known to limit the productivity, the field experiments were conducted during the Rabi seasons of 2015–2016 and 2016–2017 in a split plot factorial design. All treatments were replicated 3 times in an experiment. Each sub plot experimental unit was 7.5 m² with 8 rows. Forty seeds per row were sown 10 cm apart at 30 cm row spacing. Twenty-six treatments consisting of two different factors for soil application and seed treatment were evaluated. Four soil application formulations, namely *Glomus intraradices*, *Bacillus subtilis*, *Rhizobium* and compost were evaluated as the main treatment factors. The *Trichoderma* spp (*Trichoderma harzianum*-Indian Type Culture Collection No.-6797, *T. viride* ITCC No.-2109, *T. virens* ITCC No.-4177), considered as compatible with other soil microbes, therefore, clay soil based seed priming formulations developed from these isolates were evaluated for seed treatment along with one commercial biocontrol based formulation Kalisena-AN 27. Untreated soil and seeds served as controls. Factors were randomized at each level. The experiment was conducted in a hot spot of pre-established root lesion nematode *Pratylenchus thornei* (4 J₂/g soil) followed by inoculation with fungal pathogen *Fusarium oxysporum* f. sp. *ciceri* by incorporating a 15-days old inoculum multiplied on sorghum grains, at the rate of 13g sub plot⁻¹ (2 x 10⁹ cfu g⁻¹). JG-16 was used as susceptible check and the fertilizers viz. N 25 kg ha⁻¹ and P₂O₅ 50 kg ha⁻¹ were also applied. 100g Vesicular Arbuscular Mycorrhiza, *Bacillus subtilis* @ 1kg.ha⁻¹, *Rhizobium* @ 1kg.ha⁻¹, and prescribed dose (5kg/m²) of compost were applied 4-5 inches below the treated seeds at the time of sowing in furrows. The seeds treated separately with BASH-*Bacillus subtilis*, and clay soil based formulation of *T. harzianum*, *T. viride* and *T. virens* at 4g kg⁻¹ of seed (10⁸ cfu g⁻¹) were used alone and in integration. Among all the treatments, a combination of *Rhizobium* and compost for soil application and clay based *T. viride* for seed treatment together, provided the highest seed germination, shoot and root lengths and grain yield with the lowest incidence of lesion-wilt complex in chickpea under field conditions. Individually, soil application of *Glomus intraradices* and compost and seed treatment with clay soil based *T. harzianum*, *T. viride*, *T. virens*, BASH-*Bacillus subtilis* and *Rhizobium* were effective in reducing the incidence of lesion-wilt complex and increasing the grain yield of chickpea, but their effectiveness was greater when applied as a combination. The study recommends combined application of *Glomus intraradices*, and compost as soil treatment along with clay soil based *T. virens* and *Rhizobium* as seed treatments as two modes of application for the management of lesion-wilt complex of chickpea.

41. Identification of polyalcohols by smith degradation method from alkali soluble seeds polysaccharide of *Quercus incana* Roxb. plant

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Quercus incana Roxb. plant (*Fagaceae*) is commonly called as *Banj*, *Phalat* and occurs in Himalayan region of Northern India and Nepal. Seeds yielded a alkali soluble (NaOH)

polysaccharide as D-galactose and D-mannose in 1:5 molar ratio by TLC, Paper and Column chromatographic analysis. Present investigation mainly deals with the reduction of periodate oxidised seeds polysaccharide by Smith degradation method. Periodate oxidised seeds polysaccharide on reduction with sodium borohydride and hydrolysis with sulphuric acid yielded glycerol and erythritol in 1:6 molar ratio by paper chromatographic analysis. Derivative of glycerol was prepared with pyridine and *p*-nitrobenzoyl chloride after recrystallization with acetone as glycerol-tri-*O*-*p*-nitrobenzoate, had m.p. 186-187 °C. Derivative of erythritol was prepared with pyridine and *p*-toluene sulphonyl chloride after recrystallization with acetone-ethanol mixture gave tetra-*O*-tosyl-erythritol had m.p. 118-119°C. The large proportion of erythritol was released with acid hydrolysis of polyalcohols produced by sodium borohydride. The main polymer linkages are of (1→4)-β-type and (1→6)-α-type at non-reducing end. Ratio of erythritol to the amount of glycerol indicated that the branching point on the average of six unit in the backbone of the seeds polysaccharide structure of *Quercus incana* Roxb. plant.

42. Effect of rice straw on wheat yield and soil health

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KVK, Kushinagar conducted an on farm trial to assess the effect of zero-tillage and mulching with rice straw on wheat yield at farmers' fields. Results indicated that T2 gave the highest yield i.e. 42.13 q/ha with B: C. ratio 3.34 followed by T1 i.e. 37.33q/ha with B:C ratio 3.04 in comparison to farmers practice i.e. 32.10 q/ha with B:C ratio 1.98. It was also observed that zero-tillage wheat with mulching reduced the cost of cultivation Rs. 5450.00/ha and increased 23.8 per cent yield over farmers practices. Improvements in soil health have been recorded.

43. Irrigated rice-wheat cropping system and soil health

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Krishi Vigyan Kendra (KVK) Kushinagar assessed the technology of intensification and diversification of irrigated rice-wheat cropping system at 5 farmer's field. Cropping intensity of district Kushinagar i.e. 155.25 % due to sugarcane as sole crops in a year, in case of rice –wheat system only 200%. During kharif season, rice var P-2511 gave 40.25 q/ha in 125 days in comparison to farmers practice i.e. BPT-5204 gave 22.75 q/ha in 147 days due to dry spell and un scattered rainfall and save 20 days of cropping period so that in rabi season farmers take advantage and timely sown –Toria var.PT-303 and Uttara) and got 7.45 q/ha from PT-303 and 6.25 q/ha from Uttara respectively in comparison to farmers practice i.e. Wheat var. HUW-234 gave yield 20.15q/ha due to delayed in sowing due to delay harvesting of paddy and preparation of land. During zaid season farmers sowed cowpea variety kashi kanchan after harvesting of toria as vegetables crop. In the trial T1 cropping intensity increased 300 % (Paddy var.P-2511- Toria var. PT-303/Uttara- Cowpea var. Kashi Kanchan) in comparison to farmers practice i.e. 200 % (Paddy var. BPT-5204- Wheat var HUW-234- followed by fallow land).Improvement in soil health have been recorded.

44. Weed management in maize and soil health

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KVK Kushinagar conducted a farm trial on weed management in rabi maize at Farmer's field. Variety of maize was hybrid DKC 9081. Result showed that use of post emergence atrazine @ 1.0 kg.a.i./ha +Halosulfuron 90 g/ha (T₂) completely finished the weeds in maize crop followed by spray of atrazine @ 1.0 kg. a.i. / ha. Formulations of post emergence with treatment T₁ (2.0 kg per ha, 50 percent W.P.) found average 50.25 weeds/m². In manual weeding, no major weeds were found; and improvement in soil health was recorded.

45. Bryozoan diversity and rural development in India

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Bryozoans are microscopic, sessile, colonial, unsegmented, coelomate animals attached on various substrata. Although bryozoans are widely distributed yet little is known about their zoogeographical status. The key to bryozoan survival lies in their production of remarkable seed like statoblasts (sclerotized, dormant structure) produce asexually and can survive freezing, desiccation and other environmental stresses. In this investigation freshwater bryozoans were collected from near about 13 different water bodies of Aurangabad, region. Live sample with substrata and statoblasts were collected and preserved. Scanning Electron Microscopy (SEM) photograph of statoblasts are taken. Analysis of ultrastructure of statoblast using SEM provides useful data like dimensions, pattern, shape of annulus and fenestrate etc. The same with data on external morphology, distribution pattern of zooids helps to identify species. Till now twelve different bryozoan species are identified. A thorough understanding of diversity and ecology of bryozoans is essential for their effective use as indicators in bioassay studies, water quality monitoring, palaeolimological research, controlling their growth as fouler and its implication on rural development.

46. A survey of macrophytes along the bank of river Narbada in Nimar Eco-region of Madhya Pradesh

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The present paper deals with the macrophytic vegetation found to grow in and around the bank of river Narbada flowing in Nimar eco-region of Madhya Pradesh. Macrophytes are aquatic plants or hydrophytes which grow in or near water and are visible to the naked eye. These plants may be either emergent, submerging, free floating or floating leaved plants. Morphologically they may be amphiphytes, elodeids (stem plants), isoetids (rosette plants), nymphaeids (rooted plants) and pleuston (vascular plants). Macrophytes perform many ecosystem functions in aquatic systems and are used by human beings as a food source, important potential source of therapeutic agents and also as watershed health indicators. Earlier such type of survey has not been done, hence the present investigation is taken. The present survey was done during 2016-2017 and in this connection, the route starting from Makarkheda to Nawada todi along the bank of the river. The plant specimens were collected and identified following standard floras. Later on the herbarium sheets were kept in the Botany Department of Govt. College, Niwali, M.P. for future reference. The present study revealed all 40 species belonging to 36 genera of 23 families. Out of which one species belong to pteridophytic family. The dominant families with three or more genera are Asteraceae, Cyperaceae, Hydrocharitaceae, Scrophulariaceae and Euphorbiaceae while two species each belong to Amaranthaceae and Potamogetonaceae. Important genera reported are *Amaranthus* (2 spp.), *Bacopa*, *Caesulia*, *Croton*, *Cyperus* (2 spp.), *Crozophora*, *Eclipta*, *Eleocharis*, *Gnaphalium*, *Hydrilla*, *Jatropha*, *Parthenium*, *Potamogeton* (2 spp.) and *Vallisneria*. Further research work is in progress.

47. Some fresh water siluriformes “Catfishes” in Alwara lake of district Kaushambi, U.P.

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Present investigation deals with a survey of some fresh water siluriformes “Catfishes” in Alwara lake, which is commonly known as Alwara Taal. 28 species were observed at different transects of Alwara Taal. Out of these 28 species, 11 species were found as catfishes and remaining fishes come under red data list and IUCN. The fishes were collected from different transects by gill nets and cast nets and identified these species by (K.S. Mishra Identification of fishes India and Pakistan, 1959, 62, 2003) belonging to the family of Cyprinidae, Bagridae, Siluridae, Ophiocephalidae, Notopteridae, Sacchobanchidae, Schilbeidae, Clariidae, Gobiidae, Anabantidae, Osphronemidae, Clupeidae, Engraulidae, Belonidae and Mastacembeleidae. The survey was conducted from January 2014 to December 2017 during day and night time. Eleven (11) species of catfishes were recorded belonging to 5 families on the basis of rate of decline, population dynamics, area of geographic distribution. International Union for Conservation of Nature (IUCN) Red data list (2016) classified the species into 9 groups including Endangered (EN), Vulnerable (VU), Near Threatened (NT), Least Concern (LC) and Not Evaluated (NE), therefore, it is suggested that the lake should be totally protected by District Administration of Kaushambi where no hunting, fishing and egg collection should be allowed. The object is to protect a breeding nucleus of this species of Alwara lake. The lake should be totally declared as protected area since another vulnerable species of birds i.e. Sarus Crane is also abundance in the area.

48. Effect of stone crusher dust on grain characteristics of *Zea mays* L.

D.D. Pandey* and Madhu Rani**

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The study area was confined to the Karwandi, Rohtas, Bihar (24057' north latitude, 840 east longitude, 405 at the mean sea level) to assess the impact of stone crusher dust pollution on grain characteristics of maize, that is, number of seeds per cob, weight and volume of 1,000 seeds, moisture, protein, total ash, fat, crude fiber, total carbohydrates, iron, phosphorus, calcium and calorific value. All characteristics of polluted seeds showed lower values as compared to control except total carbohydrate and calcium.

49. Floristic diversity of medicinal flora of Azamgarh district U.P. India

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Azamgarh district of Eastern Uttar Pradesh state of Indian Union, spread over on area of c. 4054 sq km, lies between the rivers Ganga and Ghaghara, It is surrounded by district of Mau in east, Gorakhpur in the north, Ghazipur in the South-East, Jaunpur in the South-West Sultanpur in North-West. It lies between the geographical limits of 25028" and 26027" north of latitude and the meridians of 82040" and 83052" east of longitude. The forest cover of the district is c.110 hectares. The dominant trees of the forest include trees of Jamun, Neem, Mango Jack-fruit etc. Present paper throws lights on medicinal plants (Angiosperms) found in Azamgarh district of Uttar Pradesh. As per number of genera and species both Fabaceae (16 genera, 30 species) family is most dominant followed by Asteraceae (10 genera, 10 species) Nomenclature, vernaculars names (s), localities, phonological data and uses are provided (in tabulated form) of 157 species belonging to 119 genera and 57 families in this paper.

50. Synthesis, spectral characterization and biological evaluation of divalent transition metal complexes derived from furan and Schiff base ligand

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Biologically active complexes $[M_2(C_{44}H_{52}N_{20}O_2S_8)X_4]$ of Cu(II), Ni(II) and Co(II) with Schiff base ligand ($C_{22}H_{26}N_{10}OS_4$) obtained through the condensation of 2,5 diethylidene furan bis (thiocarbohydrazide) with 2-thia-6-aza-bicyclo[4.2.0]oct-4-en-7-one. The newly formed Schiff base and its metal complexes have been structurally characterized with the help of elemental analysis, condensation measurements, magnetic measurements and their structure configuration have been determined by various spectroscopic (electronic, IR, ¹H NMR, ¹³C NMR, GCMS) techniques. The electronic spectra of the complexes indicate a octahedral geometry of the center metal ion. These metal complexes and ligand were screened for their *Antioxidant* and antimicrobial inhibiting potential and compared with standard drugs butylated hydroxyanisol (*free radical scavenging active*), Imipenem (antibacterial) and Miconazole (antifungal).

51. Ultrasonic reactive-extraction is an easy method for biodiesel production from castor oilseeds.

Gajendra Kumar

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The alkyl ester of castor oil represents as an alternative fuel for diesel engines which is to reduce the cost of biodiesel by increasing the efficiency of biodiesel production by single step reaction i.e. production of biodiesel by combing extraction of oil from castor oilseed and reaction of extract with alcohol by using ultrasonication. This process is called Ultrasonic reactive-extraction. It consists of the investigation of the optimum conditions i.e. seed size >1-<2, molar ratio oilseed to methanol 1:100, catalyst concentration 1.5 wt% of oilseed, reaction time 20 minute and ultrasonic amplitude 50%, cycle 0.3s gives the maximum conversion.

52. Prevalence and risk factors of allergic disorders among people of Arrah, Bihar

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Allergic disorders impair functional ability of individuals. The implications of allergic disorders can be minimized if strategies are planned for its early identification followed by appropriate interventions. To find out the prevalence and risk factors of allergic disorders, data was collected by house to house survey among participants aged over 18 years a standardized allergy assessment questionnaire. Mean age of the 300 participants was 42.8±14.7 years. Majority of females 216(72.0%) were house wives 162(54%). Majority of participants were of upper socio economic class 74(44.84%) out of 165 and majority were from urban areas 244(81.33%). The prevalence of allergy among participants was found to be 88(29.33%). Out of these 28(31.82%) had possibility of allergy, 45(51.14%) had probability of allergy and the rest 15(17.04%) had very high likelihood for allergy. People residing in semi urban areas had increased risk of allergy (p=0.024) than those from urban areas. The prevalence of asthma was 22(7.5%) and skin allergy was 18(5.8%). Family history of allergy was associated with allergy among participants (p<0.001). Usage of firewood was associated with symptoms of respiratory allergy among participants (p=0.01). The study revealed

some important determinants of allergic disorders which have important implications to frame appropriate prevention and health educational strategies.

53. Review of challenges to environmental management practices in Indian mining industries

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Mining has been and continues to be a major contributor to the economic growth of most of the developed and developing countries. India ranks among top five global players in terms of production of several important minerals. A high environmental cost which has been associated with years of unregulated mining and mineral-processing activity made it realized to strike a balance between mineral developments on the one hand and the greening of the environment on the other. Gracefully many technologies to reduce the environmental burden and greening the supply chain in mining sector have been developed. Yet implementation of these technologies is not free from challenges. Attempt has been made in this paper to identify these challenges in the context of Indian mining industries.

54. Plastic: A threat to life (a review article)

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Plastic pollution is a growing issue to individuals, businesses, policymakers etc. People are so much dependent on plastic products in our daily life. Plastic is a non-biodegradable material and its degradation by chemical means or by burning leads environmental pollution. Disposal of plastic in water bodies is a big threat to aquatic life. The present article tells us how plastic entered in our life and causes problems to humans, animals and environment and also attracts our attraction towards the need to reduce or ban the use of plastic .Plastic ban is a big step to save the earth.

55. Phytochemical and pharmacological study of Indian medicinal plant-*Ocimum sanctum*

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Modern medicine has made phenomenal progress in the treatment of several diseases. Yet, scientists are unable to find a successful and sure-cure therapy against certain diseases. Plants are the only source of a well-established traditional and modern drugs and phytochemicals. India, a treasure of plants has wide variety of medicinal plant species. *Ocimum sanctum* is one of the most popular culinary herbs known for its medicinal properties. It includes at least 150 species. *Ocimum sanctum* is a plant of family *Lamiaceae*, is commonly known as Holy Basil. Holy Basil is extensively famous and has been used since centuries in Ayurvedic and Greek medicines owing to its beneficially medicinal properties. It is pungent and bitter in taste and hot, light and dry in effects. Ayurvedic texts categorize *Ocimum sanctum* as stimulant, aromatic and antipyretic. Since Ayurveda times, various parts such as leaves, roots, seeds and whole plant has been recommended for treatment of a various diseases including bronchitis, malaria, diarrhea, dysentery, eye ailments, dermatological issues, rheumatoid, arthritis etc. *Ocimum sanctum* has a variety of biological pharmacological activities such as anticancer, antiviral, anti-diabetic, antifertility, antifungal, antimicrobial, cardio protective, anti- oxidant, analgesic, anti-bacterial, anti protozoal, antimalarial, immunomodulatory, hepatoprotective, antiallergic, antipyretic, antiulcer, adaptogenic/ antistress, anti-inflammatory CNS depressant and antiarthrities activities. Its biologically active constituent is known as Eugenol (1-hydroxyl-2-methoxy-4-allyl benzene) which is responsible for the mediation of therapeutic

characteristics. This review an attempt has been made to congregate the botanical, pharmacological, phytochemical, ethnomedicinal and toxicological information on *Ocimum sanctum*.

56. Environmental concerns in India: Problems and solutions

Rekha Rani Agarwal

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Although India has a rich and long history of environmental laws dating back to the 1970s, it still ranks very low on air and water pollution levels compared to the rest of the world resulting in higher rates of infant mortality and lower life expectancy rates. Poor sanitation conditions and sewage problems compound the problem affecting the health of ordinary citizens in India. The reasons for this disconnect between enlightened environmental laws and high levels of pollution could be traced to lax enforcement of existing environmental laws, discrepancies in the environmental guidelines for businesses to follow between the central government and at the state levels, and the existence of a large number of SMEs who neither have the resources nor the technical skills to adhere to the existing environmental laws. Using extensive secondary research, this paper suggests a series of steps to help the country achieve safe air and water pollution levels resulting in improved health conditions for its citizens. The cornerstone of the prescription for improvements in the environment is a collaborative arrangement that brings together the various government agencies, the citizens, SMEs, large domestic companies, and NGOs to participate in a collaborative arrangement to educate, streamline effective policies, develop the necessary institutional infrastructure, and provide adequate funding for improving the environment. Indian environment has been deteriorated remarkably in the past 50 years due to rapid decline in natural resources and severe increase in pollution level. Depletion of forests, population growth, vehicle emissions, use of hazardous chemicals and various other undesirable human activities are mainly responsible for this degraded scenario of environmental health in India. It is, in fact, rendering considerable economic loss to the country and warrants serious attention of policymakers, administrators, scientists and people altogether to save the environment and humanity and to provide generational equity. The present paper deals with the threat of environmental degradation and suggests some possible remedial measures for eco-conservation in India. Now it is essentially advisable to become protector, producer and caretaker of natural resources and not the predator, polluter and consumer of earth.

57. Treatment of tannery effluent using cyanobacteria and coir pith

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Leather industries contribute to be one of the major industrial pollution as the effluent discharged are highly putrescible voluminous and when untreated damage the normal flora and fauna of the receiving stream. It contains high pollutant load in terms of BOD, COD and heavy metals which are formed during various stages of processing leather and collectively called as composite effluent. The high conc. of the chemical constituents of the solid sludge and liquid waste from the tanneries pollute the ground water permanently and make it not suitable for drinking, irrigation and general consumption. So, there is an urgent need to determine the pollution levels in the effluent and their bioremediation from these industries. The by-products of coir yarn industry are coir dust and coir pith or coco peat which constitute about 70% of the husk. Cyanobacteria are also capable to fix CO₂ and N₂ and are photosynthetic in nature. Hence, the present investigation has been focused on treatment of tannery effluent using cyanobacterial sp. along with coir pith to remove the toxic substances and other chemicals which are present in the tannery effluents.

58. Effect of treated tannery effluent on induction of seed germination and evaluation of plant growth

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Disposal of tannery effluent results in heavy metal contamination of land and it leads to many important health and environmental hazards. The adverse effect of untreated tannery waste water is a challenging process for tannery industry. Coir pith is purely a natural organic product and it is biodegradable and eco-friendly with high water holding capacity. Nava Rasa Karaisal (NRK) is an organic product to play the role of promoting growth and providing immunity in plant system. It contains microbial consortium such as bacteria, fungi and actinomycetes which naturally enhances soil fertility. It is effective in protecting young roots from fungus as well as from soil-borne pathogens and seed borne diseases. The effects of untreated and treated tannery effluents using coir pith and NRK on seed germination and field experiment was determined. The results of this study will interpret during the presentation.

59. Assessment of microbial flora from treated tannery with NRK and coir pith

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Bioremediation is a set of technologies that uses living organisms in order to degrade contaminants into their less toxic forms. Tannery effluent is a waste material originate from all stages of leather making, such as fine leather particles, residues from various chemical discharges and reagents from different waste liquors comprising of large pieces leather cutting, trimming, gross shavings, fleshing etc. NRK (Nava Rasa Karaisal) is a consortium of microbes which can transform the harmful substances present in the tannery effluent to non-toxic compounds. The result of the present study suggests a great potential of coir pith and NRK (combined treatment) to be used for the removal of toxic chemicals from tannery effluent. Bacterial and fungal species were isolated from tannery effluent treated with coir pith and NRK which can be able to reduce toxic materials of tannery effluent into harmless product and can be used for agriculture purposes.

60. Evaluation of acute and sub-acute toxicity of *Acacia oxyphylla* (Benth.), an anthelmintic medicinal plant

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The stem bark extract of *Acacia oxyphylla* has been widely used in different parts of Northeast India to treat different ailments. However, toxic effect of the plant on its consumers has not been worked out. Hence, in this study acute and sub-acute oral toxicity of *Acacia oxyphylla* stem bark extract was investigated in Swiss albino mice. Methanolic extract of stem bark of the plant was prepared using Soxhlet extractor. Acute oral toxicity was study conducted following OECD guidelines 407 and 423. The plant extract was studied for its sub-acute toxicity in albino mice involving ultrastructural, histological, and biochemical parameters. Blood parameters, relative organ weight and histopathological examinations showed that granular and vacuolar degeneration appeared in the liver, kidney, intestine and testis after administration of high dose of the plant extract. Surface topographical and ultrastructural observations of liver, kidney, intestine and testis shows remarkable structural alteration in these organs. The higher LD50 value (5000 mg/kg body weight) for the methanolic crude extract of plant suggest that they are experimentally safe, thus justifying the use of

this plant as herbal remedy. However, prolong exposure at the higher doses may cause extensive changes at ultrastructural and biochemical level to its consumers.

61. Dimensions of environmental threats

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Indian environment has been deteriorated remarkably in the past 50 years due to rapid decline in natural resources and severe increase in pollution level. Depletion of forests, population growth, vehicle emissions, use of hazardous chemicals and various other undesirable human activities are mainly responsible for this degraded scenario of environmental health in India. It is, in fact, rendering considerable economic loss to the country and warrants serious attention of policymakers, administrators, scientists and people altogether to save the environment and humanity and to provide generational equity. The present paper deals with the threat of environmental degradation and suggests some possible remedial measures for eco-conservation in India. Now it is essentially advisable to become protector, producer and caretaker of natural resources and not the predator, polluter and consumer of earth.

62. Effect of salicylic acid and indole acetic acid on growth and anthocyanin properties of tomato (*Lycopersicon esculentum*) varieties under salinity and cadmium stressed environment

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Tomato is one of the common garden fruits in India and is cultivated worldwide because of its edible fruits that are rich in antioxidants. Two sets of experiments (seed treatment and foliar spray) were conducted at Allahabad during rabi season of 2016-2017 and 2017-2018 to study the effect of salicylic acid and indole acetic acid on growth and anthocyanin content in tomato (*Lycopersicon esculentum*) under induced NaCl and cadmium stress. Salinity and cadmium decreases growth and anthocyanin contents of tomato. Salicylic Acid (SA) and Indole Acetic Acid (IAA) are involved in the protection of plants against multiple stresses, such as heavy metals and salinity stress and showed positive impacts in terms of growth and anthocyanin content of tomato crop. In the present study salicylic acid and indole acetic acid are used to improve crop properties under stressed conditions and tomato is used as test crop.

63. Anthelmintic efficacy of *Lysimachia ramosa*: Alteration induced in the activities of enzymes of carbohydrate metabolism in *Raillietina echinobothrida*

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Raillietina echinobothrida, one of the most prevalent pathogenic cestode inhabiting the gastrointestinal tract of domestic fowl, is largely responsible for reduced productivity in poultry industry. Various commercial drugs are available for controlling helminthic infections but most of these became ineffective due to resistance developed by the parasites as well as toxic effects caused by various synthetic drugs. Natural products offer a great source for developing effective pharmaceutical products. *Lysimachia ramosa* is a plant found in North east, India where the Jaintia tribes consume the leaves to combat helminthiasis. The current investigation aims to evaluate the effect of leaf extract and its *n*-butanol fraction against some carbohydrate related metabolic enzymes viz. Hexokinase, Phosphofructokinase, Pyruvate kinase, Phosphoenolpyruvate carboxykinase, Lactate dehydrogenase, Malate dehydrogenase, Malic enzyme and Fumarate reductase in *Raillietina echinobothrida*. Following exposure to crude leaf extract and *n*-butanol fraction at a dose of 6mg/ml,

highest inhibition was seen in case of malate dehydrogenase (66-71%) followed by Fumarate reductase (66-67%), Phosphoenolpyruvate carboxykinase (54-67%), Lactate dehydrogenase (48-60%), Malic enzyme (33-38%) and Pyruvate kinase (27-36%.) The decrease in the enzyme activities of Hexokinase, Lactate dehydrogenase and Malate dehydrogenase were also demonstrated histochemically. The result indicates that the interference of the phytochemicals in the function of enzymes of energy generating pathway of *R. echinobothrida*, perhaps deprives the parasite from ATP production leading to paralysis.

64.A preliminary study on evaluation of wound-healing potential of roots of *Hygrophila auriculata* Schumach and leaves of *Acanthus leucostachyus* Wall in Swiss albino mice.

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The roots of *Hygrophila auriculata* and the leaves of *Acanthus leucostachyus* are commonly used by the people of Assam for curing wounds. Therefore, a preliminary study was conducted to evaluate the wound-healing potential of roots of *H. auriculata* and leaves of *A. leucostachyus* in mice. The wound-healing activity was determined using excision wound model. The animals were divided into four groups. Group 1 animals were topically treated with carboxymethyl cellulose (control). Group 2 animals were treated with reference drug (positive control). Group 3 and 4 were treated with methanol extracts of two plants. Healing was assessed by measuring wound area, histomorphological observations and estimation of protein and DNA content. The wound area of extract treated groups was lesser than the control group and quite comparable with positive control group. The epithelialization in extract treated groups was faster than the control group. The amount of protein and DNA in extract treated groups were more than the control group. The acute dermal toxicity test showed no adverse effects on the animals. These results indicate that the methanol extracts of roots of *H. auriculata* and leaves of *A. leucostachyus* exhibit wound-healing activity in excision wound model.

65. Evaluation of acute toxic effect of active n-butanol fraction isolated from *Lysimachia ramosa* Wall. ex Duby, a chief anthelmintic plant of NE India

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Lysimachia ramosa is one of the most common medicinal plants used by the people of Northeastern states to treat helminth infection. Preliminary work revealed potent anthelmintic activity of the plant, however, toxic effect on its consumers, if any, is not known. Therefore, the present study has been undertaken to study the acute toxic effect of the active n-butanol fraction, isolated from the crude plant extract, on the consumers taking Wistar rats as model. Following OECD 423, three rats of single sex per step were taken and doses starting from 300 mg/kg to 2000 mg/kg body wt. were administered. At a dose of 2000 mg/kg body wt., two out of three rats exposed to the active fraction developed abnormal behaviour and died within 30 h. The remaining single rat was kept under observation for 14 days. Thus according to OECD 423, the active anthelmintic n-butanol fraction falls under category 4 of Globally Harmonized Classification System (GHS) for chemical substances and mixtures. LD50 value of the active anthelmintic fraction is found to be 1000 mg/kg body weight. Histological and haematological study showed structural changes in liver, intestine, kidney and blood constituents.

66. Biodegradation and decolorization of textile dye effluent using marine cyanobacterium and coir pith

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Textile industries usually consume large volume of water and chemicals for dyeing process of fabrics. The composition of chemical reagents used in this process is very diverse in nature and the waste water produced during this process contains large amount of dyes and chemicals residues which are capable of harming the environment and human health. The cyanobacteria also known as blue green algae, ubiquitous in nature and it have a high potential ability to reduce toxic substances and other pollutants. Coir pith, a waste product obtained during the extraction of coir fiber from coconut husk, it has excellent water holding capacity and it can be used for the adsorption of residues, heavy metals present in the waste water. The present investigation is to study the efficiency of marine cyanobacteria along with coir pith to remove colours and pollutants in textile effluent with different treatment (individual treatment-coir pith, cyanobacteria and combination of both). Among this combined treatment showed reduction of the pollutants and it was further confirmed with GC-MS analysis.

67. Assessment of the impact of sand mining on physicochemical parameters and phytoplankton composition in the river Sone at Koelwar and Bihta

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River Sone flows with sand and silica particles and other chemical compounds phosphate, ion species and fluvial particles. It is marked with in stream sand mining activities along Bihta and Koelwar region. Present study aimed to assess the impact of sand mining on physicochemical parameters and phytoplankton diversity. Sampling sites were selected on the basis of mining load - (1) Upstream of mining sites (reference site) (2) Mining sites and (3) Downstream of mining sites, in pre-monsoon, monsoon and post-monsoon. Chemical analysis was done following APHA. Result shows hike in, turbidity (48.9 NTU), silica particles (275 mg/l) and fluvial load during monsoon season at sand mining sites, adversely affect phytoplankton density as sun ray penetration into water retards. Phytoplanktons depleted with sand taken out from the river bed, decrease primary productivity. Karl Pearson's correlation coefficient reveals as the sediment load increases phytoplankton diversity decreases. Canonical Correspondence Analysis (CCA), shows impact of variables on phytoplankton distribution. Bacillariophyceae were dominant (*Ceratocorys horrida*, *Ceratium cephalotum*, *Ornithocercus steinil*, *Thalassiosira subtilis*, *Palmeria hardmaniana*, *Citharistes apsteinii*, *Bacteriastrum hyalinum*, Dinoflagellate) and Hydrodictyaceae (*Pediastrum*) found in water due to alkaline nature (pH 9) and silica which promotes growth of the dominant genera.

68. Biodiversity and environmental challenge

Ashwani Kumar Dubey and Vandana Dubey

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Biological diversity refers to the variety of plants, animals and microorganisms that exist. The status of our biodiversity has always been dynamic. Over millions of years, under natural conditions, some species have increased in variety or numbers and others have been reduced or lost. Some people wonder why we should be worried about conserving biodiversity now, in particular, when the world has gone on more or less as it is for so long. But natural habitats everywhere are being assaulted as never before and as habitats are lost we are also losing various types of plants and animals. No one would have thought, even a few years ago, that the common house sparrow of Britain could be endangered, but now it is. There are concerns that man-made changes to our environment are leading to too many of our species being lost and our biodiversity becoming seriously depleted. One of the reasons biodiversity is important is because it helps to keep the environment in a natural balance. An ecosystem which is species-rich is more resilient and adaptable to external stress than one in which

the range of species is limited. In a system where species are limited, the loss or temporary reduction of any one could disrupt a complex food chain with serious effects on other species in that same system. Once biodiversity is sufficient, if one nutrient cycling path is affected another pathway can function and the ecosystem - and the biological species it supports - can survive. Elsewhere, tropical rainforests, in particular, have provided many beneficial products, from natural medicines to biological control agents for agriculture. We need to preserve as many individual species as we can and we also need to preserve as many different types of ecosystem as we can, because each one serves a different and important function with environmental challenges.

69. Sustainable rural development through ecotourism in Thar region, India

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Ecotourism is the most dynamic forms of tourism now-a-days because it offers a plenty of advantages to both tourists and host communities. Rural areas of Thar region are rich in ecological and rural diversity. For a long time in the survival, rural communities have their faith on the abundance of natural resources present in their area. But in recent years, there is a drastically change in the technology which have brought an intense revolution in the field of agriculture that is leading a better lifestyle for rural communities. Thar region basically comes under arid region where rainfall is less. Rural communities cannot depend upon only agriculture for their daily basic needs. Ecotourism is now a basic need for rural communities to earn money for living besides agriculture. This process includes a set of particularities of nature followed from tourist action, specify in its complication and interacting with the environment and other divisions of the economy, the scale and variety of social affairs which they generate, on the one hand, and the features of sustainable development, in common, on the other hand. The purpose is to examine the existing relationship between rural tourism and ecotourism, among the need for sustainable development and the need to preserve the local ethnicities, and to witness if such equilibrium is possible between these two terms.

70. Genotypic correlation coefficient and character association studies of growth, biochemical and yield parameters of different genotypes of garden peas (*Pisum sativum* L. var. hortense) under Allahabad agro-climatic condition

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The experiment was carried out with 26 genotypes procured from Department of Horticulture, under Randomized Block Design (RBD) with three replications was conducted at field experimentation center, of Department of Biological Sciences, at Sam Higginbottom University of Agriculture Technology and Sciences, Allahabad during *rabi* 2016-17. Correlation coefficient is the mutual association between variables without implying any cause and effect relationship. Simple correlation coefficients were computed at genotypic and phenotypic levels between pair of characters adopting in different genotypes of garden pea. Genotypic correlation coefficient analysis revealed that pod yield per hectare showed positive significant association with leaf area index (0.5652***), proline content (0.2505***), pods per plant (0.4528***), seed per pod (0.5312***), seed yield per plant (in gram) (1.0000***), pod length cm (0.5535***), pod width cm (0.6172***), pod weight (0.5317***), and moisture content % (0.4316***). Phenotypic correlation coefficient analysis revealed that pod yield per hectare showed positive significant association with Moisture Content % (0.239*), Pods per Plant (0.319**), seed per pod (0.359**), seed yield per plant (1.000***), and pod weight (0.285*).

71. Impact of soil salinity on rice productivity in agriculture areas of Varanasi district

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Agriculture is the major source of income in the rural areas of India and plays a key role in food security. Agricultural lands are facing major problems such as irregular precipitation, anomalous temperature change, water scarcity, interference of some wild animals and soil salinity. Increasing soil salinity by excess use of fertilizers, improper irrigation, sea water intrusion etc., are causing high yield losses and soil quality deterioration. Our study focuses understanding the salinity problems in and around Varanasi district in Uttar Pradesh. Six salinity affected areas were selected based on survey conducted in Varanasi, Chandauli and Mirzapur districts. Sites were categorized as least saline site (Rajatalab (RJT) and Beerbhanpur (BBN)), moderate (Mirzamurad (MZM) and Baraipur (BRP) and highly saline sites (Dharahara (DHR) and Salempur (SLM)). Soil quality parameters such as total organic carbon, humic acid, ammonium nitrogen and available phosphate were negatively correlated with soil salinity. Soil salinity differentially influenced rice productivity as damage was highest at sites with maximum salinity. The site having highest salinity (SLM) even failed to reach reproductive maturity. Based on the observed results it can be suggested that yield reductions due to salinity stress can be minimized up to certain level by different agronomic practices and improving soil quality.

72. Effect of tick worry on cattle milk quality: A study conducted in Malwa region of Madhya Pradesh

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Ticks and the diseases they transmit are widely distributed throughout the world, particularly in tropical and subtropical regions. It has been estimated that 80 percent of the world's cattle population is exposed to tick infestation (FAO, 1984). The aim of this study was to assess the status of tick infestation in relation to climate change and milk production and to estimate the economic losses caused as a result of the effect of ticks on dairy cattle and its implications on milk quality like milk SNF (Solid not Fat) and milk fat in selected districts of Malwa region of Madhya Pradesh.

73. Prevalence of ticks in cattle and buffaloes in Kanpur district, U.P.

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Ticks are ectoparasite of various vertebrate hosts. Ticks parasitizing livestock can reduce the quality of animal products and can even cause livestock death. The main aim of this study was to determine the distribution and identify the ticks prevailing in different areas of Kanpur district of Uttar Pradesh. During the study period of June 2016 to May 2017, survey of ectoparasites (ticks) was done. Approximately, 1923 samples of ticks from total 1829, cow (1011) and buffalo (818) were collected from different areas of Kanpur district of U.P. 67.06% tick infestation were on cows and 41.93% in buffaloes were observed. Overall prevalence 55.82% were observed in cow and buffaloes. The collected ixodid tick species were identified morphologically and *Rhipicephalus (Boophilus) microplus* (52.26%) has been found to be the most common vector species followed by *Hyalomma anatolicum* (32.91%) and *Haemaphysalis bispinosa* (14.82%). This study therefore included the degree of infection with respect to age wise, breed wise, sex wise, season, management practices and predilection site. So it can be concluded that extra survey is required to be done for better knowledge on ticks devastating effect on livestock.

74. Morphological identification and comparison study of parasites and their eggs of *Haemonchus* spp. and *Oesophagostomum* spp. of goat (*Capra hircus*)

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Goats is the important source of animal protein and primarily useful for meat, milk and skin. Parasitic gastroenteritis has been noted as a major constraint to ruminants' productivity in terms of economic importance. Infection by nematode parasites of small ruminants resulted in low productivity due to stunted growth, poor weight gain and poor food utilization. In the present survey, gastrointestinal tract of goats were collected from different regions of Lucknow. The gastrointestinal tracts were dissected and analyzed to confirm the presence of gastrointestinal parasitic infection, fecal sample were collect from the gastrointestinal tract for eggs by the standard technique. Overall 71.00% samples were found positive for infection by the nematode parasites. Parasites and eggs were morphologically identified by following standard key. Capulatory bursa was found in both spp., however dorsal rays and valvar flap was found in *Haemonchus* spp. The comparison of egg was done on the basis of size (length and width). It was also observed that worms was significantly higher ($P < 0.05$) in female goats in comparison to male goats.

75. Studies on diversity of cestode parasites in Lucknow region

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Several species of cestodes have been described in poultry throughout the world. Free-range domestic chickens are at high risk of parasitic infection, particularly by cestode parasites. Intermediate hosts of cestode on the ground are snails, ants, beetles and housefly. Tapeworms parasitize the intestinal tract and they debilitate the birds and the infections include decline in production, retarded growth, emaciation, weight loss, ruffled and dry plumage, slow movement (weakness), rapid breathing, paralysis and diarrhea. Catarrhal enteritis, hemorrhage, intestinal blockage (large worms) and nodular growths can also be seen in heavy infestations. This study aims to investigate the diversity of cestodes that infected the free-range domestic chickens in Lucknow region. Intestine specimens were collected from different slaughter houses. The cestodes were examined from intestine specimens using light microscope. Through Investigation found the cestodes belonging to *Raillietina* sp. The highest prevalence of *R. echinobothrida* was higher than others in this study. The use of drugs for removal of tapeworms is usually not effective if the intermediate hosts are still present as sources of infection. Hence, treatment should be associated with control measures directed against intermediate hosts. Prevention of birds from contact with the intermediate hosts is the most important step that should be taken in the control of tapeworm infection.

76. Antibacterial activity of *Cucurbita maxima* Duchesne ex. Lam. (fam. Cucurbitaceae)

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Cucurbitaceae family is also known as squash family. In India, it is represented by 84 species out of a total of 750 species of the world. Plants of this family are mostly used as vegetables, a few yield delicious summer fruits and a few are medicinal. In fact members of Cucurbitaceae form a source of a variety of compounds like alkaloids, flavonoids, terpenoids, glycosides tannins and saponins. In view of the medicinal importance of this family, the present investigation was undertaken. *Cucurbita maxima* is a giant pumpkin and locally called as 'kaddu'. The present paper describes the findings of the antibacterial activity of this plant. The present study was conducted in the year 2016-17. The

plant material was collected locally from Barwani and identified by the experts. The plant material was air-dried in shade for 60 days and powdered in a wearing blender using a mixer. The powder was stored at 4°C for further analysis. The powdered material was extracted with aqueous and ethanol solvents using Soxhlet apparatus. Extraction with each solvent was carried out for 10 h. Both the solvent extracts were collected in different flasks and the solvent was distilled off. An amount of 2 mg of extract was dissolved in 2 ml of ethanol and distilled water separately and solubility was tested. Sterile paper discs (Whatman No. 1) were dipped in the solvent extracts and aseptically placed on seeded plates. All the plates were incubated at 37 °C FOR 24 h. The organisms used were *Bacillus subtilis* (MTCC-441), *Escherichia coli* (MTCC-1687), *Pseudomonas areogenosa* (MTCC- 1934), and *Staphylococcus aureus* (MTCC- 737) and all of them were gram-positive. The study revealed that the ethanol extract with pure ethanol as control showed more inhibition zone in case of *Staphylococcus aureus* (18 mm against 16 mm in aqueous extract) while all the rest three organisms selected for this study showed more inhibition zone in aqueous extract i.e. *E. coli* with 15 mm, *Bacillus subtilis* with 20mm, and *Pseudomonas areogenosa* with 14 mm inhibition zone while these three organisms showed less inhibition zone in ethanol extracts i.e. 15 mm, 20 mm and 14 mm respectively. Thus from the present study it is inferred that *Cucurbita maxima* plant extracts of various solvents possess potential of folk medicinal properties. Further research work is in progress.

77. Ethnobotanical and phytochemical study of *Cocculus hirsutus* (L.) Diels. (= *Cocculus villosus* Lam

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Cocculus hirsuta is one of the members of the family Menispermaceae. It is found to be distributed in tropical parts of India. This plant is a straggling scandent evergreen shrub. At Khargone it grows as a common weed of road sides and waste places flowering and fruiting occurs from March to May. The fruits are drupelets and reddish purple. Ethnobotanically the usage indices (ui) of the plant is 6, since it is used by the tribal people in various diseases like dysentery, insect bite, stomach pain, liver trouble and digestive problems, and also in sun stroke, general weakness and wound healing agent. In biochemical analysis, TLC and column chromatography techniques were applied to determine the various phytochemical compounds. The present investigation was done during the year 2016-2017 and the plant material was collected locally. The phytochemical study revealed that 11 phytochemical compounds are found in the methanolic extract of the plant with Rf values ranging from 0.05 to 0.93. The study of chemical profile revealed the plant powder (stem) contains sufficient amount of crude fibers with little amount of starch and its active gradients are alkaloids (0.3%). These compounds possess good insecticidal properties which help to control fruit-piercing moths and caterpillars. Triboline and isotriboline are two important drug compounds that are reported in this species. The study of successive solvent extraction of the plant revealed that in *C. hirsutus* the percentage value of extractive was more than 15% in the methanol extract, 18.65 in ethanol and 22.3% in water. When the qualitative examination of the extract obtained by successive extraction method was done by using various reagents, then positive reactions were obtained with alkaloid, carbohydrates, starch, protein, amino acid, phenolic compounds, tannins and flavonoids while phytosterols and fixed oils were found to be absent indicated by their negative reaction with Libermann's test and spot test respectively. The amount of tannins in the ethanolic extract of the plant indicates the antibacterial property of the plant. Further research work is in progress.

78. Aquatic biodiversity of west Nimar district of Madhya Pradesh

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The present paper deals with the aquatic biodiversity of West Nimar district of Madhya Pradesh. Biogeographically this region lies in Central India and situated at 21°45' N latitude, 75°37'E

longitude and 250.38 m above MSL. A number of water bodies both of temporary as well as permanent nature are found in this tract. It is well known that most of our earth planet is covered with water in which millions of living species reside. Today, we are losing our biodiversity at a greater rate. It is mainly due to overpopulation, deforestation and pollution. The present survey was done during 2016-2017. And in this connection various aquatic bodies were visited and plant specimens were collected dried and identified with the help of standard literature use on aquatic plants. The study revealed in all 44 species belonging to 39 genera of 21 families of angiosperms except two species belonging to 2 genera of 2 families of Pteridophytes (Lemnaceae and Marsileaceae). Amongst angiosperms, 8 families belong to monocotyledonous and 13 families to dicotyledonous group. The species ratio of dicots and monocots is 1:1.1 while families ratio is 1:1.5. All the collected plants may be categorized into four groups i.e. submerged plants, floating plants, free-floating and amphibious plants. The important species reported during this survey are: *Azolla*, *Lemna*, *Salvinia*, *Nymphioides*, *Vallisneria*, *Alternanthera*, *Polygonum*, *Ipomoea aquatica*, *Potamogeton* and *Hydrilla*. Hence in the present context, it is important to conserve the aquatic biodiversity of our country as a whole and this may be possible by developing research strategies and public awareness to protect the aquatic vegetation. Further research work is in progress.

79. Biofertilizer production using waste food materials

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India is an agriculturally developed country in which almost 70% of its population depends on the farming. Mostly in rural area, people depend on the agriculture for their livelihood. Due to inefficacy in harvesting, high cost of transport and storage of government subsidized crops causes loss of the agricultural output. The farmers also faced problems like unfavorable environmental conditions such as irregular rainfall, flood, drought etc. which gradually decreased soil fertility and productivity. To meet the current food demand, farmers are using inorganic fertilizer for more production of crops. Using of chemical fertilizers cause pollution in ecosystem as well as it is high cost. The researchers have proposed biofertilizer as an alternative source to overcome this problem. Biofertilizers help to increase the soil fertility and supply other nutrients to the plants for its growth. It is very cheap and eco-friendly. Biofertilizers are derived from biological waste such as vegetable waste, agro-waste and food waste etc. Food waste and food co-products waste created very big amount of environmental crisis and socio-economic problems. The restaurants, marriage halls, hostels, vegetables and fruit markets etc. generated huge amount of food waste. Food waste has a great potential to convert into biofertilizers. The present study highlights the conversion of the food wastes that generated from various sources into biofertilizers for agricultural purpose.

80. Unregulated aquaculture of introduced fish species in India stems biodiversity and sustainability issues

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An assessment of aquaculture potential and associated risks of introduced fish species was conducted in freshwater ecosystems. The biodiversity loss and changes in the trophic spectrum spanned all levels and the gut repetitive index (GRI) indicated that that food items in most of the wild fishes in river streams were similar showing possible biotic homogenization. Invasion of introduced fish species into river streams of freshwater ecosystems represented one of many possible causes of the decline in river health and overall loss of native aquatic communities. Three major hypotheses namely “human activity” hypothesis, “biotic resistance” hypothesis, and “biotic acceptance” hypothesis were tested and arguments, which are not necessarily mutually exclusive, have been proposed and presented in this paper to explain the establishment of popular introduced species available in aquaculture. It is advocated that aquaculture development and conservation activity must

go side by side to protect our native fish biodiversity from threats of bioinvasion besides escalating the fish production as a whole.

81. Cause of depletion of major carnivores and its consequences in Thar Desert, India

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At the western side of Rajasthan province of India, there is a broad sandy, scoured and dry locale is found, known as the Great Indian Thar Desert (GITD). It is the principle desert with staggering human masses on the planet. The present investigation basically fixates on Carnivore a mass which includes keystone species of felid and canid family. The substantial flesh eater creatures found in this desert are-the wolf (*Canis lupus*), Hyaena (*Hyaena hyaena*), jackal (*Canis aureus*), desert fox (*Vulpes pusilla*), Indian fox (*Vulpes bengalensis*), jungle cat (*Felis chaus*), desert cat (*Felis sylvestris*) and mongoose (*Herpestes spc.*). In the midst of analyze, it was found that various meat eater species has persevered conduct changes and continuation deviations to cop up with exhibit conditions. Today, the extension in urbanization, arrive use for agrarian business practice and house/structures/complex advancement, road/street improvement for interfacing various common towns et cetera have impacted the carnivores toward the end in such constrained conditions. Earlier the golden jackal (*Canis aureus*) was living a long way from the human social groups with its huge home range and territorial domain. From 10 years prior, their masses have affected greatly and their home or area has been encroached by the human world. Because of exhaustion of these creatures, other lower trophic creatures have expanded massively and put grazing weight and exploitation of common assets hence causing natural unevenness in the Thar Desert. This issue can be overwhelmed by taking appropriate conservational procedure in near future.

82. Evaluation of acute and sub-acute toxicity of Acacia oxyphylla (Benth.), an anthelmintic medicinal plant

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The stem bark extract of *Acacia oxyphylla* has been widely used in different parts of Northeast India to treat different ailments. However, toxic effect of the plant on its consumers has not been worked out. Hence, in this study acute and sub-acute oral toxicity of *Acacia oxyphylla* stem bark extract was investigated in Swiss albino mice. Methanolic extract of stem bark of the plant was prepared using Soxhlet extractor. Acute oral toxicity was study conducted following OECD guidelines 407 and 423. The plant extract was studied for its sub-acute toxicity in albino mice involving ultrastructural, histological, and biochemical parameters. Blood parameters, relative organ weight and histopathological examinations showed that granular and vacuolar degeneration appeared in the liver, kidney, intestine and testis after administration of high dose of the plant extract. Surface topographical and ultrastructural observations of liver, kidney, intestine and testis show remarkable structural alteration in these organs. The higher LD50 value (5000 mg/kg body weight) for the methanolic crude extract of plant suggests that they are experimentally safe, thus justifying the use of this plant as herbal remedy. However, prolong exposure at the higher doses may cause extensive changes at ultrastructural and biochemical level to its consumers.

83. Genus *Cycas* L. in India: Reappraisal

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The present paper throws light on the present status of Indian Cycads (*Cycadaceae s s*). As per present studies by the authors, the family *Cycadaceae (s s)* is represented in India by 14 species.

These are enumerated in this paper. Accepted name followed by basionym/synonym with citation, distribution and notes on status of some taxa is given.

84. Interspecies relationships within the *Asparagus* subgenus *Protasparagus* based on rDNA ITS, cpDNA *trnL* intron sequences and cladode characteristics

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Asparagus is the 'type genus' of the family Asparagaceae and comprises of three cladode bearing subgenera: *Asparagus*, *Myrsiphyllum*, and *Protasparagus*. However, interspecific delimitation of *Protasparagus* is controversial till date due to lack of discontinuous morphological characters. In the present study, phylogenetic relationships within the subgenus *Protasparagus* have been analyzed for the first time based on rDNA ITS1-5.8S-ITS2 and cpDNA *trnL* intron sequences, cladode characteristics, genome size (2C value) and chromosome number. The phylogenetic trees based on rDNA ITS and cpDNA *trnL* intron sequences revealed hitherto unbiased grouping of the studied members into four distinct subclades. The present study also provided detailed information on rDNA ITS secondary structure diversity in the four subclades of this subgenus. Scanning electron microscopic observations on different cladode traits viz. cladode shape, type of palisade, spongy and central pith tissues showed to have remarkable taxonomic potential for circumscription of species-level phylogeny of this subgenus. The flow cytometric analysis of nuclear DNA content and mitotic chromosome analysis identified a putative polyploid event shared by the members of subclade-I only. Therefore, the present work elucidates phylogenetic and taxonomic relationships within the studied taxa of the subgenus *Protasparagus* and also provides background information for further studies on biogeography of a wide range of species.

85. Reclamation of municipal waste water using *Lemna minor*

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In a laboratory based study, it has been found that Municipal Waste Water can be reclaimed after *Lemna minor* treatment. The effluent characteristics are reasonably rationale for non-potable reuses like gardening, agriculture and other industrial purposes. The fresh Municipal Waste Water from the source was brought to the laboratory and samples were tested for initial concentration of pH, biochemical oxygen demand, chemical oxygen demand, total suspended solids, dissolve oxygen, chloride content and alkalinity. Results obtained showed that the *Lemna minor* has got the capacity to remove organic pollutants from municipal waste water. There is a drastically changes in the results obtained over a period of 15 days and also observed increase in biomass production.

86. Role of genetically modified crops in rural development

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The paper deals with the study of role of genetically modified crops in rural development. Farmers stand to reap enormous profits from growing GM crops. Initially, the cost is expensive but money is saved on pesticides. Once the technology is properly harnessed it would be economical in comparison to traditional foods. GM crops can be produced to be herbicide resistant. This means that farmers could spray these crops with herbicide and kill the weeds, without affecting the crops. Biotech companies are even experimenting with crops that can be genetically modified to be drought resistant and salt –tolerant, or less reliant on fertilizers, opening up new areas to be tilled and leading to increased productivity. Even animals could be modified to have special characteristic, such as greater milk production in cows. These modifications again lead to improved productivity for farmers and ultimately lower costs for the farmers. The Genetic Engineering Approval Committee

in India has already given approval for field trials for Bt rice, chickpea, groundnut, maize, mustard, okra, pigeon pea, potato, tomato, watermelon, papaya and sorghum. There are 238 varieties of 56 GM plants at different stages of trials in India. This included 41 food crops.

87. Responses of *Wedelia chinensis* against elevated ultraviolet-B at three developmental stages

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Application of medicinal plants is nowadays receiving greater consideration, but changing climatic conditions, anthropological activities and misuse of medicinal plants cause superfluous degradation and pressure on these plants, leading to habitat destruction, phyto-chemical constituent alterations and degradation of vital compounds. Depletion of ozone layer due to various reasons causes increased penetration of UV-B which is reported as severe abiotic stress for various plants. To evaluate the effects of elevated UV-B on medicinal plants, experimental study was conducted using *Wedelia chinensis* as test plant at three stages to evaluate their physiological, biochemical and morphological changes. Photosynthetic pigments showed significant reductions under elevated UV-B in summer and post monsoon compared to winter. Plant showed reduction in photosynthetic rate; but stomatal conductance showed an increment during summer and post monsoon under UV-B stress. Total phenolic contents showed increment at all stage compared to control. An increase in anthocyanin accumulation was observed with advancement in growth phases, but an opposite trend was observed for membrane damage. Morphological characters like number of branches, leaf area, shoot and root lengths showed positive response; while, root-shoot ratio showed reduction against applied dose of UV-B at all the growth stages. So, it can be concluded that defensive strategies of the plant performed better under prevailing stress which can be observed in the form of morphological characters of the plants and accumulation of secondary metabolites.

88. Study on thermophilic fungi with special reference to *Thielavia* spp.

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Temperature is one of the basic, limiting physical factors of the environment which plays an immensely important and often decisive role in the distribution of living organisms over the face of the earth. Microorganisms during the millennia of their evolution have become adapted to occupy a wide series of temperature niches. To understand the mode of survival of life at high temperature the present study undertaken to know about the distribution of thermophilic fungi in different habitats. During investigation it has been noticed that some of mesophilic fungi have become obligate to higher range of temperature and some temperature resistant thermophilic fungi change their heat shock protein (melanin) when exposed at constant higher temperatures. For example the white mutants of *Aspergillus*, *Chaetomium*, *Humicola*, *Penicillium* and *Scytalidium* are important for evaluation of heat shock protein at higher temperatures. Some of the mesophilic forms e.g. *Cladosporium oxysporum*, *Penicillium citrinum*, *Phoma sarghina*, *Thielavia variospora*, showing thermophilic tendency. Besides above isolates the genus *Thielavia* seems to be more prevalent in Indian soil as the numbers of species *T. basicola*, *T. fragilis*, *T. novoguineensis*, *T. octospora*, *T. variospora*, *T. terricola* along with other three isolates *Thielavia* sp.1, *Thielavia* sp. 2 and *Thielavia* sp. 3 which could not be identify up to species level as they differ from other reported species. Since fungal species and their isolates inhabiting different habitats possessing some temperature growth relationship therefore morphological, features differ from one isolate to another, seems to be important for taxonomic description. The taxonomic details of above taxon will be discussed during the presentation.

89. Is grief response restricted to human or not?

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Grief response to the postnatal death of a black coat female infant in Hanuman langur was studied at daijar (troop B1) near Jodhpur Rajasthan. The study was conducted in January 2018, the authors observed individual Hanuman langur (mother of death infant) carried her dead infant for a period of 6 days. Mother of dead infant responses to range from interested observation and active investigation (smelling, grooming and kisses) of the body. The observation took place one day after the infants died, Mother carries death infant long after its death and try to avoid corps from other troop's members. Mother show grieving for dead infants and occasionally show on feeding site for some time for feeding purpose only then directly return to the roosting site. In a human population, mother grieve more strongly than fathers, and both grieve more strongly for a male than females, and parents with fewer children will grieve more intensely than those with several children. But in langur, there is no correlation with the number of children, sex of infant carrying the dead infant. However, the age of mother, the causation of death may affect this period of carrying a dead infant.

90. Agrochemicals used and their side effect on human health in Jagatsingpur district of Odisha, India

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Decades back, agrochemicals were presented going for improving harvest yields and at protecting crops from pests. Nowadays agrochemical has come to be crucial to modern-day agriculture to feed the growing population. Chemical fertilizers are used appreciably in modern-day agriculture, as a way to improve crop yield and pesticides are used to reduce the loss of crops due to pests and microorganisms. But excessive use of agrochemicals can harm the environment as well as the health of the individual's. This chemical also increases environmental degradation like soil salinity, pH, water pollution and ground water pollution. The present research is on the use of agrochemicals in Jagatsinghpur district of Odisha and to know the adverse effect agrochemicals on environment and health of persons. Preliminary survey was carried out in three different villages of Jagatsinghpur by meeting different farmers doing diverse types agriculture. Samples of soil from the fields were collected to know the conditions of the soil. The authors visited the district agricultural office to get a better statistics of the area after that they visited the district medical head quarter to get statistics of people diagnosed by the different diseases including cancer and data was thoroughly analyzed. The authors found 74 different types fertilizers-hormones and 37 pesticides were used predominantly in the Jagatsinghpur district. The most common fertilizer is NPK and pesticide is Chlorpyrifos. Out of these agrochemicals found some are very carcinogenic and caused breathing and skin disorders. The authors conclude that agrochemicals increase yield but also harm the environment and the long-term uses can be catastrophic. So beside use of chemical product, people can use biological products for good health and better environment.

91. Intra species variation in sound frequency of Hanuman langur, *Semnopithecus entellus*

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Acoustic variation of sound frequency in alpha male of the unimale bisexual group of Hanuman langur (*Semnopithecus entellus*) were studied from January 2018 to April 2018 at Mandore garden near Jodhpur Rajasthan. The study was mainly based on field observation and alarm call recording of Hanuman langur. In a field study, the authors observed that the voice perception abilities play

critical importance in social interactions, such as the capability to recognize a conspecific individual from its vocalizations. Conspecific Vocalizations (CVs) play a crucial role in social interactions, territorial call and alarm call etc. After studying for 3-4 months it was found that the voice of every alpha male (unimale bisexual group and dominant male in a multimale group or all male band) are different in spectral pattern of frequency, people can't distinguish the sound by hearing in the field. In morning time when alpha male of troop B7a generates alarm call to maintain their realized niche, troop members do not react to this particular alarm call but near vicinity troop B8 respond to this particular CVs. In response to this sound, the alpha male of troop B8 also generates alarm call to show dominant behaviour to repellent. Based on our observation the sound of particular alpha male (alarm call) is unique in frequency just like human being sound. In a Hanuman langur due to similar morphological characteristics are insufficient for proper identification. An acoustic sampling of data for proper intra species identification in this species can also be used.

92. Macrophytes biodiversity of pond ecosystem at Chhatarpur district, Madhya Pradesh, India

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Biodiversity is essential for balancing ecosystem and facing different problem to environment globally. The present investigation deals with the macrophytes of three natural ponds of Chhatarpur District Madhya Pradesh. Total 20 species of macrophytes belonging to 18 families were recorded from study area. Aquatic plants play an important role in aquatic ecosystems, where they provide food and habitat to fish, aquatic organisms and wildlife. The quality of water as well as animal and plant diversity are affected due to increase in unwise activities. Aquatic ecosystem is also adversely affected due to release of wastes in it. In the present work aquatic plant, *Trapa* species dominated to other macrophytes.

93. Impact of invasive fishes on the Native fish fauna of river Yamuna at Mathura district, U.P.

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In terms of the status of Invasive fish species significance presence of *Oreochromis niloticus*, *Cyprinus carpio*, *Hypophthalmichthys molitrix* and *Clarias geripineus* is evident in majority of the river stretches. A preliminary record shows that 48-fish species belonging to 13-families were recorded in Mathura waters so far. Species of the family Cyprinidae were most dominant followed by Bagaridae, Schilbeidae, Clupeidae, and Ophiocephalidae. As far as concern with the trophic utilization of fishes; carnivorous fishes were dominant followed by herbivorous and omnivorous. Now present condition has changed in terms of native fish fauna are gradually decreasing. It has been recorded that presence of invasive fishes gradually establishing themselves as a breeding population replacing the Indian native fish fauna. Study reveals that the use of Yamuna river water for the purpose of hydal projects, irrigation and drinking purpose and water pollution are the main threats affecting the habitat of native species and has provide a favorable environment for the alien fishes. So, need of the hour is to check the entry of alien fishes in river Yamuna and monitoring the river water in terms if water pollution can be a mile stone in conservation of life and environment as well. In the present study recorded 14-species belonging to 12 genera and 8 families, of which reported 4-species as Alien.

94. Nutraceutical perspective on Indian health care system

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Research has verified that there is a relationship between food and their components which helps in health and well-being. A nutrient diet can be more effective than exercise or hereditary factors for achieving good health. Nutraceuticals means foods having extra medicinal value beside basic nutrient. Nutraceutical contains nutrients, herbal products, and several dietary supplements which help it to fight against various diseases. Nutraceutical provides multiple therapeutic effect which does not have any side effects, this attracts consumer interest. There are various techniques to increase the concentration of functional components of food. It serves in treating various diseases such as lowering of blood cholesterol, cardiovascular disease, diabetes etc. It has anti carcinogenic effect by possessing different chemical action which are usually absent in pharmaceutical products. Here, the authors aim to highlight the role of nutraceutical and its effect on health care system. Nutraceutical is cost effective as well as easily available to locality of a population. It promotes the quality of life.

95. Animal biodiversity of India with special reference to eco-tourism

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India is a veritable mosaic of landscapes and environment, beginning from the snow-clad peaks of Himalaya in the North to the sea encased southern Peninsula with a variety of climatic conditions and therefore a wealth of flora and fauna, it becomes a place of natural choice for tourists from abroad as well as for domestic tourists. India possesses an enormous wealth of fauna spread all over the subcontinent. It is estimated that nearly 59,000 species of insects, 2000 of birds, 400 of mammals and hundreds of species of reptiles, amphibians and fishes exist in the country today. Most of the fauna of the country is protected by the Indian Wild Life Protection Act of 1972. In future, wild life tourism will be accepted as a catalyst for economic development of our country.

96. Third generation of biodiesel production from algae and its current status

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The use of traditional fuels and its energy sources has reached at the extreme level that whole world is hanging on it. The fear of declining the fossil fuel sources thirst towards biofuel production and it has increased during last decades. Taking into consideration the food and fuel problems, algae gain the most attention to be used as biofuel producers. The use of crop and food-producing plants will never be a best fit into the greatest importance for biofuel production as they will disturb the food needs. However, looking to limited fossil fuel associated with problems, intensive efforts have been given to search for alternative biofuels like biodiesel. Algae are prevalent on earth, have an ability to produce biofuel. The algal biomass has been reported to yield high oil and has capacity to produce good amount of biodiesel. The ability to produce biofuel from algae depends on the species and strains of the algae. Common algae have 20%-80% oil contents that could be converted into different types of fuels such as kerosene oil and biodiesel. Though the technology for biofuel production from algae facing a number of obstacles before it can compete in the fuel market, it is showing a promising biomass for future generation. The challenge lies in determining a particular strain identification and improvement of algal biomass by using genetic manipulation. Different species such as *Tribonema*, *Ulothrix* and *Euglena* have superior potential for biodiesel production. However, Algal biofuels could be made more cost effective by extracting other valuable products from it. Gene technology can be used to increase the production of oil and biodiesel contents and constancy of algae. By enhancing the genetic expressions, we can find the ways to attain the required biofuel amounts easily and continuously to overcome the fuels deficiency. The present article focuses on the role of algae as a possible substitute for fossil fuel as an ideal biofuel reactant.

97. Phytoremediation of heavy metals using floating plants

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This article presents the potential of using floating plants for phytoremediation of heavy metal contamination. Unlike organic compounds, metals cannot be degraded. Heavy metal contamination is a common result from human activities which is a big environmental problem at present day. Phytoremediation is a green technology which can clean the toxic contamination of heavy metals in the water body cost effectively. Natural water bodies like ponds and rivers are usually contaminated by industrials or sewage effluents which contain organic, inorganic and various toxic metals like Cd, Fe, Cu, Cr, Mn and Pb etc. With the help of Phyto-accumulation technique of phytoremediation, the floating plants can remove heavy metals such as cadmium and chromium. Chromium is a major component of human and animal diet and its defect causes disturbance to glucose and lipid metabolism. Chromium is highly toxic carcinogen and may cause death of animals/ humans. The mean removal efficiency for plant species i.e. water hyacinth was 80.26% for Cr and 71.28% for Cd.

98. Antimicrobial activity of *Sesbania grandiflora*

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The extracts of *Sesbania grandiflora*, a plant of leguminosae family have various antimicrobial activities. Polyphenolic extracts of *S. grandiflora* flower have various effects against some pathogenic bacteria. By using in situ and ex situ method, the *S. grandiflora* shows their activity against the microbes. The polyphenol compound has various inhibitory effect against *Staphylococcus aureus*, *E. coli* and other microbes. *S. grandiflora* also shows some growth promoting activity against some bacteria. The butanol fractionated extract of the stem bark is known to be effective against gram negative bacteria. The stem bark contains various antimicrobial substances for various purposes. For the treatment of cold, fever, stomach disorder, diarrhoea and skin cancer this plant is used. The dried powder plant parts contain phytochemical constituent used in aqueous and organic solvent. *S. grandiflora* has some potential source of new classes of antibiotics, which is used for curing of many infectious diseases.

99. On two new species of the trematode parasite of the genus, *Bucephalopsis* (Diesing, 1855) Nicoll, 1914 from freshwater fishes of Varanasi, India

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During extensive survey for the study of trematode parasites of freshwater fishes of Varanasi, eight specimens of bucephalid worms were recovered from the intestine of two species of fishes. Fishes were obtained from river Ganga and Varuna at Varanasi in the month of March. Both trematode parasites belong to the genus *Bucephalopsis*. Four specimens of the *Bucephalopsis guptai* sp. nov. were collected from a freshwater fish, *Eutropichthyes vacha* (Ham.) having elongate body and sucker like rhynchus and absence of receptaculum seminis. Another new parasite species is *Bucephalopsis vinodae*. Also four specimens of this form were collected from the intestine of a freshwater fish, *Silundia gangetica* (Ham.) and it is having elongate and slender body, extension of uterus not beyond the testis, testis and ovary in the middle third of the body, presence of uterine coils in between the testis, having smooth body and the position of intestine above the ovary partly overlapping it and longer cirrus sac in relation to body length.

100. Ethnobotanical survey of medicinal plants used for the treatment of skin disease in Jaraka area of Jajpur district, Odisha, India

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Ethnobotany is the investigation of an area's plants and their functional uses through the conventional information of a nearby culture and individuals. Plants have been utilized from the early human advancement on wards as a medication for a wide range of disease. Disregarding the improvement in the health science and creation of modern, plants still involve an essential part in the modern and traditional system in everywhere throughout the world. Pores and skin is the human largest organ, and critical to the human fitness are the vegetation displaying dermatological qualities and the capability to arrest bleeding, remedy wounds and cuts. Skin illnesses are available in exclusive forms, basically classified as non-contagious and contagious diseases, the primary which can be microorganism, fungi, viral and parasites diseases. Those diseases occur all over the global but are widely wide-spread within the rural and tropical areas. The study turned into geared toward surveying the ethnobotanical medicinal plants used traditionally to treatment pores and skin illnesses in Jaraka area of Jajpur district. Administration of structured questionnaires / interview has been employed. Herb sellers, traditional medicine practitioners, farmers and elderly people had been the respondents. Plant species have been collected, photographed, locally identified and scientifically identified at the department of botany, Centurion University of Technology and Management, Bhubaneswar, Odisha. In this paper 20 plants species (i.e. *Strychnos nux-vomica*, *Citrus lemon*, *Momordica charantia*, *Allium sativum*, *Annona squamosa*, *Azadirachta indica*) belonging to different families were documented which were used against different skin diseases consisting of eczema, rashes, boils, acne. The preliminary result reveals that natural remedies are extra powerful and inexpensive compared to the synthetic medicine. Medicinal plant used in this place form a rich source of indigenous knowledge which could function for therapeutic functions.

101. Floristic composition, diversity and status of important medicinal plants of Ranpur hill ranges of Khurda, Odisha, India

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The plants of the Maninag hill of Ranapur, Odisha, India has excessive ethnobotanical values by using distinctive feature of its rich floral range. People in the urban area are extremely dependent on the plants available in and around the city for their main needs. The preliminary study highlights the usage of local vegetation, discover, identification, ethnobotany and conservation of wild and cultivated plant species within the Maninag hill Ranapur Hill, Odisha, India. It additionally pays heed to the right utilization of vegetation as a manner of highlighting its ethnopharmacological importance. A field survey changed into conducted to acquire statistics approximately floral variety in and around the hill. A total of 121 plant species were identified, along with their local name, botanical name, vernacular name, family and habitat. Of these plant species, a lot of them are medicinal, some are ornamental, fit to be eaten and weeds. *Gmelina arborea* (gambhari), *Rauwolfia serpentina* and *Crataeva nurvala* (varuna) fall into the RET (rare, endangered and threatened) group and are very powerful against numerous diseases. A few wild plants like *Shorea robusta*, *Dalbergia sissoo*, *Pterocarpus marsupium*, *Murraya koenigii* and *Schleichera oleosa* are dominant on this hill. Traditional use of nearby vegetation in an urban region like Ranapur hill is very breathtaking. This suggests that, no longer best rural and tribal regions are wealthy in useful bio-resources but so are semi-urban areas. The documentation of all useful floras with their ethnomedicinal ability is useful

in protecting plant biodiversity as well as in environmental research together with ability packages in drug discovery and oriental medicine.

102. Sustainable rural development through agriculture

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Rural Development is a process of changes carried out deliberately for the uplift of the Rural People. It is generally refers to the process of improving the quality of life and economic well-being of people living in relatively isolated and sparsely populated areas. Changes in global production networks and increased urbanization have changed the character of rural areas. Increasingly tourism, niche manufacturers, and recreation have replaced resource extraction and agriculture as dominant economic drivers. Agriculture, with its allied sectors, is unquestionably the largest livelihood provider in India, more so in the vast rural areas. Indian agriculture and allied activities have witnessed a green revolution, a white revolution, a yellow revolution and a blue revolution. The sector accounts for 18 per cent of India's Gross Domestic Product (GDP) and employs just a little less than 50 per cent of the country's workforce. This sector has made considerable progress in the last few decades with its large resources of land, water and sunshine. Sustainable agriculture, in terms of food security, rural employment, and environmentally sustainable technologies such as soil conservation, sustainable natural resource management and biodiversity protection, are essential for holistic rural development.

103. Sustainable development and environment

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Most developed countries are economically more advanced. They not only exploited their own natural resources rapidly, but also used the natural resources of developing countries to grown own larger economies. So as development progressed, the rich countries got richer while the poor nations got poorer. However, even the developed world that their lives were being seriously affected by the environmental consequences of development based on economic growth alone. This form of development did not add to the quality of life as the environmental condition had begun to deteriorate (air, water pollution, waste management, deforestation, ill effects and human health). The disparities in life style between the rich and poor were made worse by these unsustainable development strategies. Many decades ago, Mahatma Gandhi envisioned a reformed village community based on sound environmental management. He stressed on the need for sanitation based on recycling human and animal manure and well ventilated cottages built of recyclable material. He envisioned roads as being clean and free of dust. His main objectives were to use village made goods instead of industrial products. All these principles are now considered part of sound long-term development. Gandhiji had designed a sustainable lifestyle for himself when these concepts were not a part of general thinking. A growing realization of the development strategy that Mahatma Gandhi had suggested many decades earlier is now accepted by experts on development across the world. This is based on his concept that the world good support peoples need but not their greed. It has taken the path of short term economic growth and now suffers the consequences the environmental degradation as the cost of loss of quality of human life. Society must change its unsustainable development strategies to a new for where development will not destroy the environment. This form of SD can only be brought about if each individual practices a sustainable life style based on carrying for the earth.

104. Determination of LC₅₀ of lead nitrate and their effect on the haematological profiles of *Channa punctatus*

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Water pollution has become a global problem as various pollutants like heavy metals and toxic chemicals are discharged without prior treatment into the water bodies most commonly in developing countries. In the present study, efforts have been made to investigate the toxic effect of short and long term exposure of lead nitrate on haematological parameters of *Channa punctatus* from Bareilly of Rohilkhand (U.P). The fishes were exposed to 0, 50, 100, 200 mg/l of lead nitrate. The median lethal concentration (LC50) value of lead nitrate was found to be 200 mg/l and 146.89 mg/l by using arithmetic graphical method and Probit method respectively for 96 hours exposure. The mortality of the fishes is directly proportional to the concentration. After determination of LC50, these fishes were treated at sub lethal concentration of LC50 (1/5th of LC50 concentration) for long term lead exposure (30 days) in order to investigate haematological variations. The results revealed a decrease in parameters like RBC, PCV, WBC and Hb at short term exposure while WBC increased during long term exposure. Lead as a heavy metal is known to cause detrimental effects on aquatic organisms. *C. punctatus* is a commercial fish and widely preferred as edible fish in India. Therefore, it is very important to evaluate edible organisms like *C. punctatus* from toxicity point of view as it directly affects the health of human beings.

105. Green synthesis of nanoparticles and antimicrobial activity with their application for future prospective

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Nanotechnology deals with those materials which have specific size of 1-100nm. Different methods can be adopted to synthesize the nanoparticles such as chemical and physical approaches. However, any of the two methods are not well considered as it causes environmental problems. Green synthesis of nanoparticles is one of the promising and eco-friendly methods which can be implemented to overcome the existing problems. As compare to chemical synthesis, green synthesis is the most attractive and fascinating method. Green synthesis of nanoparticles involves bio-molecules from plant extract and microbial species as suitable agent. Some microorganism like bacteria, fungi, yeast, algae, and plants either intra or extra cellular have been found to be capable of synthesizing nanoparticles. UV-Vis spectroscopy, Fourier transform infrared spectroscopy analysis, X-Ray Diffraction analysis, scanning electron microscope and High resolution transmission electron microscope were used to analyze their absorbance, stabilization of bonds, sizes of the particles, shape of the particles and used as the characterization of the synthesized nanoparticles. The green synthesis is mostly used as to avoid the hazardous byproducts. According previous scientific researches the nanoparticles have many applications such as antibacterial, antifungal, antiviral, and anticancer drugs, and larvicidal excellent catalytic nature, all this application are used towards the degradation of dyes, very good antioxidant, treatment of diabetes related complication, and wound healing activities. This work aims to highlight the green synthesis of nanoparticles and its application.

106. Use of agricultural wastes by- products for the growth and yield of white button mushroom [*Agaricus bisporus* (Lange) Imbach]

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An attempt was made to evaluate the effect of different casing materials (agricultural wastes by-products) on the growth and yield, protein and carbohydrate content of white button mushroom (*Agaricus bisporus*). White button mushroom derives its name from its shape when still young. They contribute up to 31.8% of the global mushroom cultivation and 85% of total produce in India. The main function of casing layer is to aid with moisture retention in the substrate providing consistent humidity. A total of seven treatments including control were replicated eight times. Harvesting of button mushroom was carried out time to time. Minimum days required for

mycelial run on the casing layer and pinhead initiation (19 days), highest average yield (1.32 kg/bag), highest biological efficiency percentage (31.57), protein percentage (30.050%) and carbohydrate percentage (7.40%) were recorded in treatment containing farm yard manure (FYM), garden loam soil (GLS) and vermicompost (2:1:1) as compared to farm yard manure (FYM). Garden loam soil (GLS) and pigeon manure recorded the lowest yield (0.398kg/bag), maximum days for mycelium run and pin head initiation on the casing material (24.625 days) and recorded lowest biological efficiency percentage (7.140).

107. Effect of substrate on the growth, yield and nutritional composition of oyster mushroom- *Pleurotus florida* (Singer Mont.)

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The research experiment was carried out to evaluate different substrates for the cultivation of oyster mushroom (*Pleurotus florida*). The objective of this study was to evaluate the best alternative substrate that support the growth of oyster mushroom, produces maximum yield with highest biological efficiency and nutritional contents. Data relating to the time taken for spawn ramification, pin head initiation, days to maturity of the fruiting bodies, total yield and biological efficiency as well as the moisture, protein, carbohydrate, and lipid content of the mushroom was recorded and analyzed. A total of seven treatments replicated five times were taken under the complete randomized design. The minimum time taken for mycelium run (15 days) was recorded in wheat straw (control) whereas maximum was recorded in cardboard (21 days). Maximum yield was recorded in banana leaves (915.23g) with highest biological efficiency (91%). Moisture content was found highest in grass (92%) while maximum protein (30.20%) was recorded in combination treatment of cardboard + banana leaves and highest carbohydrate per cent in wheat straw (4.46%). Maximum lipid content was recorded in combination treatment of cardboard + banana leaves (0.88g). Therefore, it can be concluded that banana leaves substrate singly as well as in combination proved to be best for cultivation of *P. florida*.

108. Management of damping off (*Pythium* sp.) in radish by six isolates of *Trichoderma*

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Pythium spp. are worldwide in distribution that infect mainly the juvenile or the succulent tissues and even other stages of the various crops causing significant losses to them. Almost all greenhouse crops are susceptible to one or more species of *Pythium*. Even though various chemical methods have been found effective, its increasing hazards have emphasized the need to adopt the biological methods as an alternative disease control. Species of the *Trichoderma* are well known to be good fungal biocontrol agents. The antagonistic effect of six isolates of *Trichoderma* against *Pythium* sp. was evaluated. The experiment was carried out both in *in vitro* and *in situ* during 2017-18 at Sam Higginbottom University of Agriculture Technology and Sciences, Allahabad. Under *in vitro* condition, the results revealed that *Trichoderma* sp. (isolate 5) effectively inhibited the radial mycelial growth of *Pythium* sp. (71.6%). Under *in situ* conditions, *Trichoderma* isolates were tested against the damping off (*Pythium* sp.) disease of radish and it was found that application of *Trichoderma asperellum* (isolate 2) showed maximum germination (87.77%) of radish seeds.

109. Effect of FYM and neem based compost against wilt of Chickpea (*Cicer arietinum* L.)

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Chickpea (*Cicer arietinum* L.) is an important pulse crop, which belongs to Fabaceae family, ranks third after dry beans (*Phaseolus vulgaris* L.) and dry peas (*Pisum sativum* L.). Chickpea wilt (*Fusarium oxysporum* f. sp. *ciceri*) is one of the serious disease which causes huge loss to crop throughout the world. An attempt was made to manage the disease in a sustainable manner by using eco-friendly approaches. Nine treatments viz. farmyard manure; combinations of farm yard manure + neem cake; combinations of farm yard manure + neem cake + neem leaves; neem leaves; combination of neem leaves + farm yard manure; combination of neem leaves + neem cake; neem cake; including carbendazim; as treated check and an untreated check were evaluated against fusarial wilt of chickpea in the field conditions and Randomized Block Design was used with three replications. Treatment containing composted combination of farm yard manure + neem cake + neem leaves recorded minimum disease incidence (30.30%), maximum root length (14.41 cm), shoot length (45.29 cm) and yield (13q/ha) however, cost benefit ratio revealed that combination treatment of neem leaves + farm yard manure was economical with cost benefit ratio of 1:2.91.

110. Eco-friendly management of damping-off of cabbage and tomato

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Tomato and cabbage are common culinary vegetables under family Solanaceae. However, there is still lower production of these vegetables in India when compared to other countries. This can be attributed to the infection by various fungal/ bacterial pathogens affecting the production at seedling stage in both nursery and field level. An experiment was conducted to evaluate the effect of bio-agents, botanical and fungicide *in vitro* and *in situ* against *Pythium* sp. causing damping off disease of cabbage and tomato. A total of seven treatments were used for management of damping off of Cabbage and Tomato. The treatments used were Control (untreated check); *Trichoderma viride*; *Azadirachta indica*; *P. fluoreescens*, Combination of *T. viride*+ *Azadirachta indica*; combination of *P. fluoreescens* +*Azadirachta indica*; Combination of *T. viride* + *P. fluoreescens* + *A. indica*, Carbendazim (Treated check). Among the treatments, *Trichoderma viride* was found most effective in the inhibition of mycelial growth (38.88%) of *Pythium* sp followed by combination *T. viride* + *Azadirachta indica* (32.95%), then followed by *P. fluoreescens* (31.47%); combination of *P. fluoreescens* + *A. indica* (29.44%), combination of *T. viride* + *P. fluoreescens* + *A. indica* (26.11%) and *A. indica*(100%), as compared to Carbendazim (treated check) (100%) and Control (untreated check) (0.00%). The bio-agents and plant extracts were tested under field conditions during *rabi* 2017-2018 for their efficacy against the disease. Among the treatments minimum disease intensity per cent was recorded at 45 DAS tomato showing minimum disease incidence percentage was recorded *T. viride* (6.40%) followed by combination of *T. viride* + *A. indica* (8.35%); *P. fluoreescens* (8.50%); combination of *T. viride* + *P. fluoreescens* + *A. indica* (10.35%); *P. fluoreescens*+ *A. indica* (10.38%) and *A. indica* (12.10%) as compared to Carbendazim (treated check) (5.72%) and Control (untreated check) (16.83%) and at 45 days after sowing cabbage showing minimum disease incidence percentage was recorded in *T. viride* (7.46%) followed by *T. viride* + *A. indica* (8.78%), *P. fluoreescens* (9.99%), *P. fluoreescens* +*A. indica* (10.40%) and *T. viride* + *P. fluoreescens* + *A. indica* (12.14%) *A. indica* (13.02%) as compared to Carbendazim (treated check) (5.80%) and control (untreated check) (18.09%).

111. Evaluation of hepato-toxic effects of *Aesculus assamica* Griff. on Swiss albino mice

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In Meghalaya, *Aesculus assamica* is traditionally used for the treatment of various diseases, however, toxic effect of the plant products on its consumers, if any, is not known. The objective of the present study is to evaluate the hepato-toxic effect of crude extract *A. assamica* on Swiss albino mice. Mice were administered with different doses (200, 500, 1000 mg /kg body weight) of the plant extract for

28 days. On day 29th, blood for biochemical test was collected, liver excised was processed for cell viability test and ultrastructural studies. Dose-dependent reduction in the percentage of viable cells and elevation in the biochemical markers like alanine aminotransferase and aspartate aminotransferase was also recorded. Ultrastructural observations carried out on hepatocytes of treated mice revealed deformation and destruction of hepatocytes, its nucleus and micro organelles. From the results obtained, it can be concluded that, consumption of the plant at higher doses should be avoided in traditional system of healing.

112. Growth, biomass and yield losses of early and late sown wheat cultivars under elevated level of tropospheric ozone

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Tropospheric ozone (O₃) concentrations have now reached to the levels that can potentially affect crop production in several regions of the world. Therefore, a study was undertaken to assess the growth, biomass and yield responses of wheat cultivars, having different growing period (early and late sown), under elevated O₃ using open top chambers. Two wheat cultivars (HUW468 (early sown cultivar) and HUW234 (Late sown cultivar)) were grown in ambient (AO₃) (52.7 ppb) and elevated levels of O₃ (EO₃) (ambient+20 ppb). The stomatal flux of O₃ was higher in early sown as compared to late sown cultivar under elevated O₃ treatment. Plants grown under AO₃ showed better growth performance and higher biomass accumulation compared to those grown under EO₃ in both early and late sown cultivars. Late sown cultivar showed high growth rate due to short life span as compared to early sown cultivars. The grain yield loss in early sown cultivar was 30% while 22% loss in late sown cultivar under EO₃. Path analysis approach showed that stomatal flux of O₃, absolute growth rate, relative growth rate, specific leaf area, plant biomass were the most important variables influencing grain yield under O₃ stress. The current study clearly showed that the early sown cultivar is more sensitive under projected future O₃ scenario than late sown wheat cultivar.

113. Antileishmanial activity of methanolic crude extract of *Myrica esculenta* bark against *Leishmania donovani*

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Leishmaniasis is a disease caused by *Leishmania* and represents in three forms i.e. cutaneous, mucocutaneous and visceral leishmaniasis. About 350 million population of the world are at risk. Bihar is the most affected state by visceral leishmaniasis in India. Currently, the true antileishmanial drugs or vaccine is not available. The routine drugs in use have severe side effects. The present era is ecofriendly and believed in use of medicinal plant for the treatment of disease as their first choice. The aim of this study is to explore the antileishmanial properties of methanolic crude extract of *Myrica esculenta* bark against *Leishmania donovani* by using different concentrations of extract in terms of inhibition (%). The promastigote form of the parasite *Leishmania* was incubated for 0-72 h with different concentrations of extract under specified condition. The inhibition was checked by counting the motile parasites under microscope using counting chamber. The results showed the reduction in mortality with respect to dose. The highest lethal effect was shown by highest concentration of extract which confirmed the antileishmanial property of methanolic extract of *Myrica esculenta* bark. Further studies are required for the confirmation of bioactive component responsible for antileishmanial potential.

114. Hepatotoxic and nephrotoxic potential of *Carex baccans* Nees. in Swiss albino mice.

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Liver and kidney play vital role in the metabolism, biotransformation, detoxification and excretion of xenobiotic compounds and are primary organs where the undesired effects of such compounds are manifested. The present study was carried out to evaluate the hepatotoxic and nephrotoxic effect of *Carex baccans*, a common traditional medicinal plant in Swiss albino mice taking biochemical and ultrastructural parameters into considerations. Markers of liver and kidney functions viz., alanine aminotransferase, aspartate aminotransferase, alkaline phosphatase, creatinine and urea were assayed at three doses of the plant extract viz., 250, 500 and 1000 mg/kg body weight. Ultrastructure of liver and kidney of mice exposed to highest dose of the extract was studied in comparison to a control group using TEM. The extract exert undesirable effects on liver and kidney chemistry such as elevated ($p < 0.05$) levels of AST, ALP, ALT, creatinine and urea at high doses. It also exerts a damaging effect on cellular and organellar structure of liver and kidney. This study highlighted the hepatotoxic and nephrotoxic potential of the plant and hence therapeutic utilization of the plant at high doses is not advisable.

115. Ultra structure study of floral organ of *Sida acuta*: Special reference to trichome and pollen grain

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Sida acuta (Burm. F.) is a small perennial herb or shrub belongs to family Malvaceae, distribution in all over plain in India. In English it is known as morning mallow and common name is bala. Whole plant of *Sida acuta* is widely used in various form of traditional medicine, for Asthma, diabetics, leucorrhoea, diarrhea, ulcer, dysentery and skin disease. Study of floral organ by using the Scanning Electron Microscope was carried out in the present investigation. The fresh sample were fixed in 6% glutaraldehyde for 12 hour then dried with CO₂ and coated with gold and observed by SEM to characterize the structure, shape, size and location of trichome and pollen grain. Structure of glandular and non-glandular trichome were ranged from unicellular to multi cellular and mostly straight, hooked, branched and unbranched. Pollen grain are tri-colporate, spheroidal, monads, and numerous. Size of single pollen was 78 μ m in diameter and average number of pollen per flowers was 7500. The average pollen-ovule ratio is 1350:1. The present providing detailed information on shape, size, structure and internal behaviour of trichome and pollen grain of *Sida acuta* (Burm. F.), this information will be help for understand in the reproductive success of *Sida* plant.

116. Discovery of new potential anti-dengue compounds from *Azadirachta indica*

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Dengue virus infections have been a very big problem worldwide because there is no any specific drug is available in the market to fight against this fatal pathogen. Dengue virus NS2B-NS3pro has been recognized as a primary therapeutic target for developing anti-dengue drugs. In the present study, *in silico* screening of 40 phytochemical compounds from *Azadirachta indica* were performed by molecular docking experiment. Total 12 compounds (kaempferol-3-O- β -rutinoside, rutin, hyperoside, epicatechin, quercetin-3-O- β -D-glucoside, quercetin, kaempferol-3-O- β -D-glucoside, myricetin, catechin, vilasinin, azadirachtol, and kaempferol) having good molecular contacts with the dengue virus NS2B-NS3pro were identified. The protein-ligand complex stability of 12 compounds were validated using molecular dynamics simulations. 3 compounds (kaempferol-3-O- β -rutinoside, epicatechin and quercetin) out of 12 were checked for their *in vitro* antiviral activity against dengue virus type-2. The antiviral assay of these drugs showed reduced infectivity of dengue virus, precisely, 100uM kaempferol 3-O- β -rutinoside, 1mM epicatechin and 10uM quercetin showed 77.7, 66.2 and 75 %, respectively. The finding of this study revealed that the above compounds have very good molecular contacts with DENV NS2B-NS3pro

and also possess wonderful *in vitro* anti-dengue activity. Hence, kaempferol-3-O- β -rutinoside, epicatechin and quercetin can be used for the development of powerful medications to combat the deadly infections of dengue virus.

117. Diabetic controls from sea

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Diabetes is a chronic degenerative metabolic disease with high morbidity and mortality rates caused by its complications. In recent years, there has been a growing interest in looking for new bioactive compounds to treat this disease, including metabolites of marine origin. Several aquatic organisms have been screened to evaluate their possible anti-diabetes activities, such as bacteria, microalgae, macroalgae, seagrasses, sponges, corals, sea anemones, fish, salmon skin, a shark fusion protein as well as fish and shellfish wastes. Both *in vitro* and *in vivo* screenings have been used to test anti-hyperglycemic and anti-diabetic activities of marine organisms. So the researchers are done a lot of experiments which are abundant to human consumption for beneficial of health and also which is cheapest in nature. So that recent studies show that seagrass acts as a nutraceutical in nature to treat some disease conditions. And also seagrass is a good food supplement used in variety of recipes. Seagrass contains macro and micro nutrients like vitamins and minerals nitrogen, potassium, calcium, magnesium, manganese, phosphorous, iron, zinc, copper, which useful for humans like medicinal plants. Seagrass contains anti-bacterial activities, anti-oxidant activities and anti-inflammatory activities. These properties helpful in to treat chronic disease conditions like diabetes, cancer and skin diseases mainly leprosy. And also good for muscle pains, wounds, fevers and stomach problems. Some of the studies existing about sea grass as a relief for rheumatism. And also it is a strong medicine against malaria. These studies demonstrated sea grass could be used as a potential source for natural health product.

118. Study of physico-chemical characteristics in ground water at Bakewar town in Etawah district in Uttar Pradesh

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Water samples from sampling stations of Bakewar town in district Etawah were collected and physico-chemical were determined using standard analytical procedure in Sept. 2018. temp. (22-26⁰C) .pH (5.09-11.15), turbidity (150-154 NTU), total hardness (75-126 ppm), DO (3.0-4.3 mg/l), COD (31-41mg/l) were determined. The results were said to their agreed with the limits set by World Health Organization (WHO) for drinking water.

119. Studies on pathogenic variability and isolation of different type of fungi to cause the wilt Disease in chickpea (*Cicer Arietinum* L.)

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Chickpea wilt caused by *Fusarium oxysporum* f. sp. *ciceris* (FOC) is the most destructive disease in India. It is seed-borne as well as soil-borne pathogen. During present investigations seven isolates of *Fusarium oxysporum* f. sp. *ciceri* representing two districts and one Agro climatic region of India were analyzed for their pathogenic variability study. All the isolates proved to be pathogenic to susceptible cv. JG-62. From which, three isolates were found highly pathogenic (71100%), two were strongly pathogenic and one moderately pathogenic to cv. JG-62. Genetic diversity was studied among the eighteen virulent isolate using RAPD.

120. Edible cutlery

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Edible cutlery is tableware, such as plates, drinkware and glasses, utensils and cutlery that is edible. Edible tableware can be homemade and has also been mass-produced by some companies, and can be prepared using many various foods. Edible tableware with millets is a replacement for plastic disposable cutlery. Plastic is not biodegradable, which means it is not possible for the earth to naturally absorb this material back into the soil. Rather, the light breaks down the plastic into small pieces that contaminate the soil. It is expensive to manage and clean the toxicity that plastic creates. Edible cutlery is made from millets such as jwar, bajra, ragi, and wheat which are edible and left over material or remaining cutlery after eating can be used as cattle feed and can be used as manure for good yield for crops. Edible cutlery is nutritious and contains high amount of fibre as it is made from millets and also it is more beneficial for diabetic and obesity people.

121. Estimation methods of above ground biomass in forest ecosystem

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Forest ecosystems are one of the most important carbon sinks of the terrestrial ecosystem. Accurate estimation and mapping the distribution of forest biomass is prerequisite in answering a long-standing debate on the role of forest vegetation in the regional and global carbon cycle. Above Ground Biomass (AGB) is the most important and visible carbon pool of terrestrial forest ecosystem. This review paper includes a variety of approaches and data sources have been used to estimate forest's AGB: (i) field measurement; (ii) remotely sensed data; or (iii) ancillary data used in GIS-based modelling. Depending on the aim of the study, different compromises concerning the used methods appeared to be inevitable. Each method has been proven to be useful and has shown its advantages and disadvantages. The objective in this paper is to review and summarize a range of approaches that could be adapted to estimate above ground biomass in Natural forests along with advantages and constraints associated therewith.

122. Impact of *Parthenium hysterophorus* on the diversity of Chitrakoot

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Parthenium hysterophorus L., a noxious plant, inhabits many parts of the world, and an erect, much branched annual or ephemeral herb, known for its notorious role as environmental, medical, and agricultural hazards. It is a widely held belief that the seeds of this weed came to India with grains imported from USA under the US PL 480 scheme, also known as "Food for Peace" which is a food assistance programme of the US government, and spread alarmingly like a wild blaze to almost all the states in India and were established as a naturalized weed. *Parthenium* contains chemicals, like parthenin, hysterin, hymenin, and ambrosin, and due to the presence of these chemicals, the weed exerts strong allelopathic effects on different crops. It also causes acute illness, when bitter milk and tainted meat from buffaloes, cows and goats, are fed on grass mixed with *Parthenium*. This weed is a weed of global significance responsible for several human and animal health issues, such as dermatitis, asthma and bronchitis, and agricultural losses besides a great problem for biodiversity. In the present study invasion of *Parthenium hysterophorus* and its impacts on agriculture fields will be done in different cultivated crops in Chitrakoot. This study will give the information that the weeds are harmful to herbs, beneficial crops and medicinal plants. *Parthenium* weed can suppress

and crowd out other weed species and could form a single dominant population in the invasion area, causing serious threat to plant community biological diversity.

123. Hydrogen: The biofuel

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As the demand of fossil fuels has increased many folds and this has caused an uninterrupted price hike of petrol and diesel like fuels, throughout the country. Over the years Non-judicious use of these fuels has generated large amount of pollution. Biofuels can be obtained from bacteria, algae, fungi, chloroplast, etc. With the technological upgradation and exploration of microbes could be new vistas of new generation of fuels such as biologically produced hydrogen. Earlier, the authors have worked on blue green algae which were found to be potential candidates for hydrogen production. During the experimental phase, the authors have collected many species of blue green algae such as *Anabaena*, *Nostoc*, *Spirullina*, *Plectonema*, *Gleocaspa*, *Microcystis* from the lakes and ponds of sagar. The evolution of hydrogen in these organisms is catalyzed by the two enzymes: 1. Hydrogenase and 2. Nitrogenase.

124. Biodiversity of mushrooms in Sagar, M.P.

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Patharia forest is situated on Vindhyan ranges at about 457.2-533.4 m above msl. It is mixed and dry deciduous type forest, dominated by *Acacia spp*, *Butea monosperma*, *Tectona grandis*, *Embllica officinalis*, *Lannea coromandelia*, *Acacia leucophloea* and ground flora consisting of *Biophytum sensitivum*, *Cassia tora*, *Cynodon dactylon*, *Euphorbia geniculata*, *Heteropogon contortus*, *Lantana camara*, *Parthenium hysterophorus* the rainy season starts from June and ends up by mid-September. The forest is good source of wild mushrooms. During the period of July 2017-August 2018, the authors have made survey and collected number of mushrooms from the Patharia forest and 18 mushrooms species belonging to 12 families were identified. That is *Vascellum pretense*, *Lycoperdon pyriform*, *Coniophora puteana*, *Clitocybe geotropa*, *Ganoderma tsugae*, *Microglossum virde*, *Panaeolus sphinctrinus*, *Pleurotus cornucopiae*, *Fomes fomentarius*, *Tyromyces lacteus*, *Lenzites betulina*, *Hypholoma elongatum*, *Pholiota highlandensis*, *Serpula lacrymans*, *Tremella mesenterica*, *Lepista nuda*, *Collybia butyracea* and *Omphalina ericetorum*. Among them some are edible like *Lepista nuda*, and *Clitopilus prunulus* which are used for culinary purposes; some are medicinal like *G. tsugae*, *T. mesenterica*, *M. viride* which are used to prepare indigenous medicines using traditional techniques.

125. Mushrooms: The source of rural livelihood

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As the world population is increasing with an alarming rate. This has caused concern for livelihood. In India, particularly in Bundelkhand area, where, situation is very grim. Year by year drought and depleting natural resources has compelled people to migrate. However, over the years working on mushroom cultivation and training programs an overwhelming result were obtained. Therefore mushroom cultivation would become future prospects of rural upliftment and livelihood. Through mushroom cultivation not only food security will be achieved but also rural and agaric waste can be converted into fertilizer and cattle feed. The mushroom cultivation provides an opportunity to establish potential enterprise in rural sector.

126. Ecosystem services of macrofungi of Patharia forest

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Forests have been great source of natural wealth-similarly once, Patharia forest was endowed with many tree species and supported by ground flora. However, over the years non judicious use of resources. Many trees and herbaceous species have been lost. In recent survey of the forest, the authors found that many macrofungi were associated with different plant species among these wild macrofungi some are acting as biofertilizer good source of food some can be exploited for medicine and cattle feed. Interestingly, some macrofungi were found pathogenic to common wild plants. The results obtained from the present study suggested that thinning of forest causes loss of macrofungi which were associated with some of the important plants of the forest such as *Dalbergia sissoo*, *Laenea caromandilica*, *Mimosops elangi*, but on the other hand, some new species of *Amanita*, *Agaricus*, and *Mycena* emerged.

127. Taxonomic studies on Agaricales of Sagar

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The study deals with the taxonomic distribution of Agaricales in Patheria forest, Sagar. The Agaricales consists about 31 families; it was observed that the distribution pattern of Agaricales depends upon the seasonal pattern. The present study suggests that most of the wild Agaricales appear in the rainy season. Interestingly, these Agaricales constitute major resources of food, fuel and fertilizers. During the survey of Patharia forest. Twenty genera belonging to 15 families were collected and identified. They were *Agaricus spp*, *Amanita spp*, *Pleurotus spp*, *Chanterelles spp*, *Mycenas spp*, *Lepiota spp*, *Macrolapiota spp*, *Vascellum pretense*, *Lycoperdon pyriform*, *clitopilus prunulus*, *Panaeolus sphinctrinus*, *Pleurotus cornucopiae*, *Hypholoma elongatum*, *Pholiota highlandensis*, *Termitomyces spp*, *Marasmius spp*, *Leucocoprinus spp*, *Clitocybe nuda*, and *Cortinarius spp*. Among these, *Pleurotus spp* and *Agaricus spp* are edible and medicinally important. *Amanita spp* is a deadly poisonous and *Lepiota* and *Macrolepiota* have ectorrhizal interaction.

128. Optimizing conditions for growth and sporulation of *Alternaria* pathogens of *Parthenium* weed

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Alternaria macrospora MKP1 was found to be highly aggressive towards congress grass and has most of the characteristics that make it a desirable candidate as biocontrol agent of this weed, such as: Capable of limiting population of the weed; can be easily cultured on natural host; good sporulation capacity; narrow host range, fast growth rate and hence can be mass produced in a short time. The growth of the fungal pathogen is known to influence by environmental factors such as temperature, relative humidity and pH. Therefore, the main objective of the study was the optimization of cultural conditions for the growth and sporulation of *A. macrospora* MKP1.

129. Bioplastics from sugarcane bagasse

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With volatile oil prices and growing concerns about greenhouse gas emissions, the chemical industry is looking for renewable alternatives to diversify its sources of raw materials. Sugarcane bagasse has emerged as an important ingredient to substitute in the production of plastic. These so-called “bioplastics”. Bioplastics have the same physical and chemical properties as regular plastic and maintain full recycling capabilities. The results indicated that sugarcane bagasse was plasticized by homogeneous chemical modification with phthalic-anhydride. Bioplastics were fabricated directly from sugarcane bagasse, which is one of the most abundant and renewable lignocellulosic industrial residues. The sugarcane industry also teamed with petro chemical companies and already established operating plants to produce bioplastics. Innovation also occurred in the field of co- generation of electricity from sugarcane bagasse. Sugarcane is used more and more to help to solve our global energy challenges. Sugarcane is now expanding into new clear and renewable products. The high tech innovation has recently unveiled that sugarcane can be used as a substitute for greenness and the result is more eco-friendly product. Sugar cane based bio plastic has a number of uses. It can be used to create bags, covers, tubes, films, wraps and stretch film, which means there are a wide variety of functions to which it can be applied. Bioplastics are growing rapidly because of the clear advantages they have in many applications. These advantages will grow. Their carbon footprint can be much lower than oil-based equivalents. Bioplastics can provide excellent biodegradability helping the world deal with the increasing problems of litter particularly in the world’s rivers and seas. Durable plant-based bioplastics can also be recycled as well as their conventional equivalents assisting the growth of a more sustainable world economy. Bioplastics are renewable and sustainable alternatives to oil-based Plastics.

130. Biodegradable tableware with wheat bran

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Tableware are the dishes or dishware used for setting a table, serving food, and dining. It includes cutlery, glassware, serving dishes and other useful items for practical as well as decorative purpose. Bran, also known as miller’s bran, is the hard outer layers of cereal grain – wheat, rye or oat. Bran is rich in dietary fiber and essential fatty acids and contains significant quantities of starch, protein, vitamins, and dietary minerals.

131. Distribution and current status of golden jackal (*Canis aureus*) in and around Sarmathura, Dholpur, Rajasthan (India)

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A study was conducted for distribution and current status of Golden jackals (*Canis aureus*) in Sarmathura village of District Dholpur, Rajasthan (India), which is appropriate site for study the species in details of their behavior and ecology. Total four study site were selected for study of golden jackal in and around Sarmathura. The Sarmathura subdivision uses substantial sandstone, lies at the western Rajasthan (Coordinates: 26.5117°N 77.3698°E). Sarmathura village is surrounded by hilly and rocky area and also many wild vegetation which is suitable site for living golden jackal and other animals, and proved them good shelter and home. The golden jackal is one of the most widespread canid species. Distribution of golden jackal in Rajasthan has been dynamic and including dramatic declines. Golden jackal is omnivorous and opportunistic foragers, and their diet varies according to habitat and seasons. Jackals mainly prey on goats, sheep and small animals. It also eats vegetables and fruits. There has been a high human pressure, traditional land uses, like livestock rearing, and farming cause problem to the survival of jackals and other wildlife. The number of particular species individuals and their sighting was done at a distance from the point were recorded.

132. Anti-metastatic property of genistein in MDA-MB-435 cell via OPN regulation

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Worldwide breast cancer-related mortality is common among women and mostly metastatic spread accounts for the deaths. Osteopontin (OPN) plays an important role in progression and malignancy of breast cancer. Soy isoflavone, genistein, has been reported to exert antitumoural activity in some breast cancer cell lines; however, its role with respect to OPN is not well understood. Therefore, in this study, the effect of genistein on OPN expression and cell motility was investigated in MDA-MB-435 cells. The cells were treated with genistein and the regulation of OPN expression was studied. The functional sequel of genistein on cell viability, proliferation, migration and invasion following MTT, colony formation, wound-healing and spot agarose assay were also performed. Genistein inhibited OPN expression in dose- and time-dependent manner. Analyses of the signaling pathways for regulation of OPN expression revealed an increase in the expression of p-ERK $\frac{1}{2}$ (by ~2.5 fold) by genistein in MDA-MB-435 cells without altering Akt/PKB- and NF-kB- pathway. It also displayed a reduction in aggressiveness of MDA-MB-435 cells in colony formation, migration and invasion. Our results indicated that genistein acted as an anti-metastatic agent in MDA-MB-435 cells by inhibiting OPN expression.

133. Biochemical studies on interactions of mercury and lead *in vitro* with rat liver superoxide dismutase

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Mercury and lead are environmental toxicants which exert their toxic effects through the inhibition of various enzymes. The toxicity of these heavy metals is mediated through their ability to interact with sulfhydryl groups of proteins and enzymes, substituting the metallic cofactors and phosphorus in various biochemical reactions. The main objective of this study was to determine the effect of these heavy metals on the kinetics of Superoxide Dismutase (SOD) *in vitro*. SOD isolated from the post nuclear supernatant (PNS) of rat liver was treated with different concentrations of mercury and lead. The rat liver tissue homogenate (10%, w/v) was made under ice-cold condition and centrifuged at 9000 rpm for 30min at 4°C. The supernatant was used for SOD assay using pyrogallol as a substrate. The enzyme activity was evaluated with different concentrations of heavy metals to calculate their IC₅₀ values. All other kinetic parameters such as K_m, V_{max}, K_{cat} and K_i were determined in the presence and absence of heavy metals. The results indicated significance alterations in levels of these parameters as compared to control. The data suggest that exposure of mercury and lead may exert significant adverse impact on the functions of rat liver SOD, which may negatively influence the oxidative balance in the mammalian systems and induce several health disorders.

134. Value addition of food through biofortification

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Fortification refers to the practice of deliberately increasing the content of an essential micronutrients in food irrespective of whether the nutrients were originally in the food before processing or not, so as to improve the nutritional quality of the food. Biofortification is the process of adding nutritional value to the crop. Developing biofortification crops also improves their efficiency of growth in soils with depleted or unavailable mineral composition. Biofortification is a natural source to improve the nutrient quality of the green leafy vegetables. Biofortification is intended to the prevention of micronutrient deficiencies by reaching all household members. *Spirulina* is a type of naturally occurring blue-green micro-algae which can be grown in warm water alkaline water conditions. *Spirulina* can be grown in wild waters and at home or indoors. It is fully loaded with proteins, antioxidants, and numerous vitamins and minerals required for healthy lifestyle. It is high in chlorophyll, which helps to remove toxins from the blood and boost the immune system and oxygenates the blood. Its contains Omega 3-,6 and 9s and is especially high in Omega-3s. Omegas are essential in fighting heart disease, reducing arthritis, osteoporosis, diabetes, and depression as well as lowering bad cholesterol and contains many pigments which may be beneficial

and bioavailable. It supplies nutrients needed to cleanse and heal while providing protection from all kinds of cancers as well as multiple viruses including influenza, herpes, mumps, and measles. Vegetables especially leafy vegetables are rich in micro nutrients, when densed with *Spirulina*, it increases nutrient content in greens. These studies demonstrated commonly the used strategy as biofortification, to enhance the nutrient content of plant foods. *Spirulina* can be easily cultivated at home scale and large scale production it will easy to develop in rural areas through biofortification method.

135. Role of underwater bivalve, gastropoda using mathematics for diversity in ecosystem, from Indian coast

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Underwater diversity and taxonomical study of edible bivalve and gastropoda molluscs from open sea, rocky substrata, sandy beach, and muddy habitat, especially for bottom species was carried out. SCUBA equipment was used as per need for vertical depth of Arabian Sea. Calculations were done by the Shannon diversity index and Evenness for the period of October 2016 to September 2017 of the Raigad district Coast, a valuable part of Indian Sea. The productive molluscan fauna in prevalence of different habitats were observed, which provide a wide scope for research and to save molluscan species.

136. Biological control of aquatic weeds by herbivorous fishes

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Water is the major solvent of the earth its physical, chemical and biological properties are determine living characteristics around the planet. It is found in source of river, canal, lake, ponds, reservoir, ditches, streams, and also found in form of groundwater. Above water bodies have its environmental medium in which live most favorable aquatic vertebrates and invertebrates also live together aquatic micro and macrophytes plants. It knows that such type of plant which has chlorophyll in their green part of the body. They are the primary producer producing oxygen by photosynthesis, products and byproducts. Hole heterotrophic organism depends on the plants for the nutrients and energy. Plants are the ornamental of the earth because they made earth with ever green and ever clean. Someone cannot live without plants. Some plant species found in aquatic environment can be divided in the following categories like floating, free floating, and emergent, submerged. Those plants influence the water chemistry, habit and habitat of aquatic organisms. In recent era, many botanist, scientist, researcher and naturalist have studied the nature, role, structure, habit, habitat of the plants which are found in aquatic environment. When aquatic plants produce oxygen and energy then called primary producer but whenever they overgrow in water bodies, become harmful aquatic weeds. Researchers have discussed about to control of aquatic weeds. For which, a number of methods tried to control aquatic weeds. Some methods to control aquatic weeds like physical, chemical, mechanical, manual, and biological control are expensive and time consuming except biological control. The authors observed biological control with the use of grass carp and common carp fishes over aquatic weed. That fishes are the agent of biological control of grass carp much preferred to aquatic submerged, emergent, floating weeds common carp also feed on some aquatic weeds. Although, fish maintains aquatic environment and is cheapest alternatives of other control methods.

137. Evaluation of drinking water quality of Chitrakoot nagar panchayat area, M.P.

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The present study was formatted to determine the water quality of Chitrakoot nagar panchayat area. PHE, hand pump, river Mandakini and dug wells are major sources for drinking water of the above area. All four types (PHE, hand pump, river Mandakini and dug wells) of drinking water samples were exposed to bacteriological and physico-chemical analysis which included, *E.coli*, *Salmonella* spp., *Vibrio cholera*; and pH, temperature, conductivity, TDS, turbidity, dissolved oxygen (DO), biochemical oxygen demand (BOD) and chemical oxygen demand. Thus, treatment of water of above sources is essential for its safe use in drinking activity.

138. Studies on the current trends to be adopted for sustainable aquaculture practices in India

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Aquaculture is one of the fastest developing sectors and advanced trends are being adopted time to time in the developing countries to augment their aquaculture production in sustainable ways. India also needs to adopt those trends on timely basis in order to increase the per capita production of aquaculture. The present paper focuses few of such adoptable trends for aquaculture practiced in India. Significance of eco-friendly culture practices, water conservation and management, minimizing feed wastage and its management, health management practices through bio-secured practices etc. in culture practices are critically discussed.

139. Ecological status of the Ganga river-issues and challenges

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The Ganga Basin is the largest river system in the Indian subcontinent. It covers vast plains of fertile land that sustains near about 540 million of the Indian population and also harbours a rich aquatic biodiversity. In the second half of twentieth century different types of technical interventions in the form of construction of barrages, dams, embankments, hydro-electric projects posed a great challenge for the maintenance of ecological integrity of this riverine ecosystem. In the era of rapid urbanization and industrialization, discharges of chemical fertilizers and pesticides used in agriculture in the Ganga basin have deteriorated the river water quality. The paper focuses the impact of technical interventions in the form of liquid and solid wastes, construction of barrages and dams as well as embankments along with issues and challenges for the Ganga river ecosystem, apart from some recommendations to minimize the ecological degradation of the river.

140. Bio-plastics made from agricultural waste

D. Christina Angel

SPMVV, Tirupathi, A.P.

In recent years, the environmental/economic problems and social concerns raised due to plastic usage have triggered developing environmental friendly materials such as bio-plastics. Bio-plastics are biodegradable plastics produced from renewable sources such as vegetable waste, corn starch, straw, food wastes etc. Although appearing to be conventional plastic, bioplastics are 100% biodegradable; they dissolve in a few months. When they dissolve, bioplastics, unlike plastic, don't make the soil sterile and some types can even be absorbed as fertilizers. According to a report by the central pollution control board (CPCB) India goes through 15,000 tonnes of plastic produced everyday, out of which 6,000 tonnes remain uncollected. Also an estimated 32 million tonnes of agricultural residue which includes flax fibres, cotton fibres, cocoa and rice residues and vegetable waste is burnt every year, adding to the already alarming problem of air pollution in the country. This agricultural residue management is considered to be a vital strategy in order to accomplish resource conservation and to maintain the quality of the environment. These eco-friendly polymers made from agricultural

waste reduce rapidly and replace the usage of the petroleum-based synthetic polymers due to their safety, low production costs, and biodegradability. In addition to the above advantages it also provides additional income to the farmers and reduces litter in Agricultural, Industrial and Home levels. According to The American Chemical Society scientists converting this agricultural biomass into degradable polymers open up possibilities some of the non-degrading polymers with the present bio plastics obtained from flax fibers, cotton fibers, rice and cocoa pod husks, parsley and spinach stems. At present companies like coco cola and nestle are using such bio plastics as their packaging materials. In India, the J&K Industries limited has started its joint venture with EARTHSOUL India, Ravi Industries in Maharashtra, Haritha NTI ltd, Bio tech bags in Tamil Nadu are also pioneers. Biolutions in Bangalore is slowly working towards making a huge change in the game of disposables and packaging.

141. Comparative study on a new species of *Tripospermum* (*T. cedrelatoonae* sp. nov.) in Nauradehi forest of Sagar, M.P.

Shrinarayan Tripathi and Arpana Mishra

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The present study is based on the study of mainly hyphomycetous fungi infecting mainly living leaves and the study is confined to Nauradehi forest reserve of the Madhya Pradesh state. Forests are natural wealth of our country and their protection and conservation is of prime importance. These foliicolous hyphomycetes are unique in having a superficial mycelium composed of a chain of brown, septate hyphal segment supported by and attached to the substratum by stalked swollen attachment organ. Some of the foliicolous hyphomycetes are represented by epiphyllous species typically producing hyphopodia. The study was focused at the identification of a new species of *Sirosporium poacearum* sp.nov on living leaves of *Paspalum* sp., *S. stylidii* and *S. gliricidiae* are the only two species found comparable with the present fungal species.

142. Comparative assessment of pharmacological activities of natural and synthetic antioxidants

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A prolonged exposure of various drugs, environmental pollutant, and petroleum products etc. cause formation of reactive species with in body of living organism and they are associated with initiation of various ailments inside the human body. These reactive species are highly unstable and carry out oxidation of biomolecules such proteins, lipids and nucleic acids which obstructs their normal functions. The harmful actions of free radicals can be prohibited by antioxidant systems which include both natural as well as synthetic antioxidant molecules. In various literatures, it is well documented that synthetic antioxidants causes various side effects on human health. Therefore, in the present study, a comparative assessment of natural and synthetic antioxidants was performed by using *in vitro* antioxidant models including DPPH free radical scavenging, metal ion chelating, reducing power assay and lipid peroxidation inhibition assay. Cinnamic aldehyde was used as natural antioxidant while butylated hydroxyl-anisole was used as synthetic antioxidant. From the result, it was concluded that cinnamic aldehyde has appreciable pharmacological activity in comparison to butylated hydroxyl-anisole.

143. Population status and resource utilization by golden Jackal (*Canis aureus*) in two different habitats of the south western (Rajasthan)

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The present study highlights on the population status and resource utilization patterns in the Jackal (*Canis aureus*) with respect to diet in two different region of south western Rajasthan (Kumbalgarh Wild Life Sanctuary and Jodhpur. Food selection, use and availability by Jackal (*Canis aureus*) were compared between different regions. During present study the data on their social population structure, diet and foraging behavior were collected. In study area, I recorded the position from which each bearing was taken by GPS. Livestock population is an important food source for the Jackal. Food habits of Jackal were studied by scat analysis method. The scats were collected randomly from October 2017 to June 2018. In diet of jackal, a variety of food items were identified during study. The majority of sightings of Jackals' in ten villages in Kumbalgarh wild life century area. In Jodhpur district witch having nine locations were observed. Current study provides data on the population status of the golden jackals in South-western Rajasthan despite its importance as one of the main scavengers responsible for the appropriate functioning of the food chain and food web.

144. Control of weed by *Lantana camara* extract use as a green herbicide

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Weeds are undesirable plants. Plants which interfere human activity in crop and non-crop areas are considered as weed. They compete with the main crops for nutrients and other resources and hamper the healthy growth ultimately. Allelochemicals refer mostly to the secondary metabolites produced by plants and are byproducts of primary metabolic processes. Many of these compounds are phytotoxic and have potential as herbicides or as templates for new herbicides classes. These allelochemicals offer great potential for pesticides because they are free from problems associated with present pesticides. Parts of aqueous extracts of *Lantana camara* used for the control of various weeds.

145. Nature of water soluble seeds polysaccharide obtained from *Cassia auriculata* Linn. plant

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Cassia auriculata Linn. plant (Caesalpiaceae) commonly called as Tarwar or Avaram is a small perennial shrub and growing in Himalayan region of Northern India. Plant is well known for its medicinal and economic purposes. Present investigation mainly deals with the isolation, purification and preliminary analysis of seeds polysaccharides in authentic form, its chemical properties and nature of the constituent sugars. Water soluble seeds powdered precipitated with different percentage of ethanol, yielded sugar as: D-galactose and D-mannose in 1:3 molar ratio by TLC, column and paper chromatographic analysis of hydrolyzed compound. Derivatives of monosaccharide were prepared by usual manner as: D-galactose phenylhydrazone had m.p. 172-174°C and D-mannose phenylhydrazone m.p. 196-197 °C. Seed polysaccharide had iodine value 1.55 moles by iodometrically. The low value of optical rotation of the seed polysaccharide are also confirmed the presence of β -type linkage in D-mannopyranose while α - type linkages with D-galactopyranose units. The absorbance bands are recorded at 814cm^{-1} and 874cm^{-1} IR-Spectra (KBr) of seeds polysaccharide of *Cassia auriculata* Linn. plant.

146. Isolation and identification of flower petals pigment compounds from *Butea monosperma* (Lam.) Kuntze plant

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Butea monosperma (Lam.) Kuntze plant belongs to Papilionaceae and Fabaceae and commonly called as Palash, Dhak, Tesu, Flame of the Forest and Bastard teak. It is a medium sized tree upto 10-40 feet in height and occurs in greater part of India upto 915m altitude. Flowers as source of natural dye yielded orange and dark red colour. Flower petals have been isolated and identified in the four new pigment compounds are as (i) Lanceoletin (ii) Butein (iii) Monospermoside and (iv) Sulphurin. Chemical structure of these compounds were identified and elucidated with the help of spectral data and chemical studies of the flower petal pigment compounds. The Rf value of the flower petals pigment compounds of *Butea monosperma* (Lam.) Kuntze plant were found to be 0.56; 0.63; 0.24 and 0.13 moles respectively and these compounds were identified by the spectral studies.

147. Trace metal content in fresh water tissues of *Hemipimelodus jatus* (Ham.) from Keetham lake, Agra, U.P.

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Hemipimelodus jatus (Ham.) is a small fresh water fish belongs to the family - Cyprinidae and order- Cypriniformes. Fish are omnivorous and their diet includes small invertebrates and plant matters. Fish is an important food item which lives in different types of aquatic environment from the range of environmental changes. The main aim of the present investigation was to biomonitor the concentration of selected trace metals. The trace metals like copper, zinc, iron and manganese contents in the fish tissues like gills, liver, kidney and muscles of the fresh water fish *Hemipimelodus jatus* (Ham.) were collected from Keetham Lake, Agra (U.P.). The assessment of trace metals concentration in natural water system has received increasing attention for monitoring the environmental pollution. The alternate concern of trace metal contaminants in receiving the water is their toxic impact and aquatic organisms of *Hemipimelodus jatus* (Ham.) fish.

148. Bioprospecting role of *Cladonia rangiferina* against pathogenic microorganisms

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Lichens are one of the best examples of symbiotic association where two dissimilar organisms, a fungus and an alga or a cyanobacterium live together physiologically synchronized and well intermixed so as to form a single biological unit. The lichen substances also do have great biological potentials including antibiotic, antimycobacterial, antiviral, antioxidant, anti-inflammatory, analgesic, antipyretic, antiproliferative and cytotoxic. In the present study, crude extracts of *Cladonia rangiferina* were tested for its antimicrobial activity. *Cladonia rangiferina*, also known as reindeer lichen (c.p. Sw. *renlav*), lat., is a light-colored, fruticose lichen belonging to the Cladoniaceae family. It grows in both hot and cold climates in well-drained, open environments. Found primarily in areas of alpine tundra, it is extremely cold-hardy. Thalli are fruticose, and extensively branched, with each branch usually dividing into three or four (sometimes two). The photobiont associated with the reindeer lichen is *Trebouxia irregularis*. The lichen is used as a traditional remedy for removal of kidney stones. Samples were collected from Sela Pass and its organic extract was prepared using solvents methanol, ethanol, acetone and ethyl acetate by the soxhlet setup of extraction. Common negative control used was DMSO (Dimethyl sulphoxide) and specific positive control streptomycin for antibacterial and ketoconazole for antifungal. This present work was promulgated to explore the lichen *Cladonia rangiferina* with special reference to its antimicrobial testing against pathogenic bacteria such as *Staphylococcus aureus*, *Streptococcus mutans*, *Agrobacterium*, *E. coli*, *Pseudomonas aeruginosa*, *Klebsiella pneumonia* and pathogenic fungus *Candida albicans*, *Aspergillus niger* and *Fusarium oxysporium*. Maximum inhibition zones were observed in ethyl acetate extracts against bacteria *Agrobacterium tumefaciens*, *Staphylococcus aureus* and *E. coli* whereas ethyl acetate extracts against fungi *Candida albicans* and *Fusarium oxysporium* and it can be used as a herbal formulation in future use. This will definitely provide a

base and for the future perspectives and highlight the need for further studies of this promising source to harvest more beneficial in the field of bioprospection.

149. Identification of cadmium resistance bacteria in sewage using 16S rRNA-based sequencing

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Hypothetically, survival mechanism of microbes against high load of metals contaminations in polluted sewage sites and physicochemical parameters evoke them to develop tolerance mechanism. Literature review suggested a high Cadmium tolerance among isolated bacteria ranging from 10µg/ml-3000µg/ml. Sewage and Yamuna water samples were collected from various sites to isolated bacteria randomly. On screening and characterization with biochemical and 16S rRNA-based sequencing methods; eight cadmium resistance bacteria were detected. *Pontoea agglomerans* was most potential bacteria to survive in higher load of cadmium. *Pseudomonas*, *Klebsiella*, *Moraxella*, *Staphylococcus*, *Acinetobacter*, *Methylobacterium* and *Bacillus* were also potential candidate. The identified Cadmium resistant bacteria would be useful for bioremediation of heavy metal contaminated sewage water. Biotechnological method encompasses fields from genetic engineering to reactor engineering demands focused research in these directions, further, studies are needed to develop a system to utilize these microbes to a large-scale set up.

150. Investigating antidiabetic plant based compounds drugs for sustainable rural health development

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In India, the financial problem that the government could not pay such high costs for most of the free health services for rural areas peoples those facing health problems. The present study was carried out to evaluate the anti-diabetic potential by which perform on the basis of HPTLC analysis ,antioxidant potential, enzymatic assay (alpha glucosidase and alpha amylase) of Myrtaceae family plant extract against in vitro models respective. Various characterizations were carried out by using CAMAG HPTLC System. To confirmatory test for scavenging free radical activity carried out by using flow cytometry study of adiposities to determine anti-hyperglycemic potential by in *vitro* enzymatic assay. The extract showed significant antioxidant activity in all antioxidant assays when compared to ascorbic acid. Herein, the authors also established *in vitro* model for diabetes and evaluated the therapeutic potential of guava extract against insulin resistant adiposities. They demonstrated that guava extract significantly reduces the reactive oxygen species (ROS) levels. Additionally, guava extract reduces ALT and GGT activities in a dose dependent manner. In addition, enzymatic assay also performed anti-hyperglycemic inhibitory effect. The promising results indicated the utilization of the all parts of the plants of Myrtaceae as a significant source of natural antioxidant to combat diabetes diseases and provide rural areas people's health benefits.

151. Molecular docking studies of natural phenolic acids ellagic and chlorogenic acid with enzyme cyclooxygenase-2

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Cyclooxygenase (COX)-2 is a pro-inflammatory immediate early response enzyme, chronically up-regulated in several pathological conditions. COX-1 and COX-2 are two isoforms of the key enzymes used in the synthesis of prostaglandins, the major mediator of inflammation and pain. Cytokines, growth factor and other stimuli induce COX-2 during the inflammation response. COX-

2 selective and non-selective drugs are associated with side effects. Natural phenolic compounds are safe resorts to alleviate the symptoms of inflammation with negligible toxicity. In the present work, molecular docking of ellagic acid and chlorogenic acid with COX-2 enzyme has been carried out with the help of AutoDock Vina 1_1.2 suite. The structure of COX-2 (PDB ID : 3LN1) used in this study is available at protein databank. During the docking experiment, water molecules and heteroatoms have been removed, while the hydrogen atoms were added at appropriate geometry groups. The COX-2 was ionized as required at the physiological pH and its protonated form was used for the final docking experiment. Chlorogenic acid was found to be more effective inhibitor of COX-2 enzyme with binding affinity of -8.5 kcal/mole as compared to clinically prescribed drug Celecoxib (-7.4 kcal/mol). Ellagic acid showed low efficacy.

152. Mitigation of paracetamol induced liver injury by *Terminalia bellerica* fruit extract in rats

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Liver damage is the major health concern in patients being treated with paracetamol as long term drug regimen. Present study revealed the efficacy of *Terminalia bellerica* fruit aqueous extract as potential hepatoprotective agent. Hepatotoxicity was induced in albino Wistar rats by oral administration of paracetamol for 3 weeks. Another group of rats were treated with fruit aqueous extract along with paracetamol. Biochemical analysis of rat liver was done after 21 days. Hepatic function markers (serum glutamate oxaloacetate transaminase, serum glutamate pyruvate transaminase, alkaline phosphatase, total bilirubin, albumin, total protein, urea, creatinine and ferric reducing antioxidant power of plasma) and tissue antioxidant markers (malondialdehyde, activity of superoxide dismutase and catalase) were measured using specific biochemical methods. Paracetamol abused rats exhibited remarkable elevation in the level of hepatic markers and malondialdehyde coupled with extraordinary reduction in the activities of superoxide dismutase and catalase suggesting liver damage. Rats receiving fruit extract along with paracetamol displayed noteworthy improvement in hepatic function as compared to the only paracetamol treated animals; thus, the study emphasized the hepatoprotective potential of *T. bellerica* against drug induced toxicity.

153. Effects of dental restorations on the health of rural people

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The American dental association defines dental amalgam as an alloy composed of mercury, silver, tin and copper along with other metallic elements added to improve physical and mechanical properties. Dental amalgam has been an accepted part of dental treatment for more than 170 years. Besides being prepared easily, dental amalgam is relatively inexpensive compared to most other materials used in dental treatment and longevity of dental amalgam restorations is relatively high. It is the only dental material known for marginal sealing capacity due to corrosion products released from dental restorations. It also tolerates a wide range of clinical placement conditions such as wet fields (for zinc free products) however, toxicity of amalgam due to Hg has always been a concern. Whether dental amalgam fillings are hazardous? Though low cost, durability and less sensitivity to clinical technique, its use has been controversial. Rural people who neglect their oral hygiene, never visits a dentistry may be once in all for ages. Have a cavity and the restoration mostly done to them is amalgam. The purpose of this paper is to review the literature regarding the toxicology of mercury from dental amalgam and to evaluate the current status of rural people regarding their oral hygiene.

154. Phytochemical study and phytotoxic response of aqueous extracts of *Tithonia diversifolia*

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Investigation was carried out on the phytochemical composition of methanolic and water aqueous extracts of *Tithonia diversifolia* and their phytotoxic response on the growth of *Sorghum bicolor* (L.) Moench. The phytochemical analyses indicated the presence of bioactive substances such as alkaloids, saponins, glycosides, flavonoid, tannins, terpenoid and phenols in the methanolic extract and the later five allelochemicals in the water extract. The allelochemicals were of higher concentrations in the methanolic extract than in the water extract. The methanolic extract was found to be more phytotoxic than the water extract since the reduction of the germination percentage of the test crop was in the order of 100% methanolic extract >50% methanolic extract >100% water extract. The germination and seedling growth inhibition was then extract concentration dependent and significant at $P < 0.05$. Both methanolic and water extracts have greater inhibitory effects on the growth of the radicle than on the plumule growth at 100% extract concentrations.

155. Biomagnification

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Biomagnification is a man-induced process in the ecosystem which brings input of non-degradable pollutants into the food chain. These non-degradable pollutants not only accumulate but are often biologically magnified in the food chain system. By non-degradable pollutants, it means those materials which cannot be metabolized by the living organisms. Some examples are substances like pesticides, anti-knocking agents used in internal combustion engines, anti-fouling paints etc. Since, an ecosystem in its natural functioning may not handle these novel materials they get accumulated in the body of living organisms. Furthermore, in the course of the natural process, weaker organisms are eaten by stronger ones, and the concentration of non-degradable substances go on increasing as we move from the lower to the higher levels of a food chain. Let us take an example, DDT (dichloro-diphenyl trichloroethane) a broad spectrum pesticide which kills harmful insects as well as beneficial insects is not readily decomposed. It lasts for a relatively long time (nearly 20 years) following one application; at the same time it is, of low toxicity to humans, which has encouraged its worldwide application. The other reason for its extensive use is its cost-effectiveness.

156. Impact of stone crusher dust pollution on chlorophyll content of leaves

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Stone crusher industries are the one of the major source air pollution. In the paper, comparative studies have been done, to find the effect of SPM generated from the exhaust of stone crusher industries on the chlorophyll content of leaves. The study was conducted at Bharatkoop town and its surrounding region at district Chittrakoot. The leaves samples of *Madhuca longifolia*, *Mangifera indica*, *Psidium guajava* and *Ficus religiosa* were collected from highly polluted and less polluted sites. A photosynthetic pigment (total chlorophyll) was quantified. A reduction in the photosynthetic pigments of plant leaves growing in higher polluted site as compared to less polluted site was found.

157. Soil fertility and rice production by using bio-fertilizer

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The experiment has been done to assess soil fertility and increase the yield of rice production through biofertilizer. *Azolla* and cyanobacteria (BGA) are one of the major components of the nitrogen fixing biomass in paddy fields. Bio fertilizer application in rice field is better response of rice yield production and soil property, soil fertility status is maintain by *Azolla* 0.2 kg/m²+50% P₂O₅ and K₂O

and cyanobacteria 10 kg/ ha with 50% P₂O₅ and K₂O. Application of *Azolla* and cyanobacteria has been found to improve the significant for soil nitrogen and organic matter which directly help for improving the soil fertility. *Azolla* and cyanobacteria is of great agronomic value for rice crop. Biofertilizers is positively related to the production of rice and maintenance and build up of soil fertility. Biofertilizers are eco-friendly and have been proved to be effective and economical alternate of chemical fertilizers.

158. Screening of disease resistant varieties against Septoria leaf blotch of wheat

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In recent years, Septoria leaf blotch disease is widely spread in winter wheat crops and it is considered as the major factor of losses in the wheat crops in many countries. In the experiment, screening of disease resistant variety against Septoria leaf blotch of wheat was carried out during November 2014 to April-2015 and November 2015 to April- 2016. The twenty varieties have been selected and tested are as follows- U.P.-2338, N.H.-1012, Gomati (K -9465), HUW-468, Prasad (K-8434), WH – 147, PBW- 502, PBW- 507, Malavashree (H.I.-8381), WG-377, R.R.-21 (Sonalika), HP-1102, HP-1209, TBW-396, HD- 4672, UP-1109, UP-2003, PBW-373, WH-343 and Malveey-234. The same results were recorded in 3-conditions: Laboratory, pots, and plots. NH-1012, HUW-468, PBW- 502, W.H-147 varieties were recorded highly resistant. U.P-2338, Gomati (K -9465), Prasad (K-8434), PBW 507, TBW-396 varieties were recorded resistant. PBW-373, WH-343, UP-1109, UP-2003 varieties were recorded moderate resistant. R.R.-21 (Sonalika), HP-1102, HP-1209, Malveey-234 varieties were recorded moderately susceptible. Malavashree (H.I.-8381), H.D.-4672, W.G.-377 varieties were recorded susceptible. No variety was recorded in highly susceptible.

159. Estimation of tree diversity and above ground biomass of different forest sites of Pratapgarh, Uttar Pradesh, India

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Forest volume inventories are valuable source of data for estimating above-ground biomass, density and the carbon stored in biomass of forests. The present study estimates the above ground tree biomass and tree diversity of different forest sites of Pratapgarh. The study was conducted at four sites of Pratapgarh district i.e. Shekhpur forest, Chilbila forest, Kushfara forest and Tejgarh forest. Tree species richness was highest at Chilbila forest followed by Kushfara forest, Tejgarh forest and then Shekhpur forest. Tree density was greater at Chilbila forest than the forests of Kushfara, Tejgarh and Shekhpur. Aboveground tree biomass at Chilbila forest was also greater than the forests of Kushfara, Tejgarh and Shekhpur. Variations in species composition, density, diameter distribution pattern, biomass and carbon stock at different forest sites were attributed to different forest sites.

160. Impact of phosphate solubilization and salt tolerant bacterium on seed germination of *Cicer arietinum* L. with special reference to cytological study under *in vitro* conditions.

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Chickpea (*Cicer arietinum* L.) due to its good taste and nutritive values is used as a crash diet. But, nowadays due to immense use of chemical fertilizers, the cultivation of aforesaid plants has been gradually decreased because of reduced soil fertility. This condition can be avoided by diverse group of rhizospheric soil microbes, commonly called as Plant Growth Promoting Rhizobacteria. These are the group of bacteria that are commonly found in association with the rhizosphere. The present study was done with the chief objective of impact of phosphate solubilization and salt tolerant

bacterium i.e. *Bacillus licheniformis*, on seed germination of *Cicer arietinum* L. under *in vitro* conditions. An experimental work had been carried out in lab conditions where the seeds of *C. arietinum* were mixed with selected bacterium to examine the effect on the growth rate of *C. arietinum* plant. The cytological studies have been conducted on these experimental setups that have resulted into various abnormalities due to effects of various setups. Seed germination was observed upto the three days. Furthermore, it can be concluded that use of *B. licheniformis* can enhance growth and development of *C. arietinum* to meet the current demands with minimum after effects.

161. Impact of some botanicals on the human pathogenic anaerobic bacteria causing acne vulgaris

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Skin is one of the most sensitive parts of human body and a human face is the introduction of a person. The dermal part of the body is most exposed to the external environment and thus shows high susceptibility for infections; facial problem is one of them. Acne, medically known as Acne vulgaris is a disease of pilosebaceous unit where abnormally adherent keratinocytes cause plugging of the follicular duct followed by accumulation of sebum, keratinous debris, and bacteria within this structure. Anaerobic bacteria are the main causal organism for the disease, in which *Propionibacterium acnes* and *Staphylococcus epidermidis* are considered as the major skin bacteria that cause acne. The present study was conducted to evaluate the *in vitro* antimicrobial activities of *P. guazava*, *C. longa*, *Angelis sp.* and *Juniperus communis* L. It has been shown that *P. guazava* methanolic extract has IC₅₀ value 1.025 mg/ml and the MIC value of this extract is 1.601 mg/ml and that of *P. guazava* ethanolic extract has the IC₅₀ value 2.112 mg/ml and has its MIC value 2.621 mg/ml and that of *C. longa* methanol extract has IC₅₀ value 1.166mg/ml and has the MIC value is 1.169mg/ml of this extract, the ethanol extract of *C. longa* has the IC₅₀ value 2.366mg/ml but it has been seen that it has no MIC value for. The obtained results shows that *Curcuma longa* has high antibacterial activity as it effectively inhibit the growth of *P. acnes* (MTCC No-1951). The results were compared to negative control standard tetracycline.

162. Synergistic effect of some gymnosperms against *Escherichia coli*

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The present investigation focused on the determination of antibacterial efficacy of essential oils obtained from leaves of three gymnospermous trees viz., *Juniperus communis* L., *Pinus roxburghii* Sarg., and *Taxodium distichum* L. The oils were extracted from the leaves of aforementioned plant species using Clevenger apparatus by hydro-distillation method. The antibacterial activity of the extracted essential oils was evaluated against *Escherichia coli* (MTCC No. 8936) using broth micro-dilution method recommended by Clinical Laboratory Standard Institute (CLSI). The Inhibition Concentration i.e. IC₅₀ and Minimum Inhibition concentrations (MIC) were obtained using SpectramaxPlus384, Molecular Devices Corporation, USA; with Streptomycin taken as standard. IC₅₀ values of *Juniperus communis* L., *P. roxburghii* Sarg., and *T. distichum* L., were 0.598, 0.052 and 0.127 mg/ml respectively. *P. roxburghii* was found most effective with MIC 0.105 mg/ml while *J. communis* L. showed least effective with MIC 0.617 mg/ml against *E. coli*. Hence, essential oil from leaves of gymnosperms exhibits great potential for the development of eco-friendly, non-toxic, cost-effective anti-bacterial formulations.

163. Antibacterial assay of synthesised magnesium oxide nanoparticles against some plant growth promoting rhizobacteria

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Magnesium has a number of key functions in plants such as photo-phosphorylation, photosynthetic carbon dioxide fixation, protein synthesis, chlorophyll formation, phloem loading, partitioning and utilization of photo-assimilates, generation of reactive oxygen species, and photo-oxidation in leaf tissues, etc.. Consequently, many critical physiological and biochemical processes in plants are adversely affected by Mg deficiency, leading to impairments in growth and yield. An important Mg-activated enzyme is the ribulose-1, 5-bisphosphate (RuBP) carboxylase, is a key enzyme in the photosynthesis process and the most abundant enzyme on earth. Chemical synthesis of magnesium oxide nanoparticles (MgO NP) was prepared by using Composite-Hydroxide-Mediated (CHM) method prepared from $MgCl_2$ and NaOH-KOH aqueous solution. Prepared MgO nanoparticle was characterized viz., XRD, SEM, FTIR and UV-vis for studying its crystal grain size and stability. Furthermore, antibacterial assay was done against four PGPRs named as *Azotobacter chroococcum*, *Paenibacillus polymyxa*, *Bacillus subtilis* and *Pseudomonas fluorescens*. Antibacterial assay revealed that at very high concentration above 3000 ppm, MgO nanoparticles showed toxicity to rhizobacterial inoculum. Thus, from present investigation it showed that magnesium oxide nanoparticles can be used for the plant growth regulators with soil micro flora and can be used for the noble formulation of “Nano-Biofertilizers”.

164.A comparative analysis of leaf extract and whole plant extract of *Eclipta alba* on *Klebsiella pneumoniae*

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Eclipta alba (L.) Hassk is small branched annual herbaceous plant with a long history of traditional medicines uses in many countries especially in tropical and subtropical regions. The herb has been known for its curative properties and has been utilized as analgesic, antioxidant, immunomodulatory, etc. and also considered as a good rejuvenator. A wide range of chemical compounds including coumestans, alkaloids, thiopenes, flavonoids, polyacetylenes, triterpenes and their glycosides have been isolated from this species. Secondary metabolites present in extracts from this plant have been known to possess pharmacological properties. The present study confirmed the antibacterial potential of aerial parts extracts as well as whole plant extract of *E. alba* in solvents like acetone, ethanol and petroleum- ether. The antibacterial studies were done by the Broth micro dilution recommended by CLSI protocol against human pathogenic bacterium *Klebsiella pneumoniae* (MTCC-4032). Streptomycin was taken as standard. The Acetone extract of both leaf and whole plant extract was found to be most effective against human pathogenic bacterium as compared to extracts of ethanol and petroleum-ether. In both leaf and whole plant extract leaf extract is found to be most effective against this bacterium. Hence leaf extract of *E. alba* exhibit great potential for the development of eco-friendly, non- toxic, cost effective , antibacterial formulations.

165. Anthelmintic efficacy of *Hibiscus rosa-sinensis* (Linn.): *In vitro* assay against the adult *Haemonchus* sp. of goat

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Hibiscus rosa-sinensis (Linn.) belongs to family Malvaceae (commonly known as "Gurhal") extensively distributed throughout the tropic and subtropic regions of the World. The aim of this study was to investigate the *in vitro* anthelmintic effects of methanolic extract of *Hibiscus rosa-sinensis* leaf against *Haemonchus* sp. with reference to the standard drug Albendazole (1 mg/ml). Adult worms were exposed to 1, 2.5, 5, and 10 mg/mL concentrations of methanolic leaf extract of *Hibiscus rosa-sinensis* and the effects were observed on the basis of paralysis time and death time of individual treated worms in minutes. The results of this study showed that the methanolic extract has significant ($P \leq 0.05$) dose-dependent anthelmintic activity against parasites as compared to control. This assay also revealed that the parasites treated with 10 mg/ml concentration of the extract showed potent anthelmintic activity and took less time for paralysis of worms (44 ± 1.2 min) and

death (73.3 ± 1.6 min). Photomicrographs of treated worms at concentration 10 mg/mL showed extensive structural alterations involving the breakdown of the surface cuticle, destruction of the muscle layers, severe damage of the intestinal muscle layer and distortions of the ovary wall. The result concludes that *Hibiscus rosa-sinensis* (Linn) can play as an alternative plant-based anthelmintic in the forthcoming future.

166. Anatomical assessment of marigold (*Tagetes erecta*) seedlings exposed to colloidal silver nanoparticles

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Due to the widespread use of silver nanoparticles (AgNp) in different products, the possibility of their leakage into the environment has been increasing. It is, therefore, crucial to study the possible effects of AgNp on plants as the key components of ecosystems. In the present study, the effects of different concentrations of colloidal AgNp on marigold were investigated at the anatomic level. Using dynamic light scattering and electron microscopy, the size of the AgNp was estimated less than 80 nm. After one week of treatment, thin cross sections of roots and shoots were prepared and studied by light and fluorescence microscopes. Results showed that cortex and vascular cylinder area of roots and shoots of treated plants significantly ($P < 0.05$) decreased versus control. Significant ($P < 0.05$) reduction in diameter of meta xylem elements was also identified. In addition, deformed cells and Ag accumulations in root tissues of treated seedlings were observed. The results of this study indicate that AgNp can enter into plant root and make considerable adverse effects on the plant root anatomy suggesting that AgNp can become a future emerging pollutant.

167. Ultrastructure of egg chorion of spotted boll worm *Earias vitella* (Noctuidae)

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Insect eggs are laid in different microhabitats thus exposed to varied environmental hazards such as temperature changes, humidity, desiccation, microbial invasion etc. Therefore to protect the developing embryo, preponderant role is played by the egg shell in majority of insect eggs. Insect egg shells consists of an inner layer 'vitelline envelope' and an outer layer 'chorion' made up of different layers forming elaborately sculptured surface patterns which allow the identification of egg specific characters permitting the identification of species. In the present study the chorion of spotted boll worm *Earias vitella* (Noctuidae) was investigated through high resolution electron microscopy. The surface of the egg exhibited various structural features viz. micropylar apparatus, rosette petals, ridges, cross ridges and aeropyles etc. when observed with SEM. The chorion further exhibited radial fine structure consisting 4 distinct layers i.e., innermost chorionic layer (C1), trabecular layer (C2) supported by trabecles, principal layer (C3) having hecoidally arranged stacks of fibrils and the outermost layer (C4) covered with mucous envelope when investigated through TEM.

168. Impact of dust emission on tree species growing in the vicinity of cement plant of Rewa M.P.

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The present research work was undertaken to study the dust deposition efficiency of selected common plant species growing in the vicinity of Jaypee cement plant and the response of dust deposition on the photosynthetic pigments of leaves such as Chlorophyll 'a', Chlorophyll 'b' and Total chlorophyll content. Cement industry is the major source of particulate matters, SO_x, NO_x and CO₂, emissions along with heavy metals like nickel, cobalt, lead, chromium etc. The result showed maximum dust deposition on leaves during winter followed by summer and rainy months for all tree

species. Reduction in chlorophyll 'a', chlorophyll 'b' and total chlorophyll were recorded in the leaf samples of all selected cement dusted tree species as compared with non-dusted tree species. The result shows significant negative correlation between dust load and pigment content in all the season. It is concluded that the presence of toxic pollutants in cement dust might be responsible for the reduction in photosynthetic pigments. Cement dust pollution imparts more stress on the plant species.

169. Studies on ambient air quality and its impact on micro- morphological structure of leaves of road side plant species, *Bombax ceiba* in Rewa city (M.P), India

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This study was undertaken to assess the ambient air quality (seasonal variations of ambient air pollutants SPM, RSPM, SO₂ and NO_x) and its impact on road side plant species *Bombax ceiba* in Rewa city with special reference to micro-morphological attributes of leaves. The monitored average values of RSPM, SO₂ and NO_x at the sampling sites are well within prescribed limits, whereas average concentrations of SPM in the ambient air of the Rewa city are above the permissible limits as per National Ambient Air Quality Standards (NAAQS) and Central Pollution Control Board (CPCB). The light microscopic studies of this plant indicated marked alternations in epidermal traits with increased number of stomata and epidermal cells, stomatal frequency and stomatal index on both abaxial and adaxial surface of leaf collected from polluted sites as compared to control sites. The leaf samples collected from polluted sites also exhibited decreased length and width of epidermal cell and guard cell as compared to control ones. The results indicate that these changes in micro-morphological structures could be an indicator of environmental stress caused due to urban air pollution. These characters could be used in the bio monitoring of urban air quality.

170. Genetic variation in physiological response at population level of Jamunapari goats

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Heat stress is a major problem in livestock which is influenced by different climatic condition so it is necessary to develop different strategies to make better for maintaining production performance. The aim of this work was to analyze the genetic variation in physiological response at population level in Jamunapari goats. The physiological parameters were recorded at different period with THI (Temperature Humidity Index). The THI range varied from 82.00 to 92.08 during hot period, 49.96 to 59.68 during cold period and 65.32 to 74.00 during thermo-neutral period. Two contrasting (HST and HSS) phenotype were identified on the basis of RR and HR. RR and HR was significantly different ($P < 0.01$) between heat stress-susceptible and tolerant phenotype. The RR and HR of kids and adult was significantly different ($P < 0.01$) between in heat stress-susceptible and tolerant phenotype. Age by period and age by phenotypes interaction had significant ($P < 0.05$) on RR and HR. The heritability of RT, RR and HR were 0.18 ± 0.058 , 0.077 ± 0.044 and 0.307 ± 0.076 respectively in combined data set. The h^2 estimate was significant for both hot and cold period. Similarly heritability was analyzed separately for age group. The genetic correlation between RT and HR was high and positive during hot and cold period as well as in combined data set. Our finding indicates that phenotypic difference can be heritable.

171. Arsenic exposure: Study on oxidative stress, immunomodulation and effects on gut microbiome in zebrafish

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There is a fundamental gap in understanding the role of arsenic exposure on gut microbiome through its key role in a wide range of host-related functions. Arsenic is a prevalent environmental toxin that has become a global health problem affecting millions of people. Increased oxidative stress and impaired immune functions have been reported due to arsenic toxicity. Since, arsenic exposure increase oxidative stress that can trigger catalase, SOD, and GPx, as an antioxidant biomarker. The nuclear factor NF- κ B pathway and Interleukin 6 (IL-6) has long been considered a prototypical pro-inflammatory causing immune response. Therefore, in the present study, zebrafish was used as an animal model to investigate morphological alterations in gut microbiome, expression of catalase, SOD, GPx, NF- κ B and Interleukin 6 (IL-6) at cellular level. Zebrafish were exposed to 10 μ g/L arsenic for different time interval. The intestine was removed and bacterial isolates were cultured on LB agar, morphological changes in bacterial isolates were observed by TEM. cDNA was prepared for catalase, SOD, GPx, NF- κ B and IL-6 expression through qPCR. Observations of the study showed morphological changes in gut microbiome, and increase in the expression of catalase, SOD, GPx, NF- κ B, and IL-6 in the intestine of arsenic exposed zebrafish as compared to control.

172. Hypoglycemic effect of *Callistemon lanceolatus* extract in alloxan induced diabetic rat model

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Diabetes mellitus is a metabolic disorders characterized by hyperglycemia resulting from defects in insulin secretion, action, or both. The present study was designed to investigate the anti-diabetic activity of leaf extracts of *Callistemon lanceolatus* in alloxan-induced diabetic Wistar rats for 28 days. Biochemical profiling of blood was carried out to monitor the effect. Oral administration of the extract reduced blood glucose level in glucose-loaded and alloxan-induced diabetic rats. Daily oral treatment with *C. lanceolatus* extract for four weeks resulted in reduced blood glucose, serum cholesterol, and triglycerides and improved HDL-cholesterol levels as compared to the diabetic control group. The present study revealed the antidiabetic potential of *Callistemon lanceolatus* leaf extract in diabetic rat model.

173. In-vitro antioxidant activity of *Callistemon lanceolatus* plant extract

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Free radicals pose serious hazard to tissues and membrane lipids, proteins and nucleic acids of cells. Over production of reactive oxygen/nitrogen species (ROS/RNS) and other related radicals lead to oxidative stress which has been implicated in aging and a number of diseases. ROS and RNS produced in a well-regulated manner help maintain homeostasis at the cellular level in the normal healthy tissues and play an important role as signaling molecules. Natural products of plant origin have been used in traditional medicine for the treatment of diseases resulting from radical overload. They protect cells and organisms from the lethal effects of excessive ROS production. Current study reports the phytochemical analysis and in vitro antioxidant efficacy of *Callistemon lanceolatus*. Phytoconstituents present in bark were sequentially extracted in several solvents i.e., chloroform, ethyl acetate, methanol and water. Residues were lyophilized and analyzed for phytoconstituents namely, tannins, flavonoids, terpenoids, cardiac glycosides, reducing sugars, and saponins etc. During in vitro assays aqueous extract exhibited noticeable antioxidant activities viz., DPPH radical scavenging, metal ion chelating, reducing power, total antioxidant activity and anti-lipid peroxidative activities suggesting potential of *C. lanceolatus* as medicinal agent.

174. Plasmid mediated resistance in *Escherichia coli* and antimicrobial effect of extract of *Acacia leucophloea*

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Total 12 *E. coli* isolates were processed for the plasmid mediated resistance. Plasmid DNA was positive for Sulfonamide, Tetracycline, Streptomycin and Gentamycin in Six (50%), Nine (75%), Two (16.66%), Two (16.66%) isolates respectively by PCR method. Antibiotic sensitivity test was conducted in 10 isolate against commonly used antibiotics. Multi-drug resistant was shown with Cefotaxime (CTX-30) in 58.33 %, Ertapenem (ETP-10) 33.33%, Ceftriaxone (CTR-30) 58.33%, Doripenem (DOR-10) 50%, and Meropenem (MRP-10) 58.3 %. CTX (8.33 %), ETP (16.66%), CTR (25%), and DOR (8.33 %) were in intermediate level of resistance, however, CTX (16.66 %), ETP (33.33 %), DOR (25%), MRP (25%), and HLG (83.33%) were sensitive. These antibiotic resistant isolates subjected for antibiotic sensitivity by *Acacia leucophloea* (Ramza methanolic). *Acacia leucophloea* (Var name: Remza) methanolic extract at different concentrations (in mg/ml) 500, 250, 125, and 62.5 exhibited 23, 21, 19 and 12; 26, 20, 16 and 11 mm zone of inhibition respectively. Similarly, aqueous extract at different concentrations (in mg/ml) 500, 250, 125 and 62.5 resulted in 29, 26, 19 and 14; 30, 21, 18 and 13 mm zone of inhibition, respectively. It was observed that aqueous extract of *Acacia leucophloea* is comparatively more effective than methanolic extract.

175. Wingospermocarpon of family Bignoniaceae reported from the late cretaceous Deccan cherts of India

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Fossil fruit of the Bignoniaceae family closely belongs to the fruit of extant genus *Kigelia pinnata* DC. (sausage tree) reported from the late cretaceous Deccan Intertrappean cherts of Mohgaonkalan Chhindrawara District, Madhya Pradesh, India. The fruit is unilocular, pedicelate, multiseeded, dehiscent, capsule pod like fruit with compressed, discoid, often prominently winged seeds without endosperm.

176. A mild and time efficient sodium ethoxide mediated carbon-carbon bond formation via Knoevenagel condensation

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A time efficient procedure of C-C bond formation under mild conditions has been developed for preparation of α , β unsaturated compounds via Knoevenagel condensation. Various aldehydes reacted with ethyl cyanoacetate/ malononitrile in the presence of sodium ethoxide (20 mol %) in ethanol at reflux for 1 h as well as at room temperature (25°C). This procedure is likely to be useful for the preparation of α , β unsaturated compounds (E-olefines), the key intermediates for many organic synthesis and pharmaceutical products. The best features of this procedure are the mild reaction conditions, high yields, cleaner reactions, easy workup reaction conditions, operational simplicity, cost effectiveness and readily available starting chemicals, making it a useful strategy for the preparation of commercially important olefins.

177. A relative assessment of the physico-chemical properties and heavy metal toxicity of the river Yamuna water in Delhi region India

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The current study affords valuable data of (three consecutive years) to study the hydro- chemistry of the river Yamuna in terms of physico - chemical parameters such as pH, TS, BOD, and COD and

heavy metal concentrations namely Pb, Zn, Cr, Co, Cd, Cu and Ni of river water. There were four study sites selected for the study in stretch of Delhi (Capital of India). Relationship between the parameters and spatiotemporal variability of water samples are identified through multivariate statistical methods includes ANOVA for physico-chemical parameters, Box Plot, Cluster Analysis, Pearson's Correlation. In physico-chemical parameters, pH ranged between (7.17 ± 0.0115 to 8.21 ± 0.26), TS ranged between (787-1889 ppm), BOD ranged between (7.3 - 38.8 mg/l), COD ranged between (54-119 mg/l). Heavy metals ranges followed as Pb (0.0082 ± 0.0005 - 0.072 ± 0.001), Zn (0.232 ± 0.016 - 1.855 ± 0.005), Cr (0.034 ± 0.002 - 0.112 ± 0.0001), Cd (0.0023 ± 0.0001 - 0.0032 ± 0.0001), Cu (0.063 ± 0.002 - 3.051 ± 0.0001) and Ni (0.0065 ± 0.001 - 0.0297 ± 0.001). Statistical significant degree of spatial and temporal variations has been observed in physico-chemical parameters ($p < 0.05$). Investigated physico chemical parameters and heavy metals in river water of Yamuna in Delhi segments for three years were found significant and well indicators of contamination. BOD and COD were exceeding the WHO standards at all the sites. TS values were found very high at all four sites. In case of heavy metals, concentrations of some elements were exceeding the acceptable water standards in different years at different sites, and thus are evidence to the river water pollution through drains which are draining industrial, agricultural and domestic waste in river more than its replenishing ability.

178. The roles of arbuscular mycorrhizal fungi (AMF) on plant growth promotion and photosynthetic pigments in *Vigna radiata* L.

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The aim of the present investigation was to evaluate the impact of arbuscular mycorrhizal fungi (AMF) *Glomus mosseae* on plant growth promotion, root proliferation, chlorophyll and carotenoid contents of mung bean (*Vigna radiata* L.). A field study was conducted for physiological and biochemical assay in mung bean in mycorrhizal (M) and non-mycorrhizal (NM) plants. A significant increase in the plant lengths, root growth, fresh and dry weights chlorophyll and carotenoid content was observed in mycorrhizal (M) plants. This study revealed the positive effect of *G. mosseae* on mung bean crop, thus it is concluded that *G. mosseae* promotes plant root growth photosynthetic pigments and increases level of water stress tolerance by capturing relatively immobilize nutrient and other macro -elements microelements from soil in Mung bean.

179. Comparative analysis of characters among different population of *Megachile lanata* (Fabricius) collected from different region of Rajasthan

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A comparative study on phenotypic variation in *Megachile lanata* was done in four different clusters of population. These bee specimens were collected from four selected habitats of Rajasthan India i.e. Alwar (eastern Rajasthan), Bharatpur (eastern Rajasthan), Jodhpur (western Rajasthan) and Udaipur (northern Rajasthan). *Megachile lanata* is an important and highly active pollinator. Comparative apomorphic analysis was based on different morphological characters. Different climatic conditions between different habitats may affect morphology of bee. The proposed investigation will explore the overall morphological adaptation of the bee species. It will help in designation of variants of the bee species.

180. Study on phytochemical and biological activity of some culinary herbs

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The extracts of herbs and spices contain considerable amounts of phenols and flavonoids due to which their free radical scavenging power is comparable with gallic acid and Spices are dietary supplementary herbs used widely in Indian foods as flavouring agent, colouring agent and preservative from thousands of years. The study has provided some biochemical information on the proximate, mineral element and phytochemistry of garlic, ginger and other species found in some Chitrakoot markets. There are indications that all spices are good sources of nutrients, mineral elements and phytochemicals. Hence, their use as nutritional supplements is highly promising. Spices are used worldwide as aromatic and pungent food ingredients. In general, spices are used not only for flavouring foods but also due to their antiseptic and medicinal showed properties. Currently, the antimicrobial, anti-inflammatory, antimutagenic and anti-carcinogenic properties of spices were reported.

181. Eco-friendly self reliant total development of Raj Rishi Gram Ravandeora-Alwar Rajasthan

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The paper describes about field experimental potentialities of the self-reliant eco-friendly total development of Raj Rishi Gram Ravandeora, Alwar (Rajasthan), India. People based cost effective achievements encompassing check dam (Common Wealth Youth Program Project), Panchhi Vihars, Shahid Smriti Van Project, Community Johadas (water reservoirs) developed by shramdan for harvesting rain water, total literacy campaign, mother and child care (through Angan Bari), skill development programs and dairy activities, planned forestation (Kutir Harit Kosh and social forestry, rural tourism, redressing sites of heritage and pilgrimage interest), sports for all and adventure sports, Lok Munch to promote and foster folk arts /dramatics and gram sabhas, Vivekanand Center for value Education & Indic Research, Voter's council (non-party political), introducing wellness centers (yoga and naturopathy based) etc. are reshaping this deprived pocket as an inspiring model of group dynamics with holistic concerns. *Modus Operandi* involves educating public opinion for need felt problems and brining public representatives, officials, scientists/technocrats, volunteers beneficiaries etc. together for their plausible solutions. This modest attempt of inclusive discussions, collaborative research, voluntarism and functional commitment with a pivotal focus on harmonious development on the foundation of human knowledge has rewarded the community with a telltale success.

182. Evaluation of medicinal plants for their anticarcinogenic potential in experimental animals

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Medicinal plants are being used for the treatment of various diseases in different part of the world from time immemorial. Radiation/chemicals used in the treatment of Cancer produces reactive free radicals, which cause DNA damage leading to cell death and genomic damage in the stem cells. Therefore it is necessary to search the compounds which have low toxicity and there is an urgent need to develop much effective and less toxic antitumour agents from different herbs of ethno-botanical importance. In the present study, the chemo preventive effects of some medicinal plants will be discussed.

183. Agriculture waste management: A challenge for sustainable rural development

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Indian economy is based on agro-based activities. About 65% population of India is dependent on agriculture for their livelihood. Food security is under threat because of the growing population and global climate change. India generates about 350 million tons of agricultural waste annually. This waste is generally being dumped or burned in open causing many hazards to the environment. There are many new approaches and methods for utilizing crop residues and other biodegradable waste that have become attractive and profitable such as composting, animal fodder and energy production. Conversion of agriculture waste into organic manure by various methods like biogas plant, vermicomposting etc. not only reduce the input cost of farming but also protect us from the ill effects of chemical fertilizers that would otherwise be used. Continuous use of this manure rejuvenate the soil health there by increasing the capacity of soil to recycle nutrients hence increase the nutritive value of the food and save the mother earth.

184. Effect of sub-chronic toxicity of chlorpyrifos on brain and behavior of an air-breathing catfish, *Heteropneustes fossilis*

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In spite of judiciary restriction, immeasurable use of some second generation pesticides in agricultural crop fields depreciates non-target organisms including fish. The present study has been undertaken to evaluate the effects of sub-chronic toxicity of chlorpyrifos (CPF) on structural changes in the optic tectum of brain and behavioral abnormalities in *H. fossilis*. The fishes were exposed to environmentally relevant doses, 1/10th and 1/20th of LC50 of CPF for 15 and 30 days. After completion of CPF exposure period, opercular movements of control and exposed fishes (n=12/group) were counted by visual observation and locomotory activities were recorded by an automated tracking device using ANY-MAZE software (Storling Co., USA). During experiments, water quality parameters were also recorded and analyzed. Then, fishes were sacrificed under cold anesthesia and their brains were dissected for histopathological observations. The prefixed brain sections of all groups were stained by H & E. The sub-chronic exposure of CPF induced neuronal degeneration characterized by spongiosis in the mononuclear and granular cells of different layers of optic tectum. The opercular movements and locomotory performances (total distance travelled, swimming speed, freezing episodes, head : distance travelled etc.) of CPF exposed fish were found to be significantly decreased as compared to control. This study concludes that environmentally relevant dose of CPF may induce structural and functional disturbances in the fishes, *H. fossilis*.

185. Assessment of ground water quality Karwi Tahsil, Chitrakoot district

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This paper assessed ground water quality Karwi Tahsil, Chitrakoot district for determining its suitability for drinking purpose. The experimental procedures were set according to the international drinking water standards set by WHO (1999). Ground water samples, collected from 20 different sampling locations of Karwi Tahsil for winter, summer and monsoon seasons, revealed that pH of all samples was neutral to slight alkaline. Turbidity of all samples was within permissible limit. Total hardness, total dissolve solid, alkalinity, chloride, nitrate, fluoride, sulphate and phosphate were beyond permissible limit in some samples. In most samples water quality were parameters beyond permissible limit.

186. Studies on antibacterial activity of nucleoside analogs

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Nucleoside analogs may represent a potent series of drugs for the introduction of new antibacterial agents in the field of medicinal chemistry. A series of new modified nucleosides has been designed using *in silico* methods as possible NRTIs, on the basis of Lipinski's rule of five, synthesized using multistep reactions including Vorbruggen and Bennua method and assessed for their antibacterial activity. The structure activity relationship (SAR) of these molecules was also outlined by docking against HIV-1 reverse transcriptase enzyme as protein receptor, using the software DS 2.5. Synthetic intermediates and final products were appropriately characterized by ¹H NMR and ¹³C NMR. The products were tested against the gram +ve bacteria, viz., *S. aureus* and *B. cereus* and gram -ve bacteria, viz., *E. coli* and *P. aeruginosa* and compared with the known antibiotic chloramphenicol. The data obtained as MBC (minimal bactericidal concentration) and MIC (minimum inhibitory concentration) revealed that some compounds showed good antibacterial activity against gram +ve bacteria whereas other compounds against gram -ve strains of bacteria. Hence, it can be concluded that nucleoside derivatives bearing 'NO₂' and 'S' groups may represent good lead compounds for the future discovery of a novel series of antibacterial agents.

187. Soil microbiome for environmental sustainability

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Soil is complex and dynamic biological system that provides diverse ecological niche for microorganisms and is a hotspot for belowground microbial interactions. The soil microorganisms play a vital role in the establishment with driving the plant- soil-water relations and nutrient turn over. Over the years scientists have studied a lot about the microbial mediated soil functions, biogeochemical cycling, enzyme activities and soil respiration etc., still it is difficult to identify the role of specific microbial species behind such processes. The major challenge is to link the soil microbial diversity to soil functions. It requires a deep understanding and characterization of the genetic, taxonomic and functional diversity of microbial community structure in the soil matrix. The advent of some conventional and next- generation sequencing technologies has provided the valuable and high-throughput method for culture-independent analysis of the soil microbiome. Cultivation-independent genomic approaches are more preferred for exploring the ecology and diversity of soil microbes due to the unculturable nature of soil microbes. Soil metagenomics has greatly advanced our knowledge about the complete characterization of new microorganisms, genes, gene products and whole community DNA sequence for microbial community analysis and comparisons from different microbial assemblages. Understanding how microbial communities are structured in the soil gives critical insights into their functions, diversity, speciation, inter and intraspecies interactions. The present work details the state-of-the art developments in soil microbiome studies and their sustainable utilization.

188. A study of the microsporidian parasite of honey bee (*Apis mellifera*) by electron microscopy

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Honey bees (*Apis mellifera*) are a key pollinator species for the major crops. Several countries have been reporting a progressive loss of honey bee diversity for which sudden bee colony loss or depopulation of colony without any sign of disease has been implicated as one of the major factors. Researches to find out the core reason of this mishappening indicate that microsporidian infection may be one of the major factors for this loss. Considering this fact the present investigation was designed to study the prevalence and ultrastructure of microsporidia infecting the honey bee (*Apis mellifera*). For this purpose two well flourished Apiaries, with no apparent signs of disease were selected for the sampling. These apiaries are located in Sitapur and Kanpur, Uttar Pradesh. Honey bees of different age groups viz. Forager, Nurse and Guard were collected from February 2018 to March 2018 and subjected to prevalence and incidence studies. For ultrastructural study the samples

were analyzed under electron microscope using standardized protocol and prevalence study was done by collecting 50 bees of each age group. The results showed that forager were highly infected with microsporidia compared to nurse and guard bees. Electron microscopy of the spores revealed that oval spores were present in clusters and protruding apical area was visible clearly. Similar developmental pattern were recorded in all age group. Some spores were seen to invade the host cells. The present investigation revealed that honey bees collected from visibly healthy apiaries were infected with moderate to high burden of microsporidian parasites.

189. Paraneuronal pseudobranchial neurosecretory system in certain teleosts

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Pseudobranchial neurosecretory system is the third NE system found in the gill region of fishes apart from two known ones i.e. hypothalamo-hypophysial system of brain and caudal neurosecretory system of tail. It has been placed under the category of “Diffused NE systems (DNES)”. The cell of the system fits totally in the concept of paraneurons and constitutes the peripheral division of APUD series. Present investigation has been undertaken on certain unexplored teleosts such as *Barilius barna* (carp), *Botia lohachata* (loach) and *Tetradon cutcutia* (puffer fish) in order to study the structural organization of this system. The histological investigations undertaken on these fishes using neurosecretion specific staining technique has revealed presence of a full-fledged neurosecretory system in the gill region of these fishes with a site of secretion – the cell perikarya, means of transport- the axon processes and multiple neurohaemal contact sites for the release of bioactive substances in the blood circulation. A definite neurohaemal organ similar to neurohypophysis of brain or urohypophysis of tail is lacking in the system. Although, experimental investigations undertaken on catfishes has revealed the role of this system in the condition of hypoxia, more in-depth investigations are needed to understand the function of this system in the biology of these fishes and ecological significance, if any as these three teleost belong to different habitat.

190. Role of sulfur nutrition on biomass allocation pattern and oxidative damage in tomato seedling grown under Cr(VI) toxicity

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The results show that Cr(VI) at 25 μ M significantly reduced growth of tomato seedlings by inducing ROS-mediated oxidative damage. However, external supply of S at 1.5 mM (48 mg/L) maximally alleviated Cr(VI) induced oxidative damage and thus, better growth of tomato seedlings observed. The results also showed that various biosynthetic inhibitors as well as modulators of endogenous H₂S such as hydroxylamine (HA) and BSO, and hypotaurine (HT) reversed S-mediated alleviation of Cr(VI) toxicity while external addition of reduced glutathione (GSH) was able in reducing Cr(VI) mediated oxidative damage in tomato seedlings even in the presence of hydroxylamine (HA), hypotaurine (HT) and BSO. NaHS also alleviated Cr(VI) toxicity. These results clearly point out that H₂S signaling is involved in inducing glutathione biosynthesis which involved in S-mediated alleviation of Cr(VI) toxicity. Thus, GSH is appeared to play a crucial role in alleviation of Cr(VI) toxicity. These results are helpful in reducing Cr stress in vegetable crops by using appropriate concentration of S (48 mg/L).

191.To create entrepreneurship opportunities among the rural youth by imparting training to develop value added products of *Moringa oleifera*

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The Plant *Moringa oleifera* (*M. oleifera*) belongs to the family Moringaceae and is native to Indian subcontinent. Its various parts have been utilized since long as food and medicine. It is now cultivated in and around Allahabad for the purpose to utilize in nutritive product development. The Institute of Applied Sciences, Allahabad has prepared many value added products of Moringa leaves such as “Moringa leaves powder (MLP), Moringa biscuit and cookies, Moringa Amla Jelly and Moringa Guava Jelly under the project of DBT, GOI. Separately Guava and Amla jelly blended with varying concentration of Moringa leaves extracts (10 combinations) and varying concentration of sugar (10 combinations) were organoleptically tested to find the perfect combination. The combination of 8.5 g mix MLP with 85g sugar in the Moringa Red Guava Jelly and 8.5 g mix MLP with 112g sugar in Moringa Amla Jelly have shown best organoleptic scoring among the different combinations of MLP addition. And also a good combination was found with 8 g MLP when to added 100g ingredients of Biscuit. During these periods, more than 200 candidates have learnt the methodology of preparing Moringa Leaves Powder, Moringa Amla Jelly, Moringa Guava Jelly and Moringa Biscuit in the Institute. Now, these are to be commercialized as functional foods for creating employment for trained farmers, youth and especially women of the rural area to improve their socio-economic and health status. FSSAI No -22718604000014 has been taken from food and drug administration department, Allahabad for this purpose.

192. Innovative approach towards formulation of semisolid topical cream containing natural bioactive as antifungal and analgesic therapeutics

Rajesh Kumar

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Indian demography is heterogeneous and context-specific with different livelihood systems. One of the paths that could even play a part in resolving such problems as unemployment, social exclusion, pollution, the loss of social ties is application of innovative technologies in rural sector. The use of plants in treatment of burns, dermatophytes and infectious diseases is common in traditional medicine. The development of new antimicrobial as well as analgesic agents against resistant pathogens is increasing interest about synergistic effects. Therefore, the secondary metabolites in form of essential oil extracted from different parts of various medicinal plants using Clevenger’s apparatus were evaluated for antimicrobial antifungal activity. The results were depicted in form of MICs generated after observation and analysis through Elisa reader (Septramax-384 Plus). The bioactive therapeutics exhibited significant in-vitro antifungal activity against prevalent dermatophytes viz; *Trichophyton rubrum* and *Microsporum gypseum*. The preparation, observation and optimization of formulation was performed in Petroleum Jelly. The aforesaid formulation would be proven as cost effective, eco-friendly, commercial viable which will help the Indian rural society for simple innovative technologies in rural medicine.

193. Solar bottle bulb: Lighter of light for rural areas

Astha Srivastava and Rajesh Kumar

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In rural households of India, electricity scarcity in form of lightening is still insufficient. In these areas, maximum house living in dark condition and people face many problem without electricity and they cannot do proper work there. To solve this problem the study proposed an idea for lightening in villages through solar bottle bulb technology. Solar bottle bulb technology requires low cost materials and with the use of solar energy and reflection principle, project aims to illuminate the rural households in eco-friendly way. The technology initiates with the help of waste plastic bottles encircled by galvanized sheet (10 x 10) tightly fit near bottle' neck and prevent the air bubble formation in bulb, which are filled with water and liquid bleach (10%), they are then fixed to roofs reflecting light in daytime. It is followed by preparation of solar lights to be used at night time. A micro solar panel is added in the plastic bottle to store energy to illuminate at night time. The objective of aforesaid technology is to illuminate the poor communities of in rural areas. So, this project would be proven as rapid, cost effective, commercial viable which will help the Indian rural society towards sustainable rural development.

194. Study of migration phenomenon in village Salga (Dehradun)

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Population of Schedule tribes in India is 8.6% of the total population which consists of thousands of tribes. Due to rapid urbanization and industrialization, many tribes have gone extinct or they have lost their uniqueness. With the help of NGO HESCO (Himalayan Environment Studies and Conservation Organization), survey of Salga village of Chakrata Cantonment in Dehradun district of Garhwal region has been done. The study is the outcome of base line survey. In all these social issue the thrust area that the study realized to work is continuous increasing rate of migration. In spite of being rich in culture and having abundance of natural resources a substantial chunk of their population is migrating to plain areas for employment and better lifestyle. It is observed that the population is adaptable to technical changes and novel ideas of self-employment. The present study seeks to discuss the economic and infrastructure issues of the region and the ways through which migration could be contained.

195. Green roof vegetation

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Centre of Science and Society, Rural Technology and Development, IIDS, University of Allahabad, Allahabad-211002, U.P.

A green roof or living roof is a roof of a building that is partially or completely covered with vegetation and a growing medium, planted over a waterproofing membrane. It may also include additional layers such as a root barrier and drainage and irrigation systems. Green roofs also provide extensive environmental air quality benefits through the ability to absorb not only greenhouse gases such as carbon dioxide, but also pollutants and dust. Green roofs reduce the heat flux through the roof, and less energy for cooling or heating can lead to significant cost savings. Shading the outer surface of the building envelope has been shown to be more effective than internal insulation. In summer, the green roof protects the building from direct solar heat.

196.Green approach: Antibacterial efficacy of synthesized gold and silver nanoparticles using *Allium cepa* leaf extract

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Green synthesis is a promising nanotechnological tool for biomedical and nanotechnology. Present study was undertaken to examine, a rapid, extracellular and ecofriendly chemical reaction for the

synthesis of gold and silver nanoparticles with the help of leaves has been developed. This is the first report where *Allium cepa* leaf extract was found to be an appropriate plant source for the green synthesis. The silver and gold nanoparticles were characterized by UV-visible spectroscopy (Systonic 2203) that demonstrated a peak at 555 and 440 nm of gold and silver nanoparticles respectively. Scanning Electron Microscopy (SEM-Zeiss) and Transmission Electron Microscopy (TEM-FEI Tecnai G2 S-Twin) revealed that gold nanoparticles were observed as oval in shape with 298-310 nm in size while the size of the silver nanoparticles was measured 240-260 nm with spherical shape. Further, the antibacterial activity of synthesized silver and gold nanoparticles showed effective inhibitory activity against *Escherichia coli* (MTCC 1890) and *Staphylococcus aureus* (MTCC 7443).

197. A review exhibit medicinal efficacy of *Cinnamon*

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*Department of Zoology and Biotechnology, Govt. T. R. S. College, Rewa, M.P.; *Department of Biotechnology, A.P.S. University, Rewa, M.P.*

Cinnamon used as a customary herbal medicine and condiment for centuries, belongs to genus *Cinnamomum*. It is obtained from the inner bark of trees, then extracted and the woody parts removed. These plants have ability to fight microorganisms, so it is considered as natural antibiotic agents and contains large amounts of highly potent polyphenol antioxidants. Its phyto-constituents represent the antimicrobial effects (also stops tooth decay and diminish bad breath), anti-inflammatory, antioxidant, antitumor, cholesterol-lowering, cardiovascular, and immunomodulatory effects. The divergent parts of the plant possess the same assemblage of hydrocarbons in varying proportions, with primary constituents such as; eugenol (leaf), cinnamaldehyde (bark) one of the main active components of this plant, may help fight various kinds of infection and camphor (root) in it other constituent are cinnamyl alcohol, coumarin, phenolic acids, terpenes, carbohydrates, and tannins. Thus cinnamon provide an array of different oils with diverse attribute, each of which determines its' value to the different industries. This chemical variety, exhibited the wide-variety of medicinal benefits observed with cinnamon.

198. Assessment of antimicrobial activity of *Bridelia retusa* against human pathogenic microorganisms

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Bridelia retusa spring is one of the important medicinal plant have their extensive medicinal properties. Extracts of *Bridelia retusa* possess some chemical components which can act against both bacteria and fungi. This situation has forced scientists to search new antimicrobial agents in selected plants. This is a monoecious, deciduous plant belonging to family Euphorbiaceae. By this experiment, the authors observed that ethanolic extract is the most effective as compared to the extract of water. Fractionation of extract by chromatography and Antimicrobial susceptibility testing of individual fraction further suggests that not all the fractions are equally effective against microorganisms. Antimicrobial studies of each extracts (Ether, Benzene, chloroform, Ethanol and water) of *Bridelia retusa* are performed which includes various disease causing pathogenic fungi viz. *Aspergillus* sp., *Penicillium* sp., *Helminthosporium* sp., *Fusarium* sp., *Collectotrichum* sp., *Rhizoctonia* sp., *S. aureus*, *B. subtilis*, *E. coli*, *Salmonella typhi*, *Pseudomonas aeruginosa* and *K. pneumoniae*. In chromatographic separation module, the authors found that some fractions showed strong antibacterial and antifungal activity against selected pathogens. This experiment points out the presence of antimicrobial agent in selected medicinal plants.

199. Rural sanitation and its need for sustainable rural development

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The objective of this paper is to analyze the rural sanitation and its need for sustainable rural development, with a view to awareness, acceptance and performance of the rural people in the uses of rural sanitation. Rural sanitation figures prominently in the national agenda for governance. At present, the extent of sanitation coverage in India is around 16 percent of all rural households. This figure is one of the lowest in the world, at par with countries like Nigeria and Afghanistan and possibly lower than Bangladesh. India, one of the most densely populated subcontinents in the world, had the lowest sanitation coverage. In 1991, only about a tenth of the Indian rural population of about 627 million reported access to latrines (Census of India, 1991). By 2001, sanitation coverage in rural India had increased to about 36 per cent with 22 per cent in rural areas. The importance of rural sanitation cannot be ignored as it directly affects the quality of life of children and women in this country. In order to overcome these issues the strategies and approaches have been developed and implemented through various measures to make all people to avail the sanitation facilities to achieve the cent percent sanitation in the villages. It is therefore found that due to lack of awareness and regular follow-up activities, it is yet to be achieved for all people living in rural area.

200. Algal diversity in relation to water pollution of Gwalmagra pond, Chhatarpur (M.P.), India

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The paper is report of algal studies from Gwalmagra pond of Chhatarpur, Bundelkhand region of India. Total 43 species and 27 genera have been identified from Gwalmagra pond among these 18 species belonged to Chlorophyceae, 16 species to Cyanophyceae, 5 to Bacillariophyceae and 2 to Euglenophyceae. Qualitatively Chlorophyceae were dominant while quantitatively Cyanophyceae were abundant. The species of *Spirulina*, *Oscillatoria*, *Microcystis* and *Nostoc sp.* were dominant. The pond is indicative of highly eutrophic status due to luxuriant growth of Phytoplanktonic flora. Gwalmagra pond is Mesotrophic, increasing towards eutrophication in the presence of dominant Cyanophycean member in whole year such as *Microcystis aeruginosa*, *Oscillatoria limnosa*, *Spirulina sp.* and dominant Chlorophyceae member *Scenedesmus quadricula*, *Closterium elegans*, *Cosmarium sp.*, with *Nitzschia commulata*, *Navicula viridula* var. *rostellata* (Kützinger). The Gwalmagra pond is not only a culturally acclaimed sacred water body of North-East region of Bundelkhand, Chhatarpur, and Madhya Pradesh. Gwalmagra temple and pond has also a historical value. Considering the belief of the local people as well as the devotees, it has therefore, been suggested to reduce the deposition of domestic, cultural, religious and horticulture nutrients load in the pond water to avert any type of health hazards among the surrounding human population.

201. Raising of saplings under zero energy polyhouse- an effective way for mulberry leaf enrichment

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The practice of sericulture which essentially involves propagation of mulberry and subsequent raising of silk cocoons forms one of the vital components of agriculture with which 70% of rural population of our country is associated. Typically sericulture industry is agro-based avocation in

which cultivation of mulberry for production of quality and quantity leaf is the agricultural part whereas rearing of silkworms for cocoon production and post-cocoon technology constitutes the industrial part. India having the monopoly of producing all the four types of silks is the second largest producer of raw silk after China and the biggest consumer of raw silk and silk fabrics which suggests that there is a better prospect for imparting further fillip to the industry. In Kashmir, 760 villages are engaged with this industry, constituting 1.46 % of the total sericulture villages in India. There are about 25000 families associated with sericulture industry in the state contributing to the production of 10 lakh kg of cocoons. Silkworm being monophagous insect feeding only on the leaf of mulberry plant and as such economic and quality production of mulberry leaf assumes greater importance. Although mulberry can be practically grown on any type of soil, however the major constraint encountered under temperate conditions of Kashmir valley is mass multiplication of mulberry varieties under open conditions owing to their shy rooting behaviour and as a result farmers often face shortage of leaf during silkworm cropping season which in turn not only disinterests them but also affects the quality, productivity and economics of the activity. Large scale multiplication of mulberry and subsequent plantation of plants in the vicinity of rearing zones for quality leaf production was attempted at by College of Temperate Sericulture, Skuast-K, Mirgund. The plants raised through this technology are being supplied to Sericulture Development Department, J&K for distribution among stakeholders and other beneficiaries of the area for enrichment of mulberry plantation for the sustenance of the industry. The salient features of the technology are discussed.

202. Soil microbiome for environmental sustainability

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Soil is complex and dynamic biological system that provides diverse ecological niche for microorganisms and is a hotspot for belowground microbial interactions. The soil microorganisms play a vital role in the establishment with driving the plant- soil-water relations and nutrient turn over. Over the years scientists have studied a lot about the microbial mediated soil functions, biogeochemical cycling, enzyme activities and soil respiration etc., still it is difficult to identify the role of specific microbial species behind such processes. The major challenge is to link the soil microbial diversity to soil functions. It requires a deep understanding and characterization of the genetic, taxonomic and functional diversity of microbial community structure in the soil matrix. The advent of some conventional and next- generation sequencing technologies has provided the valuable and high-throughput method for culture-independent analysis of the soil microbiome. Cultivation-independent genomic approaches are more preferred for exploring the ecology and diversity of soil microbes due to the unculturable nature of soil microbes. Soil metagenomics has greatly advanced our knowledge about the complete characterization of new microorganisms, genes, gene products and whole community DNA sequence for microbial community analysis and comparisons from different microbial assemblages. Understanding how microbial communities are structured in the soil gives critical insights into their functions, diversity, speciation, inter and intraspecies interactions. The present work details the state-of-the art developments in soil microbiome studies and their sustainable utilization.

203. Bioassay guided screening of bioactive fractions of *Ficus religiosa*

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Herbs have the principle which acts like medicines. *Ficus religiosa* L. is commonly known as Peepal a medicinally important tree species belonging to the Moraceae family. All part of the *Ficus religiosa* are useful in traditional system. The plant was subjected to extraction and also fractionated with various solvent like hexane, chloroform, diethyl ether, ethyl acetate, n-butenol and water. The

Phytochemical test, DPPH and HPTLC reports showed the presence of various compound in different solvent fraction.

204. Crop diversity and associated biocultural practices in Mirzapur district, Uttar Pradesh

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Food production for feeding the rapidly growing human population is one of the major sustainability challenges in developing countries. However, food production under changing climatic conditions is real challenge and therefore food production based on resilient crops are, paramount important. However, latest studies has been proved that more than 75% of genetic diversity have been lost from farmer's field and therefore almost 60% of world food production solely depends on three major cops such as wheat, rice, maize In this backdrop, inventorization and sustainable management of agrobiodiversity including traditional and wild varieties are important for food security and dietary diversification and also for selecting resilient varieties for crop diversification program. Hence the present study was aimed to analyze agrobiodiversity with special reference to the diversity of traditional and wild crops and associated biocultural and traditional agronomic practices for food and nutritional security in Mirzapur district of Eastern Uttar Pradesh. Our study could able to identify emerging resource conserving cropping patterns from the Rajgarh block of the district. Moreover, the area is bestowed with different crop varieties and the authors could able to identify different varieties of vegetable crops such as brinjal (23), capsicum (14) tomato (13) bean (6) pigeonpea (3), pea (2) cauliflower (2) and garlic (2), bitter gourd (3), pointed gourd (3), and coriander (3) from the above site. Here, the authors propose suitable crop intensification models to maintain the agrobiodiversity in Mirzapur district.

205. Interaction studies of biofertilizers and different environmental stresses on legume plants

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Root-colonizing non-pathogenic microbes can expand plant registration from biotic and abiotic stretch variables. Bacterial immunize as biofertilizers can build the adequacy of phytoremediation. Immunizing plants with non-pathogenic microorganisms can give 'bio protection' against biotic stresses, and some root-colonizing microbes increase resistance against abiotic stresses, for example, drought, saltiness and metal toxicity. Deliberate distinguishing proof of bacterial strains giving cross-protection against various stressors would be profoundly profitable for horticultural generation in changing ecological conditions. For bacterial cross-protection to be a viable device, a superior comprehension of the fundamental morphological, physiological and sub-atomic components of bacterially interceded pressure resilience, and the wonder of cross-protection is basic. Valuable bacteria-mediated plant quality articulation ponders under non-stress conditions or amid pathogenic rhizobacteria-plant interactions are abundant, yet just couple of sub-atomic examinations on advantageous connections under abiotic stretch circumstances have been accounted for. Along these lines, the authors endeavor an outline of current information on physiological effects and methods of activity of bacterial moderation of abiotic stretch side effects in plants, where accessible, sub-atomic information will be given to help physiological or morphological perceptions. In addition, focus was given on roads to empower better utilization of cross-protection limits of root-colonizing non-pathogenic microbes in agricultural production framework influenced by climate change.

206. Seaweeds extract: Biostimulants in agriculture and horticulture crops

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Plants are capable to absorb nutrients from their foliar parts. This developed technique is named as foliar feeding. It is helpful for plant to absorb iron and zinc which is not possible by roots. Foliar feeding gives rapid results in improved plant health, prolonged blooming, reduced growth stress, tolerance for cold and heat. It makes plant resist disease and thus directly effects on crop yield. Foliar fertilizers are utilized more than ninety percent by the plants while when a similar amount is applied to the soil, only ten percent of it is utilized. Foliar nutrients are absorbed through stomata and epidermis, besides this transcuticular pores present between cell structures and stomata play a significant role in absorption of foliar nutrients. These pores are present on both surfaces of leaves and much more they remain open all the time and nutrients can also enter through these pores. Translocation of nutrients is carried out by apoplast or symplast mechanism. Apoplast movement is ion movement from cell-to-cell. Symplast is transport through the vascular channels. Phloem and xylem transport mechanisms are described for symplast transport. Nutrients are first absorbed from foliage thus they penetrate inside host tissue. Later nutrients move to other parts of the plant by the mechanism of translocation. The applications of seaweed extract (micro and macro algae) in agriculture crops and horticulture plants have proved to be beneficial. Such algal extracts are rich in phytohormones (gibberellins, auxins, cytokinins), amino acids and fatty acids, These biostimulants enhance plant vegetative growth characteristics, i.e. plant length, number of leaves/plant, leaf area, root and vegetative growth fresh weights resistance to environmental stress and pathogen damages. Much more application of seaweed extracts helps in decrease doses of inorganic fertilizers. Marine seaweeds the most widely used in agriculture due to their good biostimulant activity are red algae, e.g., *Corralina mediterranea*, *Jania rubens*, *Pterocladia pinnata*, green algae: *Cladophora dalmatica*, *Enteromorpha intestinalis*, *Ulva lactuca* and brown algae: *Ascophyllum nodosum*, *Ecklonia maxima*, *Saragassum* spp. The present article is based on the author's observation and results obtained by spraying such biostimulants on some agriculture crops like gram, wheat, and mustard. Increased vigor, flowering and fruiting was also observed guava, drum sticks, and some vegetables like pea, cauliflower, tomato, lady finger, cucumber, bottle gourd, bitter gourd.

207. Study of pollen viability for the development of genetic modified crop programs in some selected members of Solanaceae family

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Pollen viability is important for growers, breeders and development of genetic modified crops. Information on pollen viability is a pre-requisite for carrying out a meaningful crop improvement programme. The present investigation was carried out in the Department of Biological Science, M.G.C.G.V., Chitrakoot, Satna (M.P.). Five plants of Solanaceae family namely *Datura stramonium*, *Solanum xanthocarpum*, *Solanum nigrum*, *Withania somnifera* and *Capsicum annum* were used for study the pollen viability. Stain tests have advantages as indicator of pollen viability because they are faster and easier than pollen germination. Pollen viability was assessed by acetocarmine stain (2%). The percentage pollen viability ranged from 67% to 84%. The highest percentage pollen viability was recorded in *Datura stramonium* (84%), which revealed that this genus has highest reproductive power as well as power of division and the lowest percentage pollen viability was obtained in *Withania somnifera* (67%), revealed that this genus become scarcer and endangered. From the results it is concluded that information of pollen viability is an important for the study of reproductive biology and ensuring safer crosses performed to generate new hybrids and /or increase the fertility.

208. Biopesticide efficacy of *Cichorium intybus* and *Inula racemosa*: A potential alternative to chemical pesticide against *Aphis gossypii* Glover

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In the present investigation, alcoholic extract of ten indigenous naturally occurring asteraceous plant extracts viz., aerial parts of *Cichorium intybus* (L.), *Chromolaena odorata* Linn., *Chrysanthemum cinerariaefolium* (trev.) Vis., *Inula racemosa* Hook.F., *Mantisalca duriaeri* Birq. Et Cavill., *Rechardia tingitana* (L.) Roth, *Rhaponticum acaule* (L.) DC, *Scorzonera undulate* Vahl, *Spilanthes paniculata* Well ex DC and *Tagetes minuta* Linn. were prepared under the laboratory conditions. For testing the repellent effect the okra leaves were used as food against nymph and adults of *Aphis gossypii* Glover. After four hours of *A. gossypii* nymph and adults release, the data was collected on the number of nymph and adults of *A. gossypii* reached and repelled at each treated food. All the comparisons were made with control. It is evident from the results of repellent test against nymph and adults of *Aphis gossypii* Glover that all the asteraceous extractives showed a good repellent property, when compared with the control. The repellent properties was observed based on their minimum EC₅₀ values as: *C. intybus* (0.1359) > *I. racemosa* (0.1531) > *T. minuta* (0.1833) > *M. duriaeri* (0.3208) > *S. undulate* (0.4123) > *S. paniculata*, (0.6365) > *R. acaule* (0.6469) > *R. tingitana* (0.7124) > *C. odorata* (0.9025), respectively. The relative EC₅₀ values of the above extracts are in descending order, 6.6409 > 5.8948 > 4.9236 > 2.8132 > 1.4179 > 1.3951 > 1.2668 > 1.2161 > 1.1668 > 1.0000 times as repellents, whereas *S. paniculata* is taken as a unit. *C. intybus* and *Inula racemosa* aerial parts extract significantly reduced the population and damage caused by the major insect pests of okra recorded at Kanpur, India, as compared to the untreated control.

209. In vitro antioxidant activity and total polyphenolic content in Fabaceae family plants

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Medicinal plants have played an essential role in the development of human culture. Plants are a very useful source of various bioactive compounds which have direct or indirect effects on human ailments. In the present work three plants of family Fabaceae (*Butea monosperma*, *Tamrindus indica* and *Pongamia pinnata*) have been studied for their antioxidant and T.P.C activity. The activities were estimated by DPPH (2, 2-diphenyl-1-picrylhydrazyl radical) and Folin-Ciocalteu assay methods respectively.

210. Assessment of ozone sensitivity of two grassland species under elevated ozone exposure at Indo-Gangetic plain, India

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Tropospheric ozone (O₃), a potent phytotoxic secondary air pollutant is a major issue related to ecosystem structure and function. Most of the studies related to negative effects of O₃ are concerned with crop plants, but only few studies have been performed on wild plants. Therefore, the present study was conducted to assess the sensitivity of two grassland species (*Ischaemum rugosum* Salisb., a grass and *Malvestrum coromandelianum* Linn., a forb), under futuristic elevated (non-filtered ambient + 20 ppb; NFA⁺) O₃ concentration as compared to non-filtered ambient (NFA; 48.7 ppb, 8 h mean) in mix-culture using open top chambers. Plants were assessed for physiological and growth parameters. The photosynthetic pigments, photosynthetic rate, apparent quantum yield, rubisco carboxylation rate, maximum rate of PEP carboxylation, RuBP regeneration limited photosynthesis, total electron transport rate, triose phosphate use, number of leaves, leaf area and biomass accumulation were decreased, while light compensation point was increased in both the species under NFA⁺ compared to NFA. The stomatal conductance was increased in *M. coromandelianum*, while no change was observed in *I. rugosum* under NFA⁺ compared to NFA. *I. rugosum* showed lower magnitude of reduction in total biomass. The present study concludes that forb species was relatively more sensitive compared to grass under futuristic elevated O₃ concentrations.

211. Pharmacognostic study and preliminary phytochemical investigation of root of Karpasa (*Gossypium herbaceum* Lin.)

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WHO (World Health Organization) has reported about 21000 plant species used for medicinal purpose in all over the world, where about 2500 plant species are being used in indigenous system of medicine. Karpasa (*Gossypium herbaceum* Lin.) family Malvaceae is an annual or perennial shrub. It is cultivated in India as a dry land crop in most parts of India including entire Deccan plateau and Gujarat for its cotton fibres. It is known with different names in different languages, Kapasa, Binaula (Hindi); Karpasa, Tula (Assam); Cotton plant (Bengali); Bona, Kapasia (English) and Pambadana, Habb-ul-qutn (Urdu). Karpasa plant is 1.5 to 3 meter tall, leaves simple, petiolate, alternate, lamina ovate. Flowers- axillary, solitary on long erect pedicels bending back in fruiting. Fruit an ovoid, acute 3-5 valved capsule, seeds upto 8 in each carpel, ovoid- subrotund with dull white cotton overlying a grayish, firmly adherent velvety coat. Its root, bark, flowers and seeds are used to treat various ailments like Daha, Srama, Bhranti, Murccha, Stanyaksya and also used to preparation of ayurvedic compound formulation Karpasasthi taila. It contains yellow colour contents, (cidral) 8%, Gossypol Dihydroxybenzoic acid, Salicylic acid, Betaine, Ceryl alcohol, Phytosterol. Despite the numerous medicinal uses attributed to this plant, there are no systematic pharmacognostical studies on the root of this plant have so far been carried out. Hence, the present work deals with the morphological, anatomical evaluation, physicochemical tests, preliminary phytochemical screening and High Performance Thin Layer Chromatography (HPTLC) fingerprint profile of *Gossypium herbaceum* Lin.) which could serve as a valuable source of information and provide suitable standards for further identification of this plant.

212. Role of blue green algae (Cyanobacteria), in rice productivity

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Paddy (*Oryza sativa* Linn.) is a genus of perennial grass belonging to family Poaceae that originated in India, southern China and Thailand, was domesticated and diversified in ancient times, and is now cultivated in wet tropical, semi-tropical, and warm temperate areas around the world for the production of its cereal grain. It is commonly known Chaval or Dhan in Hindi, Rice and Paddy in English, Dhanya, Vrihi, Nivara in Sanskrit and Sali in Bengali. *Oryza sativa*, is the world's the most widely cultivated crop species, serving as the staple for more than half of the world's population. Rice (*Oryza sativa* L.) is one of the first leading ancient (3,000B.C.) cultivated crops of the world. Now the food habit of global people is changing rapidly and cultivation of rice is also increasing tremendously through the world. In terms of area 55% of the total cultivated land is under rice cultivation. It is the main cereal crop of India. Farmers are using chemical fertilizers for rice productivity.

213. Phytochemical analysis of *Gossypium herbaceum* root and seed

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Gossypium herbaceum (L.) is also known as Karpas or Cotton. It belongs to the family *Malvaceae*. Traditionally, it is widely being used from antiquity in the treatment of inadequate lactation, bronchial asthma, dysmenorrhea, diarrhea, dysentery, otalgia, sexual debility, general weakness, diabetes, lung and skin diseases. It chiefly possesses antifertility, galactagogue, anti-spermatogenic, antidiabetic, antiviral and antibacterial activity. In this work, the dried powders of *Gossypium herbaceum* root and seed (100 g) were placed in the thimble of Soxhlet apparatus. 500

ml of distilled water was used as a solvent. The extract was concentrated using Rotavapor. Then the extract was dried in a digital water bath till a dried residue of extracts was obtained. The percentage yield was 8% w/w. The test sample was subjected to phytochemical analysis in order to find out the presence of phytochemical constituents. The phytochemical tests were performed for alkaloids, carbohydrate, glycosides, saponins, phenol, flavonoids, protein, terpenoids, and tannins. The results show that both root and seed contain glycosides, whereas protein is absent in both the parts. Interestingly, saponins and terpenoids are also present in both root and seed, whereas alkaloids are present only in seed. Also, carbohydrate, phenol flavonoids and tannin are present only in roots. Accordingly, it may be concluded that *Gossypium herbaceum* (L.) root and seed can be used as potential sources of respective aforementioned phytochemicals from its corresponding parts.

214. Reforestation of Shankargarh forest area of Prayagraj: A seedling conservation approach

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In the Prayagraj district of Uttar Pradesh, Shankargarh is a town and Nagar Panchayat known for its silica mining. Its geographical coordinates falls between 25° 11' 0" North, 81° 37' 0" East. The local population is majorly involved in mining activities and stone quarrying due to unavailability of employment and infertile land. Silica mining had brought various environmental changes to that area. This area is a part of the Vindhyan region where biodiversity has always been rich with medicinal plants but presently due to the mining of silica sand the area is now on the brink of destruction. For the conservation of this affected area, reforestation through seedling conservation can play a key role. In this order the present study carried out, the seeds and seedlings of some forest tree species have been collected from Vindhyan forest belonging to families Anacardiaceae, Apocynaceae, Bixaceae, Capparaceae, Combretaceae, Ebenaceae, Fabaceae, Lecythidaceae, Loganiaceae, Malvaceae, Meliaceae, Myrtaceae, Oleaceae, Putranjivaceae, Rhamnaceae, Rutaceae, Sapindaceae, Sapotaceae, Simaroubaceae, and Ulmaceae. Seedlings were identified on the basis of their cotyledonary leaves, mature leaves, hypocotyls and radicals. This study emphasizes the importance of seedling morphology in the taxonomic identification and conservation of forest plant species of Shankargarh areas of Prayagraj. Phytosociology, sibling rivalry, parent-offspring conflict in plants, the effect of alien species on the germination and seedling growth of plants has also been determined.

215. Medicinal important of *Ficus benghalensis*: A review

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Ficus benghalensis plant is an ever green plant of family Moraceae having many chemicals compounds present in this plant. This tree is commonly called as banyan tree and is considered to be sacred in many places. it has several vernacular name including bawt, jatala, nyagrodha, rohina, avrohi, vitapi, rakatphala, skandaruha. The tree is commonly found all over India from sea level to an elevation of about 3,000 ft. In traditional system of medicine various plant parts such as stem, bark, and root bark aerial roots, vegetative buds, leaves, fruits and latex are used in dysentery, diarrhea, diabetes leucorrhoea, menorrhagia, nervous disorders, tonic and astringent. Leaves of *Ficus benghalensis* contain Flavonols, responsible for the antioxidant effects of the plant. The bark of the plant is used in ayurvedic medicine for the treatment of diabetes.

216. Knowledge systems for sustainable development

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The challenge of meeting human development needs while protecting the earth's life support systems confronts scientists, technologists, policy makers, and communities from local to global levels. Many believe that science and technology (S&T) must play a more central role in sustainable development, yet little systematic scholarship exists on how to create institutions that effectively harness S&T for sustainability. This study suggests that efforts to mobilize S&T for sustainability are more likely to be effective when they manage boundaries between knowledge and action in ways that simultaneously enhance the salience, credibility, and legitimacy of the information they produce. Effective systems apply a variety of institutional mechanisms that facilitate communication, translation and mediation across boundaries.

217. Analysis of the energy access improvement and its socio-economic impacts in rural areas of developing countries

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Access to modern energy is one of the most basic requirements for development. In rural areas of developing countries, there are a large number of people who do not have access to LPG and depend on traditional biomass such as wood, crop, and dung for cooking. In addition, energy has numerous and complex links with poverty reduction. Therefore, it is important to estimate the impacts of energy access improvement on socio-economic situation in the rural areas of developing countries quantitatively. This study focuses on socio-economic impacts of cooking demand through changes in stoves adopted by the rural households. The authors have developed an energy-economic model of rural areas in India to analyze the links between energy, income, and health hazard, applying both opportunity cost for using fuelwood and exposure to Respirable Suspended Particulate Matter (RSPM). As a result of the analysis, there is a positive relation between the opportunity cost and the average RSPM exposure of women in the rural areas. Following to increase in the opportunity cost, that is, income, the cost of an improved wood stove becomes relatively lower first than that of a traditional wood stove, and then a gas stove attains price competitiveness. It is achieved that the average RSPM exposure is below the WHO and Japanese criteria for Suspended Particulate Matter (SPM), 190 and 100] $\mu\text{g}/\text{m}^3$, at the opportunity cost of US\$10 and 16/GJ, respectively.

218. Sustainable development of agricultural systems: Competing objectives and critical limits

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The sustainability of agricultural systems has become a major focus for debates about future human survival. Much of the argument appears to rely on simplistic interpretation of ecological models, and fails adequately to define what sustainability objectives are being sought. The authors explore the implications of two alternative approaches to agricultural sustainability: The critical limits view which would require future farming systems to accept the ecosystem-imposed limits on the number of people in the world and the lifestyle they can enjoy; and the competing objectives view would balance agricultural sustainability with economic viability, reduction of environmental harm and fulfilling public demands for food and landscape benefits. The development of farming systems of the future will depend on which of these views is adopted by planners and policy makers. This paper challenges some of the ecological assumptions underlying the critical limits approach and questions the conventional view that extensive farming systems are more sustainable agriculturally than intensive systems.

219. Therapeutic potential of geraniol for environmental risk management against *Malassezia* sp. and their target validation over Mala s 1 a novel allergen using molecular modeling

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Pytriasis versicolor (PV) is a chronic condition resulting in scaly hypo-or hyperpigmented lesions. *Malassezia* commensal yeasts along with multitude of antigens have been found to be the etiological agent of PV. Amongst them, Mala s1, a 37 kDa protein has been proved to be a major allergen reacting with a large panel of sera in disease pathophysiology. The current work investigates the anti-*Malassezia* activity of geraniol. Geraniol is a commercially important terpene alcohol occurring in the essential oils of lemongrass (*Cymbopogon flexuosus*) has been tested against *Malassezia* sp through broth microdilution assay. The spectrophotometric analysis revealed efficient MICs against all test pathogens. Docking simulations ascertain active binding sites on Mala s 1, a potent allergen found on the yeast cell surface that could be targeted for therapeutic measures in disease pathophysiology. Additionally, geraniol downregulated Mala s 1 gene expression profile as evidenced by qRT-PCR. Our findings indicate promising application of geraniol against *Malassezia* and establishing Mala s 1 as a key regulator of disease pathogenesis.

220. Targeted brain imaging agents for Serotonin-1a/7receptors in normal and treated environments

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The pathological processes of depression, anxiety and stress (DAS) are yet understood incompletely, mostly owing to their parallel behavioural and physiological symptoms. This is evident from the continuously growing development of DAS targeted diagnostic and therapeutic radiopharmaceuticals. Most of the medications that are administered to treat these diseases are the antagonists of serotonin receptors: 5-HT_{1A} and 5-HT₇. Therefore mapping these receptors under normal and pathological conditions can be utilized to track quantitative and functional aspects of such neurological disorders. Thus, with an objective of improving quality of life, two new and economically viable PET/SPECT based diagnostic agents: [¹¹CH₃]-BTZ-MPP and [^{99m}Tc]-DTC-BTZ-MPP, have been developed. The specificity and selectivity of synthesized radio ligands were evaluated using *in silico*, *in vitro* followed by pre-clinical evaluations. [¹¹CH₃]-BTZ-MPP showed highest initial brain uptake of 11.95±0.4 % ID/g and 13.37±1.2 % ID/g at 15 min p.i. in normal and treated mice, while under similar conditions, 1.38±0.01 % ID/g and 2.06±0.01 % ID/g at 15 min p.i. were achieved for [^{99m}Tc]-DTC-BTZ-MPP respectively. Significant radioactivity accumulation in 5-HT_{1A}/5-HT₇ receptors rich regions of brain *viz.* hippocampus and cortex ascertained high affinity of newly synthesized radio ligands. The route of excretion was hepatobiliary as observed from major activity uptake in lungs and liver.

221. Recent trends of microremediation technologies for contaminated soil and aquatic environment

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Pesticides and Heavy metal pollution is nowadays one of the most important environmental concerns. Heavy metals are natural constituents of the environment, but indiscriminate use for human purposes has altered their biochemical balance and geochemical cycles. Anthropogenic activities like pesticides, agricultural fertilizer, electroplating, metalliferous mining and smelting, waste disposal and industry discharge a variety of metals such as Cd, Cr, Pb, Cu, Zn, Ni, Hg, Co, As, Pd, Th, Ag, Au, Rd, Pt, Sn, and U, which can produce harmful effects on soil, water and

environmental health. Remediation of contamination through the microorganisms and its application of microbial metabolic potential are accepted as an environmentally and economical measure for decontamination of polluted environments. Remediation works carried out by the microorganisms are called 'micro-remediation'. The abilities of microorganisms in terms of tolerance and degradation of pesticides and heavy metals. Microremediation is a newly developed emerging technology for cleaning up contaminated sites, which is cost effective, ecofriendly and has aesthetic advantages and long term applicability. Nowadays, microbial systems are employed in remediation programs, generally in the treatment of soils and waters contaminated with organic pollutants. There are instances where natural populations are not suitable for use in the remediation of polluted sites and therefore the utilization of genetically engineered microorganisms (GEMs) is being considered for in-situ microremediation of contaminated ecosystems.

222. Microbial diversity: Microbiological and industrial perspectives

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Microbial diversity is a critical environmental topic that concerns people from all walks of life. Increasing attention is being drawn to microorganisms because the fertility of soil depends not only on its chemical composition, but also on the qualitative and quantitative nature of microorganisms inhabiting it. Maintenance of viable, diverse populations and functioning microbial communities in the soil is essential for sustainable agriculture. All the living individuals of a species contain a distinct combination of genes and the intrinsic interaction among the gene pool influences evolution, survival and genotypic/ phenotypic changes of the part of the biodiversity i.e. community. Biodiversity is an addition sum of the studies on genetic, taxonomic commercial and ecosystem aspects of living systems. The amount of genetic diversity within population varies tremendously and much of modern conservation biology is concerned with the maintenance of genetic diversity within the population of plants, animals and microorganisms. Germplasm, obtained with the vast biodiversity, provides a major source of biological material for the development of pharmaceutical products, medicines, vaccines, improved animal and crop varieties and for other environmental applications. Most of industrialized countries, who have the resources and technology to patent and develop commercial biological products, are having the benefits of biodiversity through the collected and conserved germplasm flowing through the international research centers. The principle of patenting genes is the morally or ethically correct is a matter of intense debate. However, geneticists, having conceived of the technologies with vast and immediate therapeutic, food and environmental values must try to bring to the material to market as soon as possible.

223. Production, purification and characterization of an efficient α -galactosidase from *Aspergillus parasiticus* MTCC-2796

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Aspergillus parasiticus microbial type culture collection (MTCC)-2796, a new source of α -galactosidase is an efficient producer of enzyme in basic medium under submerged fermentation conditions. Maximum α galactosidase production (156.25 Uml-1) was obtained when the basic medium is supplemented with galactose (0.5% w/v) and raffinose (0.5% w/v) as carbon source and yeast extract as nitrogen source. Enzyme production was also enhanced considerably in the presence of wheat bran (1.0% w/v). Enzyme secretion was strongly inhibited by the presence of Hg^{2+} , Cu^{2+} , and Co^{2+} in the medium and to some extent by Zn^{2+} and Ni^{+} , while marginal increase in the enzyme production was observed when Mg^{2+} and Mn^{2+} were added in the medium. Among amino acids checked (apargine, cysteine, glutamine, leucine and proline), glutamine (1 mM) was found to be an enhancer for the enzyme production. The temperature and pH range for the production of enzyme were 25 to 35°C and 6.5 to 7.5, respectively with maximum activity (50 U ml⁻¹) at 30 °C and pH 6.5

under static fermentation condition. Thermo stable alpha-galactosidase from *Aspergillus parasiticus* MTCC-2796 was purified 16.59-fold by precipitation with acetone, followed by sequential column chromatography with DEAE Sephadex A-50 and Sephadex G-100. The purified enzyme was homogeneous on sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE). It was found to be a monomeric protein with a molecular weight of about 67.5kDa. The purified enzyme showed optimum activity against onitrophenyl--d-galactopyranoside (oNPG) at pH 5.0 and a temperature of 50 °C. The enzyme was thermo stable, showing complete activity even after heating at 65°C for 30min. The enzyme showed strict substrate specificity for galactosides and hydrolyzed oNPG ($K_m = 0.83$ mM), melibiose ($K_m = 2.48$ mM) and raffinose ($K_m = 5.83$ mM). Among metal ions and reagents tested, Ca^{2+} and K^+ enhanced the enzymatic activity, but Mg^{2+} , Mn^{2+} , ethylene diamine tetra acetic acid (EDTA) and 2-mercaptoethanol showed no effect, while Ag^+ , Hg^{2+} and Co^{2+} strongly inhibited the activity of the enzyme. The enzyme catalyzed the transglycosylation reaction for the synthesis of melibiose.

224. Some behavioural study of rhesus monkey in Satna district of M.P.

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Rhesus monkey is one of the more aggressive macaques. The social interaction, grooming, play behaviour, feeding behaviour and reproductive behaviour are the common features of the rhesus monkeys. In villages and provisioned areas rhesus frequently come in contact with human beings. Rhesus troops are also live with hanuman langurs (*Presbytis entellus*) in hill and provisioned area of Babupur and Kardmeshwer dham of Satna district of M.P. during feeding behavior. A number of domestic animals *i.e.* cow, goat, buffalo, dog, pig etc. are also associated with habitat of rhesus monkeys around Babupur Kaniyari and Kardmeshwer dham. Grooming is the common behaviour of primates. Self-grooming and mutual grooming in monkeys were observed in all sex and age. Reproductive behaviour was considerably bearing on social life. The adult rhesus is sexually receptive approximately at 3.5 years old. Play behaviour of juvenile and sub adult rhesus monkeys was also observed during present study.

225. Fish diversity of Wainganga river at Balaghat, M.P.

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During last decades, these fish diversity of the country is eroding due to natural and anthropogenic stresses and human activities. In the present ichthyofaunal study, a total of 61 fish species belonging to 17 families, 7 orders and 29 genera were recorded during December 2015 to November 2017 from the Waingangā River at Balaghat of Madhya Pradesh. On the basis of percentage composition and species richness, order Cypriniformes was dominant (29 species) followed by Siluriformes (17 species), Perciformes (7 species), Synbranchiformes (4 species), Clupeiformes, Beloniformes and Osteoglossiformes (1 species each). Observation of fishes from commercial catches and those marketed indicate their wide distribution and availability in good number in Waingangā River.

226. Diversity of blue green algae in rice fields of Satna district of Madhya Pradesh

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The paper deals with exploration of blue green algae have been done from Satna district, which is one of the most primitive group of living organisms. The present study deals with the diversity of blue green algae or Cyanobacteria in rice fields of Nagod and Amarpatan tahsil of Satna District. These blue green algae found here provide a boost to rice production. Twenty nine species of blue

green algae are identified in different localities of Nagod and Amarpatan tahsil of Satna District. Out of these *Anabaena*, *Aphanocapsa*, *Coloeocapsa*, *Lyngbya*, *Nostoc*, *Oscillatoria*, *Pharmidium*, *Spirulina* etc. are the major species of blue green algae. These results indicated that high amount of dissolved solids, chloride, organic nitrogen favored the better growth of algae.

227. Sociobiology and conservation of hanuman langur in city and temple area of Chitrakoot Madhya Pradesh

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Hanuman langur (*Semnopithicus entellus*) and Rhesus macaque (*Macaca mulatta*) non-human primate found abundantly in different city and temple area of Madhya Pradesh. With the expansion of human settlements and consequent decline of the habitats most monkeys of the country have compelled to become ecological refugees, it is also true for Rhesus macaque and Hanuman langur. Hanuman langur has a variable social organization, in Chitrakoot bisexual and all male bands group are present in different locations of Chitrakoot. Bisexual troops are matrilineal groups of adults and subadult female, juveniles and infants with one adult male or more than one adult male (multimale bisexual troops). Chitrakoot hanuman langurs breed round the year. This inordinate increase in urban monkeys in the recent years has led to an unhealthy competition for space and food between man and monkeys. For this purpose noise scaring, trained dogs, sterilization and translocation methods can be used to minimize the conflict between man-monkeys. The conservation and management can become effective only with the cooperation of local people. The present paper suggests recommendations to improve the present situation of Hanuman langurs, their eco-behavioral and conservation in different location of Chitrakoot, Madhya Pradesh.

228. Scientific evaluation of wild Bilva *Aegle marmelos* (Linn) Corr. root bark

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In Indian tradition, medicinal plants are recognized as a parcel of Nature goddess. *Bilva* (*Aegle marmelos*, Linn.) is one of the most famous plants that is referred in Vedic literature, epics, *puranas*, and *Ayurvedic* texts of ancient India. This is a well-known plant for its medicinal values and close to spiritual leaders for its aromatic smell and wide uses to maintain health and happiness. It was only due to its medical and spiritual importance that *Bilva* became one of the most sacred trees for those believing in Indian Tradition. The word *Bilva* is derived from 'bil' to split. Yaska derived this word from *bhr* 'to support' or 'to nourish', or from *bhid* 'to split'. Showing importance of *Bilva*, *Atharvaveda* says, "*Mahan vai bhadro bilvo*" i.e. A man doing good to all is great and benevolent like *Bilva* tree. The present study was designed to scientific evaluation of *Bilva* root bark. The study includes macro and microscopic characters, powder microscopic characteristics, High Performance Thin Layer Chromatography (HPTLC) fingerprints preliminary phytochemical screening and physicochemical parameters. The information generated by this particulars study provides relevant pharmacognostical and physicochemical data needed for proper identification and authentication of wild *Bilva* root bark.

229. Application of science and technology in rural areas to early detection of viral diseases on soybean

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Soybean is the main food crop and an important economical crop of the world. Proper disease control measures must be undertaken to minimize losses. Different techniques of machine vision and image processing were applied mostly to detect diseases on soybean in recent years. Soybean growing countries face the challenge of improving living standards of rural people for economical production. Soybean continuously affected by viral infections which also affected rural farmers. These conditions cause economical losses. There are several interventions for development and one such potential instrument is the “Application of science and different technology in rural areas. This is used to transform information to rural areas towards development for sustainable and profitable production. It is evident that science and different technologies such as ELISA (Enzyme Linked Immunosorbent Assay), DAS ELISA (Double antibody sandwich ELISA) and RT-PCR (Reverse Transcriptase Polymerase chain reaction) has to be detecting diseases in early stage to protect yield loss of rural sector.

230. A comparative study of chemical qualities of raw milk of cow buffalo

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A comparative study of chemical qualities of raw milk of cow and buffalo was conducted at Chitrakoot- Satna (M.P.) the objective was to find out the comparison between chemical quality of cow and buffalo's and cow for three animal each viz; cow and buffalo for ten days as replication different parameter were subject to statistical analysis applying the technique of analysis of variance (f-test) the most widely used method for determining protein content by Kjeldahl method for nitrogen determination since nitrogen is a characteristic element in protein by its accurate determination protein characteristic can be find. All the animal showed considerable variation regarding the principal components in milk. In earlier studies buffalo milk showed advantage compared to cow's milk regard to milk components in view of the finding and results presented above, in February to March be concluded that the chemical quality of milk of buffalo was superior to cow milk.

231. Contribution of university of Allahabad towards design and innovation in rural technology

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After getting successful clearance from different statutory bodies of University of Allahabad, University has started M.Sc. in Rural Technology and Development in 2015. The course was also approved by University Grant Commission (UGC). Later on nomenclature was changed to Design and Innovation in Rural Technology. The details will be elaborated during the presentation.

232. Studies on the functional morphology of the wings of eco-friendly insect *Schizodactylus monstrosus* Drury (Orthoptera: Schizodactylidae): With special reference to adaptation

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Schizodactylus monstrosus an ecofriendly insect with its curled long wings is getting rare in India. It is commonly called as Sand cricket or Dune Cricket of the family Schizodactylidae. The family is represented by 16 species in two genera: *Comicus* and *Schizodactylus*. The latter genus alone occurs in India and is represented by three species: *S. monstrosus* in Rajasthan, U.P., Agra, *S. minor* in Gangetic plane and *S. tuberculatus* in North-East India. They are nocturnal animals who live in burrows. Their burrows near the sandy areas of the river Yamuna where farmers grow their crops also help in to increase soil aeration, soil porosity and improve the structure of the soil. They feed on beetles, termites who cause great loss to the crop. Their feces and excreta form humus, and where they feed, they transform the organic litter in soil into simpler particles that are easily decomposed.

All these activities contribute to soil fertility. Morphologically it is a very interesting insect with its long antenna, curled long wings and splay footed legs. Their wings show considerable modifications to suit its burrowing mode of life. They provide protective covering to the body and appear to be more a protective organ rather an organ of flight. The forewings known as tegmina cover the hind wing underneath and also the dorsal and lateral areas of the body. They also prevent the choking of the spiracles by sand particles and function as a protective cover for the whole body. They are not a very good distant flier, but like powerfully flying insects the wings are most adapted for the stresses and aerodynamics of flight. The veins are thicker, stronger and closer together toward the front edge and thinner yet flexible toward the rear edge. This makes the insect wing an excellently constructed airfoil, capable of exerting both propulsion and lift while minimizing drag.

233. Assessment of ground water quality in Nagar Panchayat Chitrakoot, district Satna M.P.

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Water represents the basic element of supporting life and the natural environment and is a vector for domestic and industrial pollution. Water quality is a major concern of developing countries, where existing conditions of water supply infrastructure is poor and financial resources for construction and maintenance of infrastructure are inadequate. Water has a great role to play in socio-economic development of human population. Much of ill health that affects humanity can be traced to lack of safe and wholesome water supply. Therefore, the present study was carried out in Nagar Panchayat, Chitrakoot. The study was aimed to examine various physico-chemical and biological quality as it is related to public health. The parameter investigated were pH, EC, TDS, DO, BOD, Hardness and total coliform etc. and results were compared with WHO and IS standard. It was observed that few ground water samples were in acceptable limit while few were found unfit for drinking propose and needs proper disinfection or treatment before consumption.

234. *Nerium oleander*: Its application in pharmacological aspects

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The traditional knowledge of plant based medicine has transferred from generations to generations orally. India is the spanning bed of traditional phytomedicinal system where Ayurveda was born out of the knowledge of traditional medicine. Today most of tribal and rural populations used primarily on these plants to cure some minor diseases. *N. oleander* is an evergreen ornamental shrub or small tree of Apocynaceae family. The long, pointed leaves are oblong and contain a prominent midrib. Large clusters of white, pink, or red flower appears at the end of the branches. *N. oleander* is one such an important plant which is famed for its medicinal and therapeutic efficiency in most of several diseases globally. In the present time, most of pharmaceutical companies are focused more toward the plant based traditional medicines to avoid the side-effects and resistance against synthetic drugs, *N. oleander* has proved its efficiency in different diseases. It is used traditionally to treat dermatitis, abscesses, eczema, warts, corns, ringworm, scabies, herpes, skin cancer, asthma, dysmenorrhea, epilepsy, malaria, abortifacients, emetics, heart trouble, and tumor. This plant species also produce secondary metabolites (steroids, flavonoids and alkaloids) having pharmacological applications. The important pharmacological activities are antibacterial, antifungal, anticancer, anti-inflammatory, antioxidant, immune potential and anti-pyretic.

235. Prenatal exposure to pregabalin induced neuronal apoptosis in the developing rat brain and long lasting effects on young rat offspring

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Drugs consumption during pregnancy cause adverse effect on fetus development. It is still unknown whether *in utero* exposure to pregabalin (PGB) may induce neurostructural and neurobehavioural changes in fetal brain. Therefore, the present study has been undertaken to evaluate the effect of prenatal administration to equivalent therapeutic doses of pregabalin (PGB) on neuro-architectural abnormalities, neurohistopathological changes, apoptotic neurodegeneration in fetal cortex, and its long-lasting imprint on behavioural impairment in young-adult offspring. Pregnant C-F rats were exposed to selected doses (41 mg, 82 mg and 123 mg/kg) of PGB, equivalent to human therapeutic doses, from gestation day 6 to 21 orally with control subjects. Half of the pregnant subjects of each group were sacrificed at gestation day 21 for histopathological, confocal and electron microscopic studies and rest of the dams were allowed to deliver naturally. Their pups were reared postnatally up to 56 days of age for neurobehavioral observations. In drugs exposed groups, there was a significant alteration in total and differential thickness of cortex associated with neuronal cells deficit and enhanced apoptotic neurodegeneration of fetal cortex region and increased anxiety-like behavior which indicating disturbed neurobehavioral pattern. The neurobiology of these changes is still to be established in rodent model.

236. Socio-economic scenario of rag pickers and their role in municipal solid waste management of city of Varanasi, India

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Rag pickers pick the reusable and recyclable waste from the road sides, dust bins and landfills and sell these to local scrap dealers to earn money to full fill their daily needs. Rag pickers are doing this in very unhygienic and hazardous condition. They always prone to being infected by infectious diseases, cuts, injuries, toxic fumes and accidents etc. Their socio economic scenario is also very bad. They don't have enough education, training and support to do anything else. This research work was carried out to assess the socio economic status of the rag pickers and their role in management of municipal solid waste of city of Varanasi, India. Research work was carried out by the help of a questionnaire survey, which contains the questions regarding age, sex, education, diseases, earning, addiction habits type and weight of waste collected, distance covered etc. these questions were asked to rag pickers, who were got selected from different places of the city. This is very necessary to understand and appreciate the role of rag pickers in the cleanliness and sanitation of our cities instead it rag pickers are very neglected and avoided part of our society.

237. Preliminary phyto-chemical investigation and HPTLC fingerprints profile of *Oroxylum indicum* (L) Vent (Fam.-Bignoniaceae)- leaf

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The progress of the medical world enables the discovery of modern medicine for the treatment of various diseases. Although there are increasing number of effective drugs, public are still interest with traditional herbal medicine. *Oroxylum indicum* (L) Vent (Family- Bignoniaceae) is a medicinally important plant found in India, Sri Lanka, China, Thailand, Philippines and Indonesia. It is also called Sonapatha for its properties. Sonapatha is a medium sized deciduous tree, up to 12 meter in height, branched at top, bark light brown, soft and often with numerous corky lenticels. It has been categorized as vulnerable medicinal plant by the government of India. In general, roots are used as astringent and for the treatment of tuberculosis. In India, roots are used in Ayurvedic preparation called "Dasamoola" *i.e.*, used as an astringent, anti-inflammatory, anti-helminthic, anti-bronchitic, antileucodermatic, anti-rheumatic, anti-anorexic and for treatment of leprosy and tuberculosis. *Oroxylum* root bark is the part used in Ayurvedic medicine, administered as an astringent, bitter tonic, stomachic, and anodyne. It is included in famous tonic formulations, such as

Chyawanprash. The plant is also used in Asian folk medicine for the treatment of abdominal tumors. It was also reported to possess anticancer properties. The seed extract exhibits antimicrobial, analgesic, anti-tussive and anti-inflammatory properties. The fruits are used in treating bronchitis, leucoderma, and helminthosis. Leaves are reported as prescribed medicine for snake bite. The uncontrolled collection and sale of large quantities of plant material from the forest leads to destruction of many forest plants due to its wide applications. Current study is aimed to study of preliminary phytochemical investigation and development of chemical fingerprints profile using HPTLC. This would help the standardization and quality control of this precious indigenous drug.

238. Ensuring year round cash regular inflow to farm families-role of AgERP (agriculture enterprise resource planning) the case of baby corn production

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The current farm sector crisis stems from the “Green Revolution Hangover” of late sixties, the advent of dwarfing genes in wheat and rice, mass production of chemical fertilizers, massive impetus to irrigation infrastructure development and provisioning of subsidies for everything thoughtfully found necessary to boost the food production on one hand applauded by all and sundry for addressing the erstwhile recurrent food famines, however proved counterproductive in long run. The ailing farm sector and over dependence of the rural masses on farming for mere sustenance led to current crisis, wherein the suicidal behaviour of the marginalized farmers is one aspect and total disenchantment of the rural youth in present day scenario is another extreme. The present government is poised to “Doubling the Farmers Income” by 2022 with techno – managerial inputs in the farm sector. The present paper provides a glimpse of what modern day technology can do, if applied thoughtfully to address the critical issues. The authors have portrayed the case in point and argues that AgERP (Agriculture Enterprise Resource Planning) if applied to farm management coupled with other off – the – shelf production technologies can not only ensure the higher returns but a more regular and trustworthy cash inflow in the farm family. The regular cash inflow in the farm family could attract and retain rural youth in agriculture with renewed vigour and enhanced interest. This further augments the current scenario favouring the downstream job creation to further expand the scope and ameliorate the farm sector GDP.

239. Distribution pattern of enzyme acetylcholinesterase in the pallial and subpallial nuclei of *Heteropneustes fossilis*

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Histochemical study of the teleostean brains is of utmost significance from neurochemical and anatomical point of view, since these areas are less demarcated among teleosts. Acetylcholinesterase is an effective marker of cholinergic and cholinceptive cells thereby giving these areas a wide scope of study. This enzyme belongs to hydrolase group of enzymes that splits neurotransmitter acetylcholine in to choline and acetate. In the present study a modified histochemical technique has been employed to localize acetylcholinesterase containing neurons among the pallial and subpallial nuclei of an Indian air breathing teleost, *Heteropneustes fossilis*. The enzyme exhibits a differential pattern of distribution among the pallial and subpallial nuclei. Medial and dorsolateral pallial nuclei showed intense reaction for enzyme, while ventral dorsolateral nucleus showed faint activity. Central pallial nucleus showed almost negative reaction for enzyme. Among the sub pallial nuclei, most of the nuclei including dorsal, ventral, and entopeduncular nuclei showed intense activity. In the light of earlier findings, these nuclei have been categorized in to cholinergic, noncholinergic and cholinceptive nuclei based on qualitative distribution pattern. A functional analysis of the diverse distribution pattern has also been done.

240. Observation of ecological factors on efficiency of *Endaphis aphidimyza* (Diptera: Cecidomyiidae)

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Endaphis aphidimyza Shivpuje and Raodev (1985) was first described in Maharashtra. It is an endoparasitoid gall midge of black aphid (*Uroleucon gobonis*) of Safflower (*Carthamus tinctorius* Linn). The experiment was conducted on Safflower crop PVNS-12 in the field of Agriculture farm house Mahatma Gandhi Chitrakoot Gramodaya Vishwavidyalay Chitrakoot Satna (M.P.) The purpose was to observe the ecological factors on the efficiency of *Endaphis aphidimyza*, *Zoophagous cecidomyiids* during the year 2007 to 2010 for three consecutive years. Three types of factors were under consideration namely fecundity, incubation period and larval period on the life cycle of *Endaphis aphidimyza*, effect of host density on the development of *Cecidomyiids*, effect of other natural enemies on the development of *Cecidomyiids*, effect of ecological factors on efficiency of *Cecidomyiids*, influence of the substrate on longevity and fecundity. Statistical analysis has revealed that a prolific and significant association was observed in case of humidity versus date of emergence, fully developed larva and days. At the same time the associations were negative and statistically significant while taking into consideration fully developed larva versus humidity and fully developed larva versus date of emergence. Lastly, date of egg laying versus date of hatching and date of egg laying versus days could exhibit negative association whereas the degree of association versus days association was prolific and statistically highly significant. Thus, as the temperature decreases, hatching of zoophagous cecidomyiids are delayed and vice-versa. Zoophagous appears to be ecofriendly organism.

241. The use of ISSR and RAPD markers for detection of genetic diversity in *Calotropis* spp.

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Calotropis is one of the most important medicinal plant since ancient period. It has been used in different countries for different medicinal purposes such as leprosy, ulcer, piles, anti-inflammatory agent, anti-microbial agent, now it has been proved that they have potential anti-cancerous activity. The polymerase chain reaction (PCR) is an outstanding concept which facilitates the development of various molecular techniques which are now playing important role in molecular marking such RAPD, SSR or microsatellite, inter simple sequence repeat polymorphic DNA (ISSR), sequence-tagged sites (STS) and random amplified microsatellite polymorphism (RAMP). In this study, the authors evaluate the level and organization of the genetic diversity and relationship among *Calotropis* spp found in various regions of India using RAPD and ISSR markers. To explore the medicinal importance there is a need for genetic profiling to optimize the utilization of these species. Also, the authors aim to report the usefulness of RAPD and ISSR for the assessment of genetic diversity and relationships among *Calotropis* spp. RAPD and ISSR molecular markers have been used in two *Calotropis* spp for detecting genetic diversity. RAPD has several advantages, such as simplicity of use, low cost, and the use of small amount of plant material. RAPDs were proved to be useful as genetic markers in case of inter-specific polymorphism, intra-specific polymorphism and RAPD markers have revealed extensive polymorphism between different genotypes of two *Calotropis* spp. *Calotropis procera*, *Calotropis gigantea* (white), and *Calotropis gigantea* (purple).

242. Innovative rearing technique of some edible fishes

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Increase in population globally leads to higher food demand which cannot fulfill by green vegetable and plants products. Thus there is a requirement of other food materials like fishes, meat etc. Fish farming is quite difficult and takes long duration (i.e. 180 -200 days). The present investigation was focused on new formulation of feeding material and decreasing the rearing time i.e. > 180 days and to make cultivation easy. The present study was carried out at village Keshavapur (Andawa), Block - Bahadurpur, Prayagraj, Allahabad during August 2017 to February 2018, fishes are Catla, Rohu, Mrigal, Common crab, etc. The feed material was provided with interval of 10 -15 days resulting in 20% less maturation time. The result showed that with the use of new feed formulation rearing time reduced significantly and fish farming business more profitable.

243. *In vitro* and *in vivo* anti-hyperglycemic potential of *Bougainvillea* leaves: An approach to reduce blood glucose level in diabetic condition.

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A diverse array of biologically active constituents synthesized by traditionally used medicinal plants, having anti-hyperglycemic characteristics. *Bougainvillea* species are employed by traditional healers for their anti-inflammatory and anti-diabetics properties. Inadequate secretion of insulin leads metabolic disorder/diabetic condition which results in elevated blood glucose level. Products which are originated by medicinal plants, act through two mechanism either insulinomimetic or as secretagogues. Ayurveda and other indigenous medicinal systems are mentioned to different plant preparations. The present study was undertaken to evaluate anti-diabetic activity of the hydro-methanolic *Bougainvillea* leaves extract by *in vitro* (α -amylase and α glucosidase inhibition methods) and *in vivo* methods (by alloxan induced diabetic rats). Metabolic disorders condition also generates verity of hazardous like ROS generation and Mycoses, which are responsible to damage cellular protection/properties. By present scenario, the authors also scrutinize to mitigation of complications of diabetes by selected sample such as *in vitro* free radical quenching activity (ABTS, DPPH, and Reducing Power), total antioxidant activity and antimycotic activity. Diabetes mellitus and its complications require multidisciplinary approach for the management. Our investigation point out to the mitigation effect of the *Bougainvillea* leave extract supported the traditional claim of the plant.

244. The productivity and recovery of sugarcane needs proper adoption of technologies

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Sugarcane is an important commercial crop in India-being the world's second largest sugarcane producer (18.6%), occupying about 3% of India's total cultivated area and contributing about 7.5% of the gross value of agricultural production in the country. India has the potential to increase its area under cultivation of sugarcane by dispersing to new areas under its cultivation arising due to climate change. Overall more than 50 million people depend on employment (direct/indirect) generated by 571 sugar industries and other factories using sugar. Sugarcane plays a pivotal role in the national economy by contributing 1.9 % to GDP. The trend of declining cane productivity and increasing cost of cultivation in recent years is of serious concern to the cane growers and mill owners. Cane yield is mainly decided by the stalk population and individual cane weight. Stalk population per unit area is decided by the planting density which in turn depends upon spacing and seed rate. However, sugarcane cultivation in India faces serious economic, environmental and social challenges. This paper deals the details of technologies for increasing the yield and quality of sugarcane along with welfare of consumers.

245. Approaches to sustainable livelihoods for the rural population of Rewa district of MP

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Rural development strategies through a commitment to sound development of rural people, supporting them to build upon their own strengths and realize their potential, while at the same time acknowledging the effects of policies and institutions, external shocks and trends. The aim is to do away with pre-conceptions about what exactly rural people are seeking and how they are most likely to achieve their goals, and to develop an accurate and dynamic picture of them in their environment. This provides the basis for identifying the constraints to livelihood development and poverty reduction. Such constraints can lie at local level or in the broader economic and policy environment. They may relate to the agricultural sector-long the focus of donor activity in rural areas-or they may be more to do with social conditions, health, education or rural infrastructure." In their recognition of the complexity of rural life, the new approaches open up a fresh agenda for external support. Agriculture is on the centre of rural development and rural women are on the centre of agriculture. Although they are main part as a major labour force at every stage of agricultural activity and undertake responsibilities such as domestic task and childcare, women do not profit from social and economic benefits proportionate to the responsibilities they have undertaken. Agrotourism is an alternative activity in the rural development process, which combines agriculture and tourism, improves natural resources, contributes the rural area socially and economically. Whether or not this support can be accurately targeted to reduce poverty depends upon a number of factors, not least the flexibility of development agencies and their partners. These organizations usually operate and allocate resources along sectoral lines; the new approaches stress the need to cross these lines and to be more flexible about sustainable rural development.

246. Study of various agricultural problems with suggested technological solutions

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Agriculture is the backbone of India. Growth of India depends largely on agriculture and agriculture related businesses Indian population is growing rapidly with a growth rate of about 1.2 percent per annum. We are going to be 1.5 billion by 2030. It is going to be very difficult task to feed such large population with current social and technological methods. In this paper we are going to discuss few of the critical problems we are facing in agriculture and will suggested technological solutions to those problems.

247. Effect of graphene and TiO₂ nanoparticles on yield and photosynthetic pigments of cowpea (*Vigna unguiculata* (L.) Walp.) exposed to ambient UV-A and UV-B condition

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The present study was aimed to explore the performance of graphene and TiO₂ nanoparticles with respect to yield and photosynthetic pigments of Cowpea (*Vigna unguiculata* (L.) Walp) treated with ambient UV-A and UV-B condition. The experiment was conducted on pots, during Zaid season. The UV-A and UV-B treated seeds were soaked in graphene nanoparticles (500 and 1000 ppm) and

TiO₂ nanoparticles (25 and 50 ppm). The results revealed that yield parameters varied significantly with respect to every treatment and varieties of cowpea. TiO₂ nanoparticles showed significant increase in the yield of plants which were adversely affected by UV-A and UV-B. However, increase of yield over control plant under UV-A treatment is observed only in Komal Kanak variety. Graphene nanoparticles showed similar results under UV-A but TiO₂ nanoparticles showed more promising results. Chlorophyll content was reduced for both varieties under UV treatment. The chlorophyll content showed an increase with graphene nanoparticles in Komal Kanak variety whereas TiO₂ nanoparticles showed increase for Kashi Kanchan variety for both UV-A and UV-B treated varieties. Carotenoid content decreased significantly with the treatment of both UV-A and UV-B. Among the different treatments, the authors found that UV-B affects the photosynthesis in both varieties which decreases the overall yield of the plant. The overall experiment showed that both TiO₂ and Graphene nanoparticles play an important role in coping up with plants affected by UV-A and UV-B which very harmful effects on the plants.

248. Nano based ecofriendly conservation of the river Ganges

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Ganges is the India's holiest river but now it becomes world's most polluted river. So, the conservation of the river Ganges becomes mandatory name of this study was to evaluate the physicochemical parameter of the deferent water samples of the river Ganges. Detection of toxic metal concentration by Atomic Absorption Spectrometry (AAS) and removal of detected toxic metal by plant mediated metal nanoparticles assessment of physicochemical parameters indicated that turbidity, total dissolved solids, alkalinity, total hardness and iron content was present in high amount. In Sangam water in comparison to Phaphamau water AAS analysis detected chromium in Phaphamau water and cadmium and led in Sangam water. Cadmium is highly toxic metal for animals, plants and humans as well. So, the removal of cadmium metal by using environmentally benign method is highly approachable. *Moringa olifera* mediated silver nanoparticle was synthesis for removal of removal of cadmium characterization was done by UV-Visible, XRD, FTIR and SEM for removal of cadmium absorption technique was used. As the concentration of bioadsorbent increases and metal concentration decreases, removal of cadmium increases.

249. Hypoglycemic effect of *Eucalyptus globulus* and *Syzygium cumini*: A traditional drug for diabetes

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The incidence of diabetes and obesity is increasing worldwide at an alarming rate, due to changes in modern lifestyles. Ayurveda, the Indian traditional system of medicine, is one of the world's oldest systems to have documented the diagnosis and treatment of diabetes. The present study was carried out to evaluate the anti-diabetic potential of Myrtaceae family plant extract against in vitro diabetic models. The authors observed more activity in methanolic extract as compared to the aqueous. The extract of *E. globulus*, *S. cumini* showed significant antioxidant activity in all antioxidant assays as compared to ascorbic acid. Herein, the authors also established the in vitro model for diabetes and evaluated the therapeutic potential of plant extract against insulin resistant adipocytes. The authors demonstrated that these plant extracted significantly reduces the Reactive Oxygen Species (ROS) levels. These plants extract showed inhibitory effect on α -Glucosidase and α -amylase. Additionally, *S. cumini* plant extract reduces the, ALT and GGT activity in a dose dependent manner. The results of this research are promising thus indicating the utilization of the all (leaves, stem, fruit, seed, root, and flower) parts of the plants viz., *E. globulus*, *S. cumini* as a significant source of natural antioxidant to combat diabetes.

250. Acoustic analysis and food-associated call of rhesus macaque, *Macaca mulatta* in Chitrakoot, India

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Present study deals with the acoustic analysis and food-associated calls of rhesus macaque in twenty five troops of Chitrakoot. The five food related call of rhesus macaque was identified i.e., coo, grunts, Chirps, warbles and harmonic arches. The primary common calls Coo and Grunts call emitted both food (chow) and nonfood context, such as during infant and mother separation and grooming interaction. Grunts given upon encountering food are acoustically distinct from those given in non-food context and in contrast, coos associated with food are statistically indistinguishable from coos given in other contexts. Warbles, Harmonic arch, and Chirps calls are encounters with rare and highly preferred foods e.g., coconut, fruits etc.

251. Total polyphenolic, flavanol and DPPH activity of endangered medicinal plant *Mallotus philippensis*

Poonam Chaudhary

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Mallotus philippensis (Euphorbiaceae) is one of the medicinally important plants that is used in indigenous system of medicine for cultivation prospects. It is commonly known as "Kamela". The present work was focused on the evaluation of quantitative analysis and antioxidant activity of the leaves, Bark, fruit and leaves of *Mallotus philippinensis*. The phytochemical analysis revealed the presence of various phytochemicals like alkaloids, amino acids, flavonoids, phenols, polyphenols, saponins, steroids, tannins and triterpenoids. The quantitative analysis of phytoconstituents also showed markedly high amount of flavonoids, flavanol, and total polyphenolic content. The antioxidant activity of methanolic extracts evaluated by Diphenyl Picryl Hydrazyl (DPPH) free radical scavenging activity revealed rich amount of antioxidant content in this selected plant. The aim of this paper is to explain the details of phytochemical properties of *Mallotus philippensis* for the future research work.

252. Effect of planting geometric and pinching operation on African Marigold (*Tagetes erecta* L.) cv. Pusa narangi”

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A field experiment was conducted during winter (Rabi) season of 2016-2017 at research instructional farm, AKS University Sherganj Satna Madhya Pradesh. An experiment was entitled “Effect of planting geometric and pinching operation on African marigold (*Tagetes erecta* L.) cultivars Pusa narangi”. The experiment consisting of twelve treatments with plant spacing as well as pinching operation (0, 20 and 30 days after transplanting) was laid out in Randomize Block Design with three replication. Growth parameter different significantly at all stage of crop growth were maximum plant height (77.62cm) and number of branches (11.37) were recorded in the spacing S2 (30x30cm), maximum number of flower, flower diameter, flower yield and seed yield were recorded in same spacing of marigold plant. Pinching operation done at 20 day after transplanting also increase growth and yield parameter, while both spacing of marigold (30x15cm), (30x45cm) row to plant spacing and pinching operation P2 (30day after sowing) did not show their positive effect. It was observed that spacing's i.e., 30x30cm and pinching operation at 20 day after transplanting significantly improved growth and yield of African Marigold.

253. Characterization of *Drosophila melanogaster* Park13 mutant as a model system to study Parkinson's disease

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Parkinson's disease (PD) is the second most common neurodegenerative disease accompanying symptoms such as tremors, postural instability and locomotory defects. Several genes are associated to rare familial forms of this disease-abnormal functioning of which may cause 3 types of cellular defects viz: Mitochondrial dysfunction, abnormal protein aggregation or oxidative damage, these are the defects involved in progression of Parkinson's disease. One of the genes responsible for causing PD when mutated is Park13/HtrA2 gene. HtrA2 protein is a mitochondrial protein which maintains mitochondrial homeostasis and also plays a role in cell apoptosis. *Drosophila* has emerged to be an ideal model organism to study neurodegenerative diseases with 75% of its genes homologous to human disease causing genes. It contains human Park13 gene homologue, mutation of which would affect the protein synthesis contributing in expression of PD in these flies. Such a mutant strain of flies would exhibit locomotory defects characteristic of PD. In order to identify and characterize the changes occurring due to mutation, the authors employ behavioral studies such as climbing assay and larval crawling assay, proteomic studies using SDS-PAGE, and PCR in order to gain a clear site of the changes occurring at molecular and genetic levels.

254. Water quality and abatement of pollution of Mandakini river at Chitrakoot, Satna M.P.

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Domestic wastewater, industrial effluents, agricultural runoffs, mass bathing, offering of religious materials, idols, etc. increases the pollution in river water due to presence of a large number of temples and restaurants etc. along the bank of river Mandakini. All the settlement discharges their waste into the Mandakini via major 6 drains. The result shows that the quality of waste water varies from site to site and it greatly depends on origin of waste water. Total fecal coliform value was found high at most of the stations. Study anchors on the need for treatment of domestics and industrial effluent before joining River Mandakini. The water quality of Sati Anusuiya Ghat was found in category-A, Raghavprayag and Ramghat were found in category-C and remaining all the station were found in Category-B. The drain carrying waste of whole Chitrakoot joins river Mandakini at Ramghat and deteriorate water quality significantly. The overall conclusion is that wastewater with a high pollution load has adverse impact on water quality in river Mandakini.

255. Screening of phytochemicals, antiradical and antiglycemic activity of methanolic extract of *Pithecellobium dulce* (Leaves and Bark)

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The aim of this study was to screen the phytochemicals (qualitative and quantitative) present in methanolic extracts of *Pithecellobium dulce* plant parts (leaves and bark) derived from two extraction methods. Further, extracts were screened for antiradical and antiglycemic activity. The results show the presence of various phytochemicals which are responsible for numerous pharmacological activities. The methanolic extracts derived from maceration and ultrasound assisted extraction method are having good antiradical and antiglycemic activity. Hence, these findings confirm that the leaves and bark of *Pithecellobium dulce* have a potential source for the formulation of new therapeutic drugs.

256. Holistic rural development in India: Role of science, technology and intervention of new policies

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India has roughly over 06 (six) lac villages with diverse geography, topology culture language, life styles, traditions, food habits and variety of multiple factors. Our villages inherit a great traditional and value based systems on certain vital principles of life. Our villages also have a tremendous inherent strength of coexistence co-operation and cohesiveness. With the recent trend of development, globalization and strong market forces, villages are facing serious threat in terms of life styles, cultural invasion and loss of livelihood. Depleting water resources, altered agricultural practices and various other socio-economic reasons have led to mass migration to the cities. Well known urban rural ratio of 70:30 is now rapidly losing its shape and turning the faces of our villages and cities ugly. Cities are becoming pythons and swallowing dozens of villages in vicinity every year putting the whole Social System in imbalance and disorder causing a huge range of problems. Keeping this vital transition in mind a sustainable mode of rural development is the urgent need of this hour. Our villages had plenty of their own resources to sustain on its own and were considered to be an independent self-sustained social unit of great Indian community. This paper tries to peep through those conditions, plans, preparations, programmers, policies and possible dimensions and avenues of effective intervention. These interventions range from scientific, technological innovations to formulation and execution of policies.

257. *Cicer reticulatum* L. seed lectin demonstrates inhibitory action against human cancer cells

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A wild chickpea lectin (WCL) from the seeds of *Cicer reticulatum* L. was chromato-purified using DEAE-Cellulose and SP-Sephadex ion exchange chromatography. WCL was thermostable upto 60°C with broad pH optima (pH 5-9) and various divalent metal ions did not influence its activity. WCL demonstrated DNA protection in a dose dependent manner. The lectin exerted antifungal activity against diverse fungal pathogens. WCL augmented the mitogenic response of mouse spleen cells at 10µg/ml concentration and showed an inhibition of HIV-1 reverse transcriptase at IC₅₀ of 200µM. Against human cancer cell lines, lectin demonstrated anticancer potential. The cell viability assay in HepG2, Ishikawa, MCF-7 and MDA-MB-231 cell line demonstrated IC₅₀ values (in µg/ml) of 61.8, 54.4, 37.5 and 44.2, respectively.

258. Mungbean (*Vigna radiata* L.) Scanning for genetic diversity based on morphological and molecular markers

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In the present study, 28 morphological and 35 simple sequence repeat markers (SSRs) was used to analyze 48 mungbean genotypes including released varieties and advanced breeding lines. The major allele frequency was ranged from 0.13 to 0.60 with average of 0.36. Similarly, the gene diversity varied between 0.32 and 0.90, whereas polymorphism information content (PIC) ranged from 0.30 to 0.90 with the average of 0.75. Further, model-based clustering generated five distinct subpopulations, with maximum 18 genotypes forming subpopulation-IV, while the subpopulation-V contained the least number of genotypes (3). Five genotypes were considered as admixtures. The clustering patterns resulting from hierarchical clustering based on phenotypic scores remained in close agreement with STRUCTURE and UPGMA clustering. The informative SSR markers

identified in this study will be great supplementary tools for hybridization programs in mungbean breeding. The findings reported here would serve mungbean research and breeding programs including germplasm management, selection of appropriate genotypes to generate new breeding materials for cultivar improvement.

259. Occurrence and prevalence of antibiotic resistance *E. coli* isolates in hospital waste water

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The emergence of antibiotic-resistant organisms is a major public health concern, particularly in hospitals and other health care settings. Antibiotic used in the hospital are not fully metabolized by patients and released in to the hospital waste water and thus played a role for dissemination of these resistance organisms. The study was carried out to investigate the presence of antibiotic resistance in *E. coli* isolates from hospital waste water collected from a government hospital. A high level of resistance was found against faropenem and amoxycillin which ranges from 55.5 to 66.6% respectively. Among the resistant *E. coli* isolates, KMS11 was found to have multi drug resistance and was characterize at their molecular level. The results from the plasmid curing showed that the acridine orange could cure the plasmids of *E. coli*. Cured *E. coli* isolates were sensitive to amoxycillin. Therefore, it is suggested that antibiotic resistance markers are confirmed on plasmid.

260. Anti-amyloidogenic effect of chickpea peptide using human insulin, serum albumin, β -lactoglobulin and lysozyme as a model protein

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Protein aggregation into oligomers and fibrils are associated with many human pathophysiologies. Compounds that modulate protein aggregation and interact with preformed fibrils and convert them to less toxic species, expect to serve as promising drug candidates and aid to the drug development efforts against aggregation diseases. In present study, the kinetics of amyloid fibril formation by Human Insulin (HI), Human Serum Albumin (HSA), β -Lactoglobulin (β -L) and Human Lysozyme (HL) and the anti-amyloidogenic activity of chickpea peptide were investigated by employing various spectroscopic imaging and computational approaches. The authors demonstrate that chickpea peptide significantly inhibits the fibrillation of HI, HSA, β -L and HL in a dose-dependent manner. Interestingly chickpea peptide destabilise the preformed amyloid fibrils and protects human neuroblastoma cell line against amyloid induced cytotoxicity. The present data signifies the role of chickpea peptide that can serve as potential molecule in preventing human protein aggregation and associated pathophysiologies.

261. Protective effect of *Blepharis maderaspatensis* (L.) B. Heyne ex Roth. on inflammation in lipopolysaccharide-induced endotoxemia

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Kani, Urali and Paliyar tribals of Western Ghats region of Kerala and Tamil Nadu states of India widely use *Blepharis maderaspatensis* (L.) B. Heyne ex Roth (BM) against bone fracture, wounds

and cuts, boils, asthma, headache, scorpion bite and nervous disorders. This study investigated the protective effects of BM on lipopolysaccharide (LPS) induced endotoxemia in male Wistar rats. Whole plant alcoholic extract of BM was administered orally to rats at doses of 100, 200 and 400 mg/kg body weight before LPS challenge (single intraperitoneal injection, 5 mg/kg body weight). The results revealed that BM inhibited LPS-induced liver damage, evidenced by decreased serum biochemical parameters (AST, ALT and ALP) and increased levels of liver GSH, SOD and CAT. Decreased level of NO and MDA showed the antioxidant property of the BM extract. Haematology (RBC, WBC and platelet count) and histopathology also supported the above results. Molecular gene expression analysis revealed that the BM-M has NF- κ B gene inhibiting activity through which it blocks the expression of pro-inflammatory cytokines (IL-1 β , IL-6 and TNF- α) and COX-2. The iNOS gene expression was also analyzed, supporting the anti-inflammatory action of the BM-M. In conclusion, the present study suggests that BM successfully and dose dependently inhibits LPS-induced endotoxemia possibly by down-regulation of NF- κ B binding activity. Thus, BM is a valuable source of novel potential anti-inflammatory compounds that are yet to be explored.

262. Traditional phytotherapeutic approaches for the treatment of diabetes by the local people of Indo-Gangetic plain

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Drug Plants have been used in various diseases since time immemorial. The primitive man used herbs as therapeutic agents and medicament, which they were able to procure easily. The nature has provided abundant plant wealth for all living creatures which possess medicinal virtues. The essential values of some plants have long been published but a large number of them remain unexplored as yet. So, there is a necessity to explore their uses and to conduct pharmacological studies to ascertain their therapeutic properties. The present explorations are based on 65 indigenous plant species belonging to 30 angiospermic families. These indigenous plants were used as traditional phytotherapies for the control and treatment of diabetes mellitus. The rural inhabitants of the area classified these traditional phytotherapies on the basis of uses of various parts of plants and method of their uses. About 35 traditional phytotherapies were investigated from the rural inhabitants of the area. These traditional phytotherapies were classified as antidiabetic extracts, leaves, powders, flour, seeds, vegetables, fruits and herbal mixtures.

263. Effect of supplementation of Giloy (*Tinospora cordifolia*) on immune status of peripartum Sahiwal cattle

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To study the effect of supplementation of *Tinospora cordifolia* on immune response of Sahiwal cattle, sixteen adult Sahiwal cattle in advanced pregnancy of about 8 months (as per records) were randomly divided into two groups of eight animals each. The cows under treatment group were fed with dried giloy stem powder by mixing it in concentrate mixture @ 60 g/day for a period of 45 days before parturition and @ 120 g/day for a period of 75 days after calving. The control group cows were fed with equal amount of concentrate mixture without giloy supplementation. Blood samples from experimental cows were collected at -45, -30, -15, -7, 0, 7, 15, 30, 45, 60, 75 days. Results showed significantly higher FRAP values in treatment group on 45, 60 and 75 days post-partum. The total leukocyte count (no./ μ l blood) was significantly ($P < 0.05$) higher in giloy supplemented (8913.54) cows in comparison to control cows (8172.96) during a week ahead of parturition and

during post-partum period of experiment. The total leukocyte count was significantly higher on the day of parturition in cows of both the groups. The lymphocyte and neutrophil count was significantly ($P < 0.05$) higher in giloy supplemented cows as compared to control cows. In conclusion, it can be stated that *T. cordifolia* supplementation had significant immunomodulatory effect in peripartum Sahiwal cattle.

264. Effect of turmeric (*Curcuma longa*) powder supplementation on growth performance of broiler chicks in cage system

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The experiment was conducted at the Livestock Production and management unit, MGCGV Chitrakoot, Satna, M.P. To complete the research work following steps were followed. Day old 75 broiler chicks (DOC) of same hatch were produced and reared in Cage system. The chicks were weighed, leg banded and distributed randomly into five groups of 15 chicks each as treatment. Chicks of each treatment were further divided into three sub groups of five chicks in each in randomized block design (RBD). Chicks of each sub group were accommodated comfortably in cage system providing 1 sq. ft./ chick. Chicks were fed standard starter ration up to 3 weeks age (1 to 21 days) and then broiler finisher ration up to 3-4 weeks (22-28 days). An experiment was conducted with DOC to 75 broilers chicks divided into five groups T₀, T₁, T₂, T₃ and T₄ which were supplemented with Turmeric powder @ 3.0g, 4.0g, 5.0g and 6.0g/kg of broiler ration respectively. Weekly observations were recorded for live body weight, weekly gain in weight, weekly feed consumption and feed conversion of birds for four Weeks. Based on the results of the experiment, it may be concluded that feed supplementation with Turmeric (*Curcuma longa*) powder influenced the body weight, gain in body weight, feed intake and feed efficiency of broiler chicks. Based on feed intake and feed efficiency (low feed intake and higher feed conversion ratio), economically best performance of broilers was obtained with T₂ (feed supplementation of 4 g Turmeric powder with 1 kg standard ration), followed by T₃ (feed supplementation of 5 g Turmeric powder with 1 kg standard ration).

265. Effects of sleep loss on kidney function: A preliminary study

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Sleep is the intermediate state between wakefulness and death; wakefulness being regarded as the active state of all the animal and intellectual functions, but death as that of their total suspension. The mechanisms of initiation and maintenance of sleep and wakefulness, as well as the interaction between them are highly complex neurophysiological processes. Sleep deprivation or poor sleep quality has been linked to increased risk of obesity, diabetes, hypertension, cardiovascular disease, metabolic syndrome, cancer, early mortality and sleep loss is also known to affect other organs of the body. Hence it was hypothesized that the sleep deprivation might influence the functioning of adrenal and kidney. Results of Biochemical parameters (BUN, Creatinine, Na⁺ and K⁺) in experimental animals were all shown to be increased in different magnitude in the course of sleep deprivation both by physical and chemical means. These findings were as per the prediction and confirm their role as probable indicator of kidney malfunctioning in sleep deprived rats. In subsequent experiment with human after 24 hours of continuous wakefulness the level of above biochemical parameters elevated significantly in case of male participants only but not as much found in experimental rats kept sleep-deprived for continuous four days.

266. Variation measured in major oilseed crop production in different district of Chhattisgarh

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Groundnut, Til, Soybean and Niger are important oilseed crops of the Chhattisgarh. The data pertaining to area ('000 ha), production ('000 mt) and yield (Kg/ha) of important oilseeds were collected for different districts and state as a whole for the period of 14 years (2001-02 to 2015-16) from the Department of Agriculture, Govt. of Chhattisgarh. Among the oilseeds crops considered for the study in period I (2002 - 2008) and period II (2009 - 2016). Mann-Whitney U test statistics and Friedman's two way analysis method such as used to test variability of area, production and yield of different districts of Chhattisgarh. All the sixteen district of Chhattisgarh are included in the analysis. The calculated value of Mann-Whitney U test statistics for major oilseed crops only Til crop shows (228) significantly differ from period I (2002 - 2008) and period II (2009 - 2016). The Friedman test statistics χ_r^2 for period I (2002 - 2008) and period II (2009 - 2016) in different districts of Chhattisgarh for all major oilseed crop shows significant variability with respect to between district as well as crop.

267. Acetylcholinesterase containing neurons among the rhombencephalic nuclei of *Channa punctatus*: A histochemical analysis

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Acetylcholinesterase is an enzyme belonging to hydrolase group that hydrolyses neurotransmitter acetylcholine in to choline and acetate and is considered to be an effective marker of cholinergic and cholinceptive neurons. The present study has been carried out to histochemically map the rhombencephalic nuclei of *Channa punctatus* by employing a modified technique to visualize acetylcholinesterase containing neurons described by Hedreen, J.C. *et al.* (1985). Fascial motor nucleus, intermediate raphe nucleus, secondary gustatory nucleus and vagal lobe exhibited very high intensity for the enzyme. Inferior raphe nucleus and medial octavolateral nucleus showed intense reaction while anterior octavolateral nucleus and descending octaval nuclei showed moderate activity. The present study has been compared with that of other vertebrates, studied earlier to set a homology among different rhombencephalic nuclei in the light of recent cytoarchitectonic and hodological studies.

268. Eugenol, curcumin and nanocurcumin differentially augment Na^+ , K^+ -ATPase activity in middle uterine artery of *Capra hircus*

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Eugenol, curcumin and nanocurcumin could control hypertension *via* vasodilation in the systemic blood vessels. One of the mechanisms may be the activation of vascular Na^+ , K^+ -ATPase. Pregnancy-induced hypertension is one of the growing concerns for maternal and foetal health. Taking middle uterine artery (MUA) of goat as a vascular model, the vascular rings were mounted in an automatic organ bath attached to a power lab data acquisition system operated by Lab chart 7.1.3 software. The tissues were isometrically contracted first with K^+ -free Pss and subsequently relaxed by KCl (10 μM -10mM) either in absence or presence of ouabain (1 μM) or eugenol (10 μM) or curcumin (10 μM) or nanocurcumin (10 μM). R_{max} (6.90% and 26.55%) obtained from KVR curve elicited in non-pregnant (NP) and pregnant (P) was reduced to 4-5 % by ouabain in both MUA rings of NP and P *Ch.* Eugenol, curcumin and nanocurcumin significantly increased the R_{max} of KVR

curve to 16.22%, 21.23%, 6.91% in NP and to 42.67%, 35.49%, 34.88% in P *Ch*. Ouabain reduced these augmented R_{max} of KVR curve to 6.11%, 9.18%, 4.11% in NP and to 5.40, 3.39, 6.00 % in P *Ch*. In conclusion, (i) a greater vasodilation of MUA during pregnancy is due to activation of Na^+ , K^+ -ATPase, (ii) the potency order of these nutraceuticals causing vasodilatation involving the Na^+ , K^+ -ATPase activity in NP is curcumin > eugenol and in P is eugenol > curcumin > nanocurcumin. The consumption of curcumin and eugenol could help in control of hypertension during pregnancy (pre-eclampsia).

269. Standardization of *Lasuna patra* (*Allium sativum* L.): A traditional medicine

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Lasuna patra (*Allium sativum* L. Fam. Amaryllidaceae), is one of the best-researched herbal remedies and frequently used as a food and a spice. The demand for herbal product thought of the world is growing exponentially. Standardization of herbal product is essential for several reasons. The western concept of standardization of a drug means clean knowledge of active compound, its quantification, pharmacology, mode of action, toxicity profile etc. This kind of information is lacking in case *Ayurvedic* medicines. Lack of standardization of single drug is a serious problem in validating efficacy and maintaining quality control of *Ayurvedic* medicines. In this studies an attempts was made to standardize *Lasuna patra* followed by total ash, acid insoluble ash, water soluble ash, extractive values, and loss on drying, microscopy characters and HPTLC. The findings of studies reveal the drug are genuine and can be used as single medicine or in compound formulations.

270. Occupational allergic diseases in kitchen and health care workers at Arrah, Bihar

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This study evaluated the frequencies of allergic symptoms and rate of upper respiratory infections during 2016-2017 in the general population, kitchen and health care workers at Arrah. It was used to inquire retrospectively about asthma and asthma-like symptoms and the number of treatments required for previous upper respiratory tract infections. 290 subjects (94 general population, 102 kitchen workers and 94 health care workers; 132 females and 158males) participated in the study. Allergic rhinitis was significantly higher in the health care workers and kitchen workers groups than in general population ($p < 0.001$). Cumulative asthma was significantly higher only in the health care workers group ($p < 0.05$). In addition, the health care workers and kitchen workers groups had significantly higher risks of ≥ 2 /year upper respiratory tract infections (OR: 1.60, 95% CI: 1.00–2.40 versus OR: 1.60, 95% CI: 1.00–2.40) than the general population. Occupational allergic respiratory diseases are an important and growing health issue. Health care providers should become familiar with workplace environments and environmental causes of occupational rhinitis and asthma.

271. Dolphin, The National Aquatic Animal of India is at threat

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Platanista gangetica gangetica : One of the most ecologically, economically and culturally important cetacean species of our planet, treated as Priority Species by WWF India; hence, we must think to ensure that such species can live and thrive in their natural habitats. The Ganges river dolphin or Sons or Susu, is among the four obligate freshwater dolphins; the other three are now likely to extinct from the Yangtze river in China, the Bhulan of the Indus in Pakistan and the Boto of the

Amazon river in Latin America. Several marine dolphins also include some ranges of freshwater habitats. Gangetic river dolphin lives in one of the world's most densely populated river areas as Ganges-Brahmaputra-Meghna and Karnaphuli-Sangu river systems of Nepal, India, and Bangladesh. River dolphin is at the apex of the aquatic food chain; hence it is considered as "*Tiger of river*". The presence of dolphin in adequate number symbolizes healthy and balanced aquatic ecosystem with greater biodiversity. Even being a carnivore, dolphin is threatened by removal of river water, siltation arising from deforestation, pollution and entanglement in fishery nets, alterations to the river due to barrages, construction of more than 50 dams and other irrigation-related projects. The survival of the Ganges river dolphin is also threatened by unintentional killing through entanglement in fishing gear; directed harvest for dolphin oil, which is used as a fish attractant and for medicinal purposes; water development projects (embankments); industrial waste and pesticides; municipal sewage discharge, noise from vessel traffic; overexploitation of prey and due to the widespread use of non-selective fishing gear. A recent survey conducted by WWF-India, Forest Department, NGOs partners and Researchers of The Institute of Applied Sciences in the entire distribution range in the Ganga and Brahamaputra river system - around 6,000 km - identified fewer than 2,000 individuals in India i.e. less than the half of the population recorded in 1982.

272. Hidden burden of malaria in some districts of Uttar Pradesh

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Vector borne diseases particularly malaria and dengue are escalating in different parts of country during monsoon and post-monsoon seasons. These enhanced cases were due to unplanned urbanization and poor socio-economic conditions coinciding with peculiar topography, crop practices, rainfall pattern and vector potential of the respective area. In the first week of September 2018, some of hard core pockets of district Bareilly, Badaun (4 pockets in each district, known as block), Hardoi (3 blocks) and in Sitapur (one block) were severely affected. The results of these areas were witnessed with alarming increase in cases of malaria i.e. Pv, Pf. and mixed infections. Albeit in the preceding years of 2016 and 2017, these areas did not exhibit such huge proportion of malaria morbidity, may be due to not applying technical advancements of parasite detections as well as non-compliance of treatment procedures. In depth analysis will be dealt during discussion of the paper.

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