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Ethnobotanical survey of Gagron Fort, Jhalawar (Rajasthan) and its environs

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Abstract

This research is aimed to introduce vast ethnobotanical treasure and natural beauty of a UNESCO world heritage site Gagron Fort. Based on author's survey conducted between January 2023 and June 2023. Gagron, A unique confluence of cultural heritage, religion and environmental protection. Surrounding by two rivers i.e. Kalisindh and Ahu by three sides of fort, a fort without foundation, These are the characteristics due to which it has been declared a World Heritage Site by UNESCO.

This extensive ethnobotanical study was carried out around Gagron Fort, which is located in the south eastern part of Rajasthan state, It is an example of hill and water fort, surrounded by Kalisindh and Ahu river by three sides. The rear of the fort is surrounded by the *Mukundara* hill and forest of *Vindhyan* range. The aim was to collect and identify plants used for therapeutic purposes by local people and to record information on traditional herbal medicine, this study identifies 67 species of 30 Families, most common plants belongs to Fabaceae Family representing 22.58% (i.e. 14) species of total. In this paper author described 10 most common plants used by local people of Gagron fort and village that has significant ethnopharmacological values for instance *Bryonia laciniosa* a cucurbitaceae member used as uterine tonic and treatment for female infertility, found abundantly here, *Sterculia urens* known as ghost tree because it is a belief that sleeping with its wood nearby does not bring ghosts etc. Author also prepare plant specimens collected from numerous excursions.

Keywords: Ethnobotanical, Gagron Fort, Ethnopharmacological, Plant specimen.

Introduction

The term "Ethnobotany" was coined by J. W. Harshberger in 1895 to indicate plants used by the aboriginals: From "ethno"-study of people and "botany"- study of plants. Ethnobotany is considered as a branch of ethnobiology. It deals with the study and evaluation of plant-human relations in all phases and the effect of plant environment on human society. Rajasthan has rich biodiversity consisting of a large number of plants, some of which are used for their medicinal value

According to UNESCO "the world heritage convention is one of the most successful instruments to protect the most extraordinary natural places on the planet characterized by their natural beauty or outstanding biodiversity, ecosystem and geological values. "

Jhalawar range is situated in the southeastern district of Jhalawar in Rajasthan state of India. It is a part of Hadoti region of Rajasthan and lies at Malwa Plateau (Chourasia et.at, 2011). This area falls in the territorial forest division of Jhalawar district ($24^0$37' 40.57' N, $76^0$10'58.64'E). The average annual rainfall of Jhalawar is 35 inches (890mm) which is the highest for Rajasthan state. Not only

the ramparts of the fort but the vegetation here is also unique and heritage. In the fort there are some untouched places where much more possibilities to discover some special plants which told about the history of the fort.

Methodology:

The study is based on author's field survey, conducted between January 2023 and June 2023. Author also prepare plant specimens collected from numerous excursions. A list of plants with ethnobotanical uses is also prepared by author, In this paper author described 10 most common plants used by local people of Gagron fort and village that has significant ethnopharmacological values.

The documentation and critical evaluation of traditional empirical knowledge about the therapeutical use and medicinal properties of botanical and animal drugs are the main foci of ethnopharmacology (Gertsch, 2009; Heinrich and Jäger, 2015; Bruhn and Rivier, 2019). Field study results consist of descriptive qualitative data and quantitative primary data (Bernard, 2011). Quantitative ethnomedical field data is the raw or primary data and is usually presented in a table describing the cultural consensus of botanical and animal drug use (Weckerle et al., 2018).

Dried plant specimen of below plants were also prepared on herbarium sheet.

Sr.No.	**Name of Plant**	**Botanical name**	**Ethnobotanical uses**	**Ethnopharmacological Important**
1.	Red morning glory	***Ipomoea coccinia***	Ornamental, to induce sneezing	
2.	Shivalingi	Bryonia laciniosa	Seeds resemble with linga statue of lord shiva	seeds uses as uterine tonic, treatment of infertility in women, improve chances of conception.
3.	Lady's thumb	*Perscaria maculosa*	Insect repellent	leaves use in stomach pain
4.	Ghost tree	*Sterculia urens*	To keep ghosts	Gum Karaya, Trees exude

			away	gum karaya used in foodstuffs as emulsifiers, stabilizers and thickeners. Seeds are eaten after roasting. Seeds and young tender roots are known as famine food.
5.	Common mullein	***Verbascum thapsus***	As Mullein tea	To treat pulmonary problems, inflammatory disease, asthma, diarrhea and migraine.
6.	Kunduri	*Coccinia cordifilia* (L.) Cogn.	unknown	Decoction, gonorrhoeae, diabetes
7.	Khub kala	*Sisymbrium irio* L.	cough	Cough and asthma
8.	Suryavarti	*Chrozophora rottleri* (Giess) A. Juss*	unknown	To purifying blood
9.	Kandira	*Ranunculus scleratus* L	unknown	Anti inflammatory, analgesic, sedative
10.	Bakla	*Vicia faba* L.	As beans / food	Anticancer, cardiovascular disease

Table 1.1

Result and Discussion of findings

According to WHO report, several diseases of modern times are generally life style diseases. Medicinal plants have great importance in providing health care to about 80% of the population in India. Plants have been an important source of precursors and products used in a variety of industries, including those of pharmaceuticals, food, cosmetics and agrochemicals. The continuing search for new drugs has seen researchers looking to the natural world for potential products.

The in-depth analysis of this study was carried out by the researcher from the insider perspectives exploring the underlying issues of social transformation impacts of Ecotourism on

local communities in a developing country. The study has outlined three domains of social transformation impacts of Ecotourism on the local community namely, Contrast to tourism i.e. Comparison, socio-cultural and environment. Through the thick description derived from the qualitative data (Bailey, 2007).

Conclusion

Plants have been a significant source of precursors and items utilized in a variety of industries, including those of drugs, food, beauty care products and agrochemicals. The herbal medicine suits to the both social as well as cultural requirements of the people and also influences the patient's mental, physical and emotional states as well. The herbal drugs which are prepared with the traditional strategies through slow crushing and blending processes conserves all natural substances present in it in the 'naturally balanced form' without losing any of the fundamental component and thus, maintains the activity and purity of the drug. As per the WHO report, several diseases of modern times are generally because of life style diseases. Medicinal plants have incredible significance in giving medical services to about 80% of population in India. Efforts should be made to preserve the ethnomedicinal plants. The current status of the economically and medicinally significant plants of the study area are required to be determined in order to prepare the plans for their protection. Further developed consciousness for conservation of plants is required.

In the short field of Gagron fort there are much more possibility to explore the medicinal plants the study conveys new insights

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APPLIED PHYCOLOGY: A REVIEW ON BIOREMMEDIATION POTENTIAL AND APPLIED ASPECTS OF *CHLORELLA* AND *SPIRULINA SP.*

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Abstract:

Phycoremediation is a type of bioremediation that utilizes algae to improve water quality. Applied phycology deals with applications of algal taxa for human benefits directly or indirectly. Algae, which are autotrophs, play a crucial role in the treatment of waste, particularly wastewater, due to their chemical processing capabilities. They have been acknowledged for their pivotal role in the natural water purification process. *Chlorella* and *Spirulina* spp. are most common and potent algae extensively used for bioremediation. This review article looks into the review on applied aspects of both the species. The reason to select these sp. is that these are naturally occurs in water bodies and requires comparatively less care during application. A number of local water bodies that are facing pollution due to different reasons, thus, research in applied phycology could prove beneficial for the health and maintenance of water bodies as well as in providing employment opportunities for locals.

Key words: bioremediation, phycoremmediation, pollution etc.

Introduction:

Water pollution, especially from industrial and residential waste, has become a major environmental problem. In urban and semi-urban areas, sewage disposal is a challenge, and the discharge of industrial waste into open drains eventually contributes to river pollution. Wastewater from industries not only promotes an imbalanced aquatic ecosystem but also alters the pH levels of water bodies, affecting aquatic life.

The pollution level in natural aquatic systems can be gauged through indicators such as hardness, alkalinity, and free CO2, among other physico-chemical parameters. Heavy metals, including lead, cadmium, mercury, nickel, zinc, aluminum, arsenic, copper, and iron, are severe environmental pollutants that can cause dangerous poisoning conditions. Poor water quality can lead to diseases and a lower quality of life.

Rivers and fresh water streams are often heavily polluted by industrial waste from a variety of industries, including petrochemicals, fertilizers, oil refineries, pulp, paper, textiles, sugar mills, steel, tanneries, distilleries, drugs and pharmaceuticals, fibers, rubber, plastics, and more. As human activities intensify, so does the complexity of wastewater composition, making it imperative to develop effective, eco-friendly wastewater treatment processes.

Biological treatments, such as the use of microalgae, are promising approaches for wastewater treatment. Microalgae can remove nutrients, metals, pharmaceuticals, radioactive minerals, or pathogenic organisms from the medium. Phycoremediation, which involves the use of microalgae

to remove pollutants, shows potential to complement traditional wastewater treatment processes. It also provides economic benefits through cost reduction and revenue from innovative products derived from microalgae.

Algae are crucial bioremediation agents and have been extensively studied over the past few decades. They play a critical role in treating wastewater, especially cyanobacteria, the first photosynthetic microorganisms. Cyanobacteria are resilient to sudden changes in light, salinity, temperature, and nutrient composition. They show immense potential in wastewater treatment, industrial effluent treatment, bioremediation of habitats, and various industrial applications. Different types of microalgae have been used to treat effluents and remove heavy metals, including Chlorella and spirullina sp. With the aim to not only explore the possible applications of applied phycology for Kota Rajasthan but also identify most suitable and less expensive local resources for bioremediation of water bodies, this study is undertaken.

Materials and Methods:

Extensive literature surveys are done followed by field studies to relate the applied aspects with locally available resources.

Discussion:

STUDIES ON APPLIED PHYCOLOGY IN RELATION TO BIOREMMEDIATION:

Bioremediation is a newer approach directed towards the treatment of decontamination. Bioremediation primarily deals with the strategies that can employ to clean up the contaminants biologically. Removal and recovery of heavy metals from wastewater is important for environmental protection and human health. Bioaccumulation process is known as an active mode of metal accumulation by living cells which depends on the metabolic activity of the cell (Volesky, 1990; Wase and Foster, 1997).

Accordingly, the biological mitigation is an economically practical and environmentally sustainable technology which has achieved much attention as an alternative method in the long term (Kumar et al., 2010). Biological CO2 fixation usually occurs through photosynthesis by terrestrial plants and trees. However, they are able to eliminate only 3–6 percent of CO2 because of their slow growth, while other microorganisms such as eukaryotic algae and cyanobacteria can fix CO2 10–50 times faster (Iasimone et al., 2017). Algae are capable of eliminating 513 tons of CO2 and producing up to 100 tons of dry biomass per hectare per year (Bilanovic et al., 2009). Another advantage with algae lies in the production of renewable fuels such as biodiesel and hydrogen. Since CO2 emitted during combustion of these biofuels can be assimilated by the algae, there is a resulting net zero balance of CO2 emissions (Kumar et al., 2010). Furthermore, algae can be a source of nutrition (Sabra et al., 2001; Becker, 2007; Plaza et al., 2008; Raja et al., 2008; Dvir et al., 2009; Gressler et al., 2010) including vitamins (Lee, 2001; Raja et al., 2008), minerals (Lee, 2001; Dvir et al., 2009), and proteins (Raja et al., 2008; Dvir et al., 2009).

It is reported that biosorption of heavy metals by certain types of non-living biomass is a highly cost-effective new alternative for the decontamination of metal-containing effluents (Kratochvil and Volesky, 1998).Biosorption of heavy metals from algae can be effective process for the removal and recovery of heavy metals ions from aqueous solution (Kaewsarn, 2002).

APPLIED ASPECTS OF *CHLORELLA SPP.*: *Chlorella vulgaris* and is highly efficient for ammonia and phosphorous removal during biotreatment of secondary effluents from an agro industrial wastewater of a dairy industry and pig farming. These microalgae were isolated from wastewater stabilization pond. Both these microalgae removed phosphorous from the wastewater to the same extent (Luz Estela Gonzalez, 1997). Dead dried *Chlorella vulgaris* was studied in terms of its performance in binding divalent copper, cadmium, and lead ions from their aqueous or 50% v/v methanol, ethanol, and acetone solutions. The percentage uptake of cadmium ions exhibited a general decrease with decrease in dielectric constant values, while that of copper and lead ions showed a general decrease with increase in donor numbers (Al-Qunaibit, 2009). Algae have received increasing attention for heavy metal removal and recovery due to their good performance, low cost and large available quantities (Wang and Chen 2008).

Among the several microalgae used to treat effluents *Chlorella* is often found from the various types of waste water for the treatment of the water (Karlander and Krauss, 1996). Raposo et al (2010) analyzed the capacity of *Chlorella vulgaris* and the autochthonous flora of the effluents to remove some of the compounds present in the effluents. Cecal et al (2012) deals with a study of the biosorption of UO2 2+ ions on two green algae: *Chlorella vulgaris* and *Dunaliella salina*. By kinetic investigations it was found that the biosorption process was greater for *Chlorella vulgaris* than for *Dunaliella salina.*

The major problem in utilization of microorganisms in any industrial or waste water treatment is harvesting of the biomass. This is solved by the strategy of immobilization. Immobilization technique is essential not only in waste water treatment but also in various industries (Prakasham and Ramakrishna 1998).

One of the main interests for microalgae in biotechnology is focused on their use for heavy metals removal from effluents and waste water (Mallick, 2002). Some research has been done dealing with the immobilization of microalgae for different purposes: morphology studies, the production of fine chemicals, energy production, wastewater treatment etc. Immobilization strains of microalgae is been used for sewage treatment. Efficiency of depuration was highest when a fluidized bed and *Chlorella vulgaris* were used (Travieso, 1992).

Tam et al, 1994 used *chlorella vulgaris* cells immobilized in alginate beads for removing N and P from wastewater and they achieved significant reductions in wastewater ammonia and phosphate.

The micro algae *Chlorella vulgaris* has been studied for phycoremediation of effluent wastewater. It has been described in study that that *Chlorella vulgaris* were able to effectively treat swine wastewater, and the relationships between microalgae growth and the removal efficiency of nutrients were established (Hasan, Zhang, Wang, & Shahbazi, 2014). Polluted water sample taken from effluent wastewater was treated with *Chlorella vulgaris*. The reported results show that the phosphate content was reduced by 69.23% and almost 60% of the phosphate had been removed by *Chlorella vulgaris* within 10 days. In addition to that, nitrate content of the water sample treated with *Chlorella vulgaris* showed 84% reduction and and increase by 247.83% of dissolved Oxygen in the water sample treated with *Chlorella vulgaris* had been found (Dominic, Soumya, & Nisha, 2009). In other study conducted by He, et al. in 2013, *Chlorella vulgaris* played a dominant role in the removal of nitrogen and phosphorus while bacteria in the culture removed most of the organic

matter. The results show that More than 44% of nitrogen was assimilated into algae indicating that this microalga can be an alternative in recycling nitrogen from wastewaters.

A similar study made by El-Kassas & Sallam in 2014 showed that *Chlorella vulgaris* also grown in wastewater demonstrated the capability of biomass production, colour and COD removal or Chemical Oxygen Demand meaning that *Chlorella vulgaris* has the potential to be an alternative in assisting in the textile culture effluent treatment mitigating environmental impact caused by their pollutants. Regarding about water contaminated with nanoparticles, *Chlorella vulgaris* has shown to have the ability of accelerating the aggregation of nanoparticles as well as to reduce NiO nanoparticles to zero valence nickel (Gong, et al., 2011). These results indicate that the green algae *Chlorella vulgaris* promising organisms for bioremediating nano-pollution. Phycoremediation is a novel technique that uses algae to clean up contaminated water and soil. It takes advantage of the alga's aptitude to take up, accumulate and degrade the constituents that are present in their growth surroundings. Algae based waste water treatment systems supply additional simple and economical technology as compared to the opposite environmental protection systems (Dominic, Soumya, & Nisha, 2009).

Similar study assessed the biomass obtained from microalgae *Chlorella vulgaris* when grown in urban wastewater, extracting the lipids from the biomass and performing Gas Chromatography analysis of fatty acid methyl esters (FAME) composition after submitting the lipids through the trans esterification process. The microalgae cultivation was monitored through chlorophyll (a) analysis and the highest cell growth was 845.8 µg L-1 using urban wastewater as growth medium. The nutrients of interest were monitored for primary concentration of 8.06 ± 0.06 mg L-1 of ammoniacal nitrogen, 12.27 ± 0.27 mg L-1 of nitrate and 21.22 ± 0.85 mg L-1 of phosphate, reducing about 99% of ammoniacal nitrogen and nitrate, along with reducing 87% of phosphate. The lipid constitution extracted from 3.7 g of dry biomass of *Chlorella vulgaris* after cultivation using urban wastewater, was 7.7%. The lipids extracted from the *Chlorella vulgaris* biomass are suitable biodiesel production regarding the amounts of FAMEs identified, after the analysis carried out, the comparison of the results obtained with other studies and the hypotheses evaluation.(Marques, I. M., Melo, N. R., Oliveira, A. C. V., & Moreira, Ícaro T. A. (2020).)

APPLIED ASPECTS OF *SPIRULINA SP:* Algae have been proven efficient biological vectors for heavy metal uptake. Biosorption potential of two strains *Spirogyra sp. and Spirulina sp.* has been studied under different initial metal concentrations (Mane and Bhosle 2012). The use of live and dead *Spirulina sp.* for sorption of metals, *Spirulina sp.* treated with different metal ions have been employed to understand the sorption mechanism. It is hoped that live *Spirulina sp*.will be a strong candidate for management of industrial wastewater (Doshi et al 2007). Bindiya et al (2012) observed the Bioaccumulation of Cadmium in Blue Green Algae *Spirulina (Arthrospira) Indica.*

Spirulina platensis, a cyanobacterium of economic important was studied for the tolerance to cadmium. The Biosorption studies showed that the algae had a great potential for adsorbing the heavy metal on to the cell. The immobilized cell of *Spirulina platensis* was able to be more effective in absorbing the metal to the cell (Murugesan et al, 2008).

The process of biosorption of trivalent chromium (Cr3+) by live culture of *Spirulina platensis* and the sorption potential by the dried biomass, in both free and immobilized states have been investigated for simulated chrome liquor in the concentration range of 100–4500 ppm. Both live

and dried biomass were very good biosorbents as they could remove high amounts of chromium from tannery wastewater (Shashirekha et al, 2008).
Spirulina are filamentous cyanobacteria that easily can grow on extreme environment and are able to absorb different materials (e.g.: ions, heavy metals, pollutants) from their environment. So, these algae can accumulate pollutants on its cells and help to clean up of the environment. *S. Platensis* is well suited for the removal of organic and inorganic compounds from aqueous solution, due to its rapid rate of biosorption as well as its high capacity of biosorption. Following the treatment of hard water with *Spirulina f*or 15 days, Total Dissolved Solids was considerably decreased by more than 50%, BOD was decreased by 82%, COD was increased by 50%, Total hardness was decreased by 72%, Calcium hardness was decreased by 44% and Magnesium hardness was decreased by 81%. This suggests that *Spirulina* absorbs and degrades the organic compounds. Thus *Spirulina* can be the promising candidate to reduce the hardness of water and play a role in purification of water.

In a study, the impact of *Spirulina platensis* growth on water treatment and its softening was examined. Results have shown TDS reduction by 50%, BOD by 82%, COD by 50%, and 72% improvement in terms of total hardness. *Spirulina sp.* was found to be a very efficient biosorbent (Somayeh Dolatabadi,Seyyed Abolfazl Hosseini, 2016).

It is said that Chlorella and *Spirulina* can effectively remove nitrate and phosphate from wastewater treatment effluents.(Sayadi et al. (2016).

Also, the use of *Spirulina* in wastewater treatment for its efficiency in absorbing and degrading organic compounds as well as reducing water hardness is recommended by Dolatabadi and Hosseini (2016).

The microalga growth parameters, the biochemical composition of the biomass produced, and the *Spirulina* efficiency to nutrient removal from the aquaculture wastewater were evaluated. The biomass (from the T-25 assay) showed the highest concentrations of protein which was 65.73%, also concentrations for phycocyanin, polyunsaturated fatty acid, and γ-linoleic are found16.60 mg/mL, 38.20% and 23.29% respectively. Besides that, the *Spirulina sp.* LEB 18 highest removal rate of sulfate (94.01%), phosphate (93.84%), bromine (96.77%), and COD (90.00%) was obtained from the T-25 assay. The *Spirulina sp.* LEB 18 cultures using 100% aquaculture wastewater supplemented with 25% of Zarrouk culture medium was suggested as the best option for the aquaculture wastewater treatment, producing added value biomass and reducing production cost. The biomass from T-25 and T-50 assays showed ideal properties for biodiesel application. (Cardoso, L.G., Duarte, J.H., Costa, J.A.V. et al., 2021).

CONCLUSION: Bioremediation potential of different Algae is a renovation in the direction of eco-friendly development. *Spirulina* and *chlorella* are the species commonly found in almost every water bodies, also well researched and proved effective for treatment of wastewater and bioremediation. Knowledge of locally available resources and their potent use can contribute in better implementation and development. Algal bioremediation is considered as an efficient and environmentally safe technology for inexpensive decontamination of polluted systems. It is widely used for heavy metal removal from waste water. The objective of the proposed study is to identify the most efficient naturally occurring algal species with bioremediation capabilities.

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Ethnobotanical and phytochemical studies of *Chlorophytum tuberosum* in Rajasthan

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Abstract

Chlorophytum tuberosum is a species of flowering plant in the Liliaceae family.[2] It is one of several species known by the common name safed musli. It is native to parts of Africa and India. It has historical uses in Ayurveda. *Chlorophytum tuberosum* has most recently been assessed

for *The IUCN Red List of Threatened Species* in 2008. *Chlorophytum tuberosum* is listed as Least Concern. *Chlorophytum tuberosum* Baker belongs to family Liliaceae and is being used in the indigenous systems of medicine as a galactogogue and aphrodisiac. It is being sold in the market under the common name *safed musali*. *Chlorophytum tuberosum* Baker belongs to family

Liliaceae. In India, it is found in rainfed areas. The plant generally grows along the forest margins, grassy slopes and rocky places along valleys (between 1300 and 2800 m).[1] This is an erect plant growing up to a height of 1.5–2 ft with sheathing leaf base acute to acuminate with entire margin. The roots are tuberous with ellipsoid tubers hanging from them, 10-12 cm long and 1–1.9 cm in diameter.[2] The tuberous roots are medicinally important and are known commonly as *safed musali*. *Safed musali* is used as an aphrodisiac and galactogogue[3–5] as well as for its nutritive, health promoting properties and immunoenhancing, hepatoprotective and antioxidants activities.[6–8] The tubers are also used in fever, leucorrhoea and also as an aphrodisiac.[8]

Keywords- *Chlorophytum tuberosum*, safed musli, threatened.

Introduction

Qualitative analysis of the root indicated the presence of proteins, reducing and non-reducing sugars, saponins, fats, tannin, glycoside and alkaloids .The quantity of proteins is higher than saponins and carbohydrates .Saponins are the important chemical and justify the use of tubers of this plant and are used as a well-known health tonic, aphrodisiac and galactogogue.

Habit and tuberous roots of this plant.

Chlorophytum (common name spider plant), is a genus of almost

200 species of evergreen perennial flowering plants in the century plant subfamily within the asparagus family.The plants are native to the tropical and subtropical regions of Africa, Australia, and Asia.

They grow to 10–60 cm tall, with a rosette of long, slender leaves 15–75 cm long and 0.5–2 cm broad and thick, fleshy tuberous roots. The flowers are small, usually white, produced on sparse panicles up to 120 cm long; in some species the plants also reproduce vegetatively by means of plantlets, tiny plants that take root on touching the ground.[3]

Chlorophytum tuberosum (Roxb.) Baker

Common name:
Marathi: Kuli
Hindi: Safed-musli
English: Edible Chlorophytum

Identification Guide

General
Chlorophytum tuberosum is a herb usually growing up to 20–50 cm tall. Its underground parts comprise a short rhizome, often surrounded by fibres, which bears swollen roots with dark tubers to up 7 cm long at their tips.

Root tubers
Fleshy, fascicled and directly originate from the stem disc devoid of any fibrous structure. The shape of tubers is cylindrical, the thickness is average 0.9 cm and the length 8cm.The number of tubers varies from plant to plant and on an average 5-30 tubers per plant are observed and slightly tapering towards lower side look like pestle. Due to its extensive use, it is naturally an endangered plant.

Leaves
The leaves are borne in a rosette and are linear-lanceolate, 10–50 cm long and 1–3 cm wide.

Flowers

The flowers are borne in a simple raceme with two flowers at each node. The flowers are large, white, showy and sweetly-scented and there is no differentiation between the petals and sepals (hence known as tepals). *C. tuberosum* is the only species within the genus which has tepals that are more than seven-veined (they are 10–14-veined). The stamens are shorter than the tepals.

Fruits

The fruits are three-edged capsules containing seeds 2 mm in diameter.[1,2]

Habit / Habitat

Chlorophytum tuberosum is a herb usually growing up to 20–50 cm tall. Its underground parts

comprise a short rhizome, often surrounded by fibres, which bears swollen roots with dark tubers to up 7 cm long at their tips.

Occurrence

Chlorophytum tuberosum is widespread from Nigeria to Eastern Tropical Africa. It is also found across central and southern India to Myanmar.

Native:

Cameroon; Central African Republic; Chad; Eritrea; Ethiopia; India; Kenya; Myanmar; Nepal; Nigeria; Somalia; Sri Lanka; Sudan; Tanzania, United Republic of; Uganda"

Edible parts

World wide use: Tuberous root or rhizome

Method of consumption

Medicinal use

Strengthens immunity – In asthma patients it boosts the energy. Roots are used for strengthening the body's immune system.

Pregnancy – The herb is used as nutritive tonic for fetus and mother both. The herb replenishes the fluids of body during parturition.

Obesity – It controls and prevents obesity. It also helps in prevention of side-effects related to obesity.

Diabetes – The herb is an effective cure for arthritis and diabetes.

Leucorrhea – The herb is used in treatment of chronic leucorrhea and prevents premature ejaculation.

Consumption of this herb increases HDL (or production of good cholesterol).

Regular intake of the herb reduces hepatic lipid profiles and plasma.

Nutritional and medicinal information

Safed Musli has very good Ayurvedic medicinal use. It is rich source of over 25 alkaloids, vitamins, minerals, proteins, carbohydrates, steroid, seponins and polysaccharides etc. A number of Health tonics (Sexual tonics) are prepared from Safed Musli.[3,4]

Used for Sexual weakness, low libido, low sperm count etc. It is also found to be effective as a energetic one in cases of cough and asthma. Primarily used as a tonic and rejuvenative for the reproductive system. For premature ejaculation, impotence, low sperm count in men. Also used in chronic leucorrhoea. Useful during pregnancy as a nutritive tonic for mother and fetus. Post-partum it replenishes lost fluids, prana, ojas and improves the quantity and flow of breast milk.

Harvesting and preserving

The wild collection of *Chlorophytum tuberosum* in Africa is likely to be minimal, and therefore not considered to be a threat there. However, *C. tuberosum* is collected from the wild in India, where it is heavily used, and not cultivated, so that over-harvesting could affect wild populations there. Consequently, it is increasingly considered as 'rare' in India. *Chlorophytum* roots are usually collected before plants have reached maturity, thus hampering natural regeneration.

Other uses

Chlorophytum tuberosum is cultivated as an ornamental for its large, showy flowers. Its leaves and roots are edible. In India the roots are dried and used as a popular tonic and aphrodisiac in Ayurvedic medicine. In northern Nigeria its tubers are crushed to produce a lotion used to treat guinea-worm.

It increases the lactation in the feeding mothers.

It is useful in treatment of problem of white discharge.

It cures knee pains within a week if taken daily with milk.

It is herbal and has no proven side effects when taken in recommended doses.

It promotes balance or homeostasis.

It increases alertness, mental ability, intelligence and sexual characters.

It checks veganism's and vaginal dryness.

It has anabolic effect on body and helps in weight gain and development of body muscles. It can be taken as body building supplement."

Research Methodology

Collection and identification of plant materials

The plant materials were collected from in and around Jhalawar district of Rajasthan during the rainy season for correct botanical identification. Efforts were made to collect the plants in flowering and fruiting condition for the correct botanical identification.

Thin (25μ) hand cut sections were taken from the fresh tuberous roots, permanently double-stained and finally mounted in Canada balsam as per the plant microtechniques method

of Johansen. The macroscopic evaluation was studied by the method of Trease and Evans and Wallis.

Histochemical study

The thin transverse sections of fresh root were taken (about 25µ). It was treated with respective reagent for the detection and localization of chemicals in the tissues as per the method of Krishnamurthy.

Phytochemical evaluation

Some roots were dried under the shade so as to avoid the decomposition of chemical constituents, powdered in a blender and finally stored in dry air tied containers for phytochemical screening. Ash and percentage extractive content was measured by following the standard pharmacopoeial techniques.

Results and Discussion

Phytochemical studies

The tuber had a total ash content of 12.6%, the acid insoluble ash being 5.6% .The values of percentage extractives were higher in chloroform and lower in benzene solvent . Fluorescence analysis was carried out to check the purity of the drug. The powder drug was observed in visible light as yellowish brown in color. The powder was treated with nitrocellulose, 1 N sodium hydroxide, 1 N sodium hydroxide in nitrocellulose and dried for 30 min. After this it was observed under ultraviolet light and it emits the color . In HPTLC study, the methanolic extract is ultrasonic for 15 min and filtered. The filtrate is used as an application for saponins and stegmasteroids. For each application 20 µl, 10 µl and 5 µl extracts were used and loaded on instrument comprising of Linomat 5 for application using Densitometer-TLC Scanner 3 with "WINCATS" software (Camag, Switzerland). These studies were carried out on pre-coated aluminum fluorescent plates (E. Merck). The plates were scanned at 254 and at 366 nm[2,8]

The HPTLC analysis showed that the saponins from the *C. tuberosum* root samples gave light yellow bands in visible light and blue bands after derivatization in fluorescence light. The plates were scanned at 254 and 366 nm. When images were compared with the graph and table values, it showed maximum area 31.38% at 366 nm after derivatization. The table also indicates the starting Rf values and end Rf values [Figures;Graph 1–3;Table 1-3].

Analytical studies (Stegmasteroids)

In HPTLC analysis, stegmasteroids revealed white bands in visible light. After derivatization in fluorescence light it showed the dark blue bands. The plates were scanned at 254 and 366 nm. It covered the area 31.27% at 254 nm. The tables also indicate the Rf values for all the peaks scanned by "WINCATS" software

Conclusions

The plant *C. tuberosum* showed the correct taxonomy which is helpful for the standardization of drug; the morphological characters and histochemical study with double staining of the root, percentage extractives, fluorescence and ash analysis and the phytochemical screening of the plant. As in case of saponins and stegmasteroids, the peaks are denoted by the Rf values. These investigations will be useful for the correct botanical identification and authentication of the drug. After getting the overall results of *C. tuberosum* and if data is comparable with the above mentioned species of *safed musali*, it can be used as a substitute for them.

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An overview on immunity enhancer plant *Tinospora cordifolia*

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ABSTRACT

Tinospora cordifolia is a herbaceous vine of the family Menispermaceae indigenous to tropical regions of the Indian subcontinent. It has an importance in traditional Ayurveda medicine used for ages in the treatment of fever, jaundice, chronic diarrhoea, cancer, dysentery, bone fracture, asthma, eye disorder etc. *Tinospora cordifolia* is one herb for all our immunity needs. A variety of phytochemicals have been isolated from different parts of *Tinospora cordifolia.* The aim of this article is to get acquainted with the medicinal properties of *Tinospora cordifolia* and to assess the information about how much research has been done so far on "Giloy". For this article extensive survey of literatures on phytochemical and medicinal properties of *Tinospora cordifolia* has been done.

Introduction

Emergent Health threats have increased human awareness towards health and immunity booster diet to promote resilience to diseases. Infectious diseases are the leading cause of death worldwide. The ever-increasing resistance of pathogens to antibiotics as well as the undesirable side effects of certain antimicrobial agents has necessitated the discovery of novel bioactive compounds. Nature not only provided us food, shelter, clothes but also medicine since ages. India is one of the countries having valuable ethnomedicine with wide variety of plants. Herbal drugs obtained from plants are believed to be much safer this has been proved in the treatment of various diseases (Mathew, 1983). In daily life we are using many herbs like *Piper nigrum, Syzgium aromaticum, Zingiber officinale, Ocimum sanctum, Curcuma longa* etc. In India during this pandemic Covid-19 uses of herbs increased and people are taking "Kadha" to boost their immunity system. One of the most important herbs is *Tinospora cordifolia.* It is a herbaceous vine of the family Menispermaceae indigenous to tropical regions of the Indian subcontinent. Its common name is "Guduchi", "Amrita" (Sanskrit), "Giloy". It has an importance in traditional Ayurveda medicine used for ages in the treatment of fever, jaundice, chronic diarrhoea, cancer, dysentery, bone fracture, asthma, eye disorder etc. *Tinospora cordifolia* is a versatile resource for all forms of life. *Tinospora cordifolia* plant extracts contains various phytochemicals or active compounds, including alkaloids, phytosterols, glycosides and mixed other chemical compounds. Therefore, more scientific research should be there with aspects how the active compounds actually interacts with the living systems. Public awareness towards medicinal plants is very necessary for the conservation and sustainable use.

Objectives

- To get acquainted with the medicinal properties of *Tinospora cordifolia.*
- To assess the information about how much research has been done so far on Giloy.
- To promote its importance because it is a one herb for all our immunity needs

Material and Method

Review of literature on phytochemical and medicinal properties of *Tinospora cordifolia*

Result

Common names:

Latin: *Tinospora cordifolia* (willd.) Hook.F. & Thomson

English: Gulancha/ Indian tinospora

Sanskrit: Guduchi, Madhuparni, Amrita, Chinnaruha, Vatsadaani, Tantrika, Kundalini & Chakralakshanika.

Hindi: Giloya, Guduchi

Bengali: Gulancha

Telugu: Tippatiga

Tamil: Shindilakodi

Marathi: Shindilakodi

Guajarati: Galo

Kannada: Amrita balli

Botanical description:

Tinospora cordifolia (willd.) belongs to the family Menispermeaceae, and it is a large, glabrous, deciduous climbing shrub found throughout India. The stem structure is fibrous, and the transverse section exhibits a yellowish wood with radially arranged wedge shaped wood bundles containing large vessels, separated by narrow medullary rays. The bark is creamy white to grey, deeply left spirally and stem contains rosette like lenticles. The leaves are membranous & cordate in shape. Flowers are in axillary position, 2-9cm long raceme on leaflet branches, unisexual, small and yellow in colour. Male flowers are clustered, and female are usually solitary. The seeds are curved. Fruits are fleshy and single seeded. Flowers

grow during the summer and fruits during the winter (BV Shettyet al., 2010). Taxonomic description: The *T.cordifolia* comes under the Class- Magnoliopsida, Order- Ranunculaceae and belongs to the family – Menispermeaceae. The species is widely distributed in India, extending from the Himalayas down to the southern part of Peninsular India. It is also found in neighbouring countries like Bangladesh, Pakistan and Srilanka. The plant is also reported from South East Asian continent such as Malaysia, Indonesia and Tamilnadu etc.

Habitat: *Tinospora cordifolia* (willd.) prefers wide range of soil, acid to alkaline and it needs moderate level of soil moisture. Found throughout tropical India, ascending to an altitude of 1000 feet, and in South Asia, Indonesia, Phillipians, Thailand, Myanmar, China and in Srilanka worldwide.

Phytochemicals present in *Tinospora cordifolia*

Tinospora cordifolia plant extracts contains diverse phytochemicals or active compounds, including alkaloids, phytosterols, glycosides and mixed other chemical compounds. Columbine, tinosporaside, jatrorrhizine, palmatine, berberine, temoeterine, tinocardifoliside, phenylpropene disaccharides, choline, tinospora acid, tinosporin and tinosporide have been isolated from *Tinospora cordifolia*.

Health benefits of *Tinospora cordifolia.*

Tinospora cordifolia is an Immune booster herb. It has Antioxidant, Anti diabetic, Anti-ageing, Anti-microbial, Anti-osteoporotic, Anti-inflammatory, Anti-arthritic, Anti-allergic, and Immunomodulatory properties. It reduces Asthmatic Symptoms, stress and anxiety. It is also use in treatment of Arthritis and chronic Anaemia, jaundice, normalization of altered liver functions.

Discussion

Literature survey reveals that secondary metabolites present in the plants. The most important of these bioactive constituents are phenolic, flavonoids, alkaloids and tannins. There is a plenty of scientific evidence that it has many anti-disease effects, like Immunomodulatory effects of *Tinospora cordifolia* on macrophages activation, control of glycemic level in patients with diabetes mellitus, antibacterial activity of synthesized silver nanoparticles etc.

Conclusion

The present situation of corona virus pandemic demands an urgent need for the development of more products based on natural resources. Now it’s time to promote Indian Ayurveda knowledge and lay emphasis on research. *Tinospora cordifolia* is a versatile resource for all form of life. Studies need to be conducted with aspects how the active compounds actually interact with the living systems. There should be more conservation strategies for restoration of germplasm of such an economically important medicinal plant.

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Floristic Inventry of Tree Species in Janki Devi Bajaj Government Girls College, Kota, Rajasthan

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Abstract

Rapid urbanization and industrialization are the major driver of pollution, climate change and related problems specifically into and around the cities. In the past few years urban plantation received much attention in mitigating effects of climate change and pollution yet green cover of the cities is rapidly degrading. Urban forest or urban green spaces includes trees in gardens, institutions, parks, and along the streets, roads, canals etc. and contribute to verdancy of the city. Current study aims to enumerate the tree species diversity of Janki Devi Bajaj Government Girls College, Kota. It is the largest girl's college with science subject in Hadoti region. The study enumerated 849 trees belonging to 43 tree species in the campus. The most dominant species was *Syzygium cumini* (L.) with 163 individuals and Fabaceae was most dominant family with 11 species.

Key words: Urban plantation, diversity

Introduction

Cities are major contributors in the economic growth and development of any country. In today's time urban areas share close to half of India's gross domestic product; but the rapid urbanization is major driver of global climate change, driving land use change, habitat loss, biodiversity decline, climate change, and pollution both within and outside the city (Satterthwaite et al, 2010). Raise in the greenhouse gas emission like carbon dioxide, methane, nitrous oxide is the main problem giving rise to other problems like increase in global temperature etc. Atmospheric carbon dioxide concentration can be reduced by either reducing demand for energy, altering the usage of energy or by increasing the rates of carbon sequestration by tress which can reduce atmospheric carbon dioxide naturally. In the past few decades urban forests received much attention in mitigating climate change and reducing biodiversity loss; but urban green areas decrease in recent decades yet because of urban expansion for urban development and population growth.

Trees in gardens, parks, and along the streets, roads, canals etc. contribute to verdancy of the city; and are included in term urban forest and urban green spaces (Ugle et al., 2010). These

patches of vegetation provide a range of ecosystem services like improvement of air quality (Singh et al., 2018), mitigating noise pollution, conserving biodiversity, regulating microclimate, soil stabilization, recharge ground water, prevent soil erosion, and carbon Sequestration (Shah & Gavali, 2017). Cultural services provided by these areas include spiritual and religious, recreation, ecotourism, and aesthetic (Chang et al., 2017). Various scientists have pointed out the role of urban green spaces in limiting the city's carbon footprint (Strohbach et al., 2012). The vegetation and soil of these green spaces not only contributes directly in reduction of atmospheric CO_2 but also affect the carbon balance indirectly by their effects on urban energy balance and thus on CO_2 emissions related to energy use (Churkina, 2012).

Forests or green patches within academic institutions in cities and are part of the urban forests. Such forest can play an important role in supporting ecological conditions in an era of climate change and biodiversity loss. The maximum benefit of these spaces largely depends on judicious selection of an appropriate and diverse mix of tree species and their proper management in the urban areas (Bhalla & Bhattacharya, 2015; Singh et al., 2017). Most of the universities/ institutions are losing its green spaces for the need of spaces for new buildings, parking and off campus housing areas. In such case monitoring and management of vegetation within these landscapes become very important. Most of the universities around the world are now focusing towards the establishment of a green infrastructure as an option of sustainable development.

The current study focuses on the natural vegetation of tree species in Janki Devi Bajaj Government Girls College, Kota.

Methodology

Study Area

The study was conducted in the Janki Devi Bajaj government Girls College, Kota. The campus of this college was established in 1958 and is the largest girl's college with science subject in hadoti region. The campus covers a total area of 57.47 acres. The geographical location of this college is 25.179324° N and 75.853915° E. Kota is situated in south eastern Rajasthan along the bank of river Chambal. The college received its name after independent activist and social reformer Padam Vibhushan Smt. Janki Devi Bajaj who donated the land for present campus.

The city experiences cold winters and warm summers, with a temperature ranging from a maximum of 48 °C to a minimum of 9°C. It receives very little rainfall throughout the year with an average of around 728 mm per year. The city has witnessed extensive urbanisation of the years, with a number of high-rise buildings, corporates and industries.

Material and methods:

All the tree individuals in the college campus were identified and measured by girth of individual trees at breast height (1.37 m) using measuring tape. Field data was recorded in spreadsheets, individuals were classified into 6 classes depending on their respective GBH viz. sapling (10-13 cm), bole (32-66 cm), post bole (67-101 cm), mature (102- 136 cm), over mature (137- 171 cm), and old (>171 cm). Species level identification of trees was done through visual observation and the doubtful samples were collected and stored in herbarium for later identification by subject experts from department of botany. Shrubs and herbs were not recorded.

Table 1: Floristic inventory of tree species in Janki Devi Bajaj Government Girls College, Kota.

S. no.	Species	Family	Total Basal Area(cm^2)	Total individuals
1	*Acacia nilotica* (L.) Willd. Ex Delile	Fabaceae	14756.04	85
2	*Aegle marmelos* (L.) Correa	Rutaceae	1503.58	4
3	*Albizia lebbeck* L. Benth.	Fabaceae	2567.61	5
4	*Alstonia scholaris* (L.) R. Br.	Apocynaceae	1040.99	7
5	*Azadirachta indica* A. Juss.	Meliaceae	12796.41	20
6	*Bauhinia variegata* (L.) Benth.	Fabaceae	6140.92	14
7	*Bombax ceiba* L.	Malvaceae	375.69	6
8	*Caryota urens* L.	Arecaceae	1874.84	7
9	*Cassia fistula* L.	Fabaceae	1343.5	4
10	*Cassia siamea* Lam.	Fabaceae	6507.64	13
11	*Citrus limon* (L.) Burm. f.	Rutaceae	59.83	3
12	*Collistemon citrinus* (Curtis) Skeels [es]	Myrtaceae	7279.63	9
13	*Cordia dichotoma* G.Forst.	Boraginaceae	1368.76	8
14	*Crateva religiosa* G.Forst.	Capparaceae	226.34	3
15	*Dalbergia sissoo* Roxb.	Fabaceae	7391.21	25

16	*Delonix regia* (Boj. Ex Hook.) Raf.	Fabaceae	2574.12	6
17	*Eucalyptus obliqua* L'Her.	Myrtaceae	71501.18	97
18	*Ficus benghalensis* L.	Moraceae	42752.95	11
19	*Ficus religiosa* L.	Moraceae	17203.65	13
20	*Guazuma ulmifolia* Lam.	Malvaceae	1271.99	8
21	*Holoptelea integrifolia* (Roxb.) Planch.	Ulmaceae	2606.04	12
22	*Jatropha curcus* L.	Euphorbiaceae	113.83	5
23	*Lagerstroemia indica* L.	Lythraceae	2062.02	6
24	*Mangifera indica* L.	Anacardiaceae	9482.17	7
25	*Manikara hexandra* (Roxb.) Dubard	Sapotaceae	229.48	3
26	*Mitragyna parvifolia* (Roxb.) Korth	Rubiaceae	13344.59	32
27	*Morus alba* L.	Moraceae	39.9	2
28	*Neolamarckia cadamba* (Roxb.) Bosser	Rubiaceae	1842.11	5
29	*Peltophorum pterocarpum* (DC.) K.Heyne	Fabaceae	24603.11	29
30	*Phoenix sylvestris* (L.) Roxb	Arecaceae	94828.34	121
31	*Phyllanthus emblica* L.	Phyllanthaceae	1649.75	4
32	*Phyllanthus reticulatus* Poir.	Phyllanthaceae	50.74	2
33	*Pithecellobium dulce* (Roxb) Benth.	Fabaceae	102.61	4
34	*Plumeria pudica* Jacq.	Apocynaceae	533.42	7
35	*Polyalthia longifolia* (Sonn.) Wall.	Annonaceae	447.37	16
36	*Pongamia pinnata* (L.) Pierre	Fabaceae	4128.02	11
37	*Ricinus communis* L.	Euphorbiaceae	310.86	44
38	*Streculia foetida* L.	Malvaceae	2471.65	7
39	*Syzygium cumini* (L.) Skeels.	Myrtaceae	141018.9	163
40	*Tabernaemontana divaricata* R.Br. Ec Roem. & Schult.	Apocynaceae	100.09	5
41	*Tamarindus indica* L.	Fabaceae	7653.1	3
42	*Tectona grandis* L.f.	Lamiaceae	4248.808	5
43	*Ziziphus mauritiana*	Rhamnaceae	3705.09	8
		Total	516108.8	849

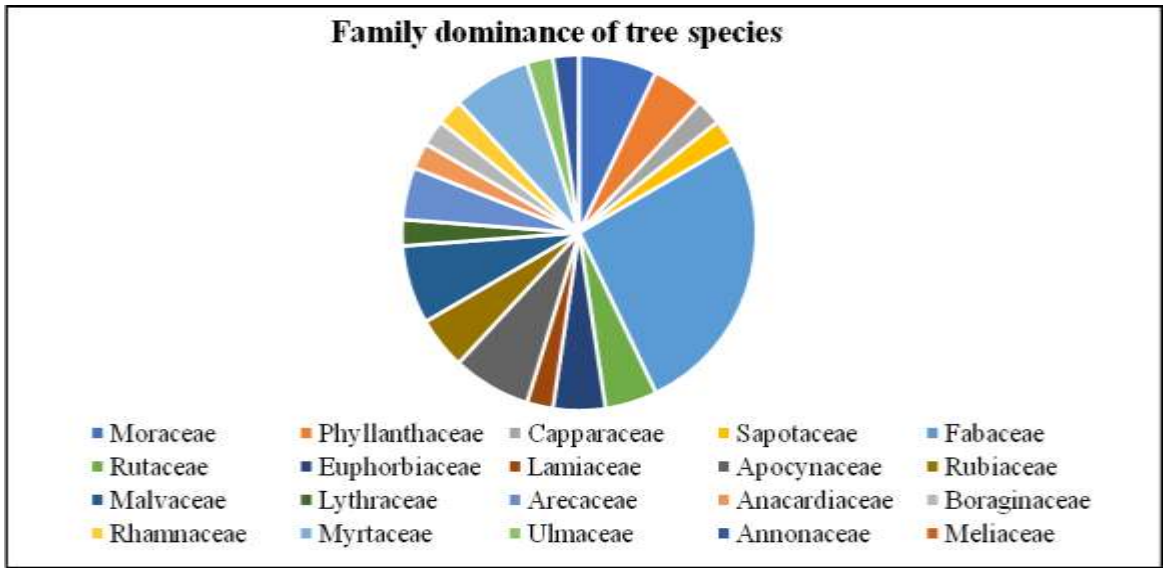

Figure 1: Family dominance of tree species in Janki Devi Bajaj Government Girls College, Kota

Result and discussion:

From the present study it was found that the campus is endowed with a diverse tree species in a naturally regenerating green patch. Present study enumerated total 849 trees belonging to 43 tree species in the campus. The most dominant species was *Syzygium cumini* (L.) Skeels with total 163 trees followed by *Phoenix sylvestris* (L.) Roxb (121 trees) and *Eucalyptus obliqua* L'Her (97 trees). Fabaceae of all the 20 tree families is most dominant with 11 tree species followed by Moraceae, Apocynaceae, Malvaceae, and Myrtaceae with 3 species each while the least dominant families were Capparaceae, Sapotaceae, Lamiaceae, Lythraceae, Anacardiaceae, Boranginaceae, Rhamnaceae, Ulmaceae, Annonaceae, and Meliaceae each representing single species. 50% of the families are monotypic i.e. are represented by a single family and Fabaceae accounts for almost 26% of total tree species.

Out of the categories we divided individuals into saplings are dominating with 291 individuals followed by post bole, 232 individuals; bole, 161; mature, 90; old, 54; and very mature, 21 individuals. These results indicate that the campus successfully saved some of its oldest trees while some of these were sacrificed in storms during past few years as reported by guards. A comparatively higher number of saplings indicated good regeneration status of the campus which means that the campus has little or no disturbance at all and the vegetation lies here can regenerate naturally.

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Allergic Effects of *Alstonia scholaris* in Urban forest

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ABSTRACT

The severity of allergies caused by *Alstonia scholaris*, commonly called the "Indian devil tree" or "Saptparni," has grown in recent years. This abstract presents a study on allergic reactions associated with *Alstonia scholaris* exposure in Alwar City to better management of urban forests and urban planning in the city.

Alstonia scholaris is a deciduous tree native to tropical and subtropical regions. This tree has medicinal properties and is used in treatment of variety of diseases in traditional system of medicine. However, its allergenic potential has gained attention in recent times. Allergic reactions to *Alstonia scholaris* mainly occur through the ingestion or inhalation and skin contact with airborne allergens from this tree.

The allergenic components of *Alstonia scholaris* are still under study, but studies have suggested that proteins and glycoproteins found in various parts of the plant such as pollen may trigger immune responses in susceptible individuals. Common allergic reactions are itching, skin rashes, hives, and respiratory symptoms like coughing, sneezing, and wheezing. It is rare but in severe cases, anaphylactic reactions have been reported.

This study highlights the importance of understanding the allergenic potential of *Alstonia scholaris* in Alwar City to prevent and manage allergic reactions effectively. Individuals living in regions where *Alstonia scholaris* is prevalent should be aware of its potential to cause allergic responses. Further research is needed to elucidate the specific allergens responsible for these reactions for effective management and planning of urban forests in the city

In conclusion, allergies caused by *Alstonia scholaris* pose a significant health concern. A deeper understanding of the allergenicity of this plant and the development of proper planning and methods to introduce urban trees in the city are vital in providing better health to individuals in the city and promoting public awareness.

Key words: Alstonia scholaris, Allergy, Allergens, Urban forest

Introduction

Alstonia scholaris, commonly known as the "Indian Devil Tree" or "Saptaparni," is a tropical tree found in various regions across Asia and South Asia, including India, Malaysia Sri Lanka, and Thailand etc. This tree has been known since old times for its medicinal properties and is mostly used in traditional systems of medicine for treating various diseases. However, it has beneficial aspects but allergic reactions have been reported associated with *Alstonia scholaris*. Allergies occur when the immune system responds excessively to a foreign substance known as an allergen. *Alstonia scholaris* have the potential to function as an allergen and trigger allergic reactions in susceptible individuals. This is because certain proteins or compounds are present in its leaves, bark, flowers, or other parts.

There is a lack of extensive research on the allergic potential of *Alstonia scholaris*, and there is a lack of studies specifically examining its allergenicity. However, there have been reports and case studies indicating a connection between exposure to this tree and allergic symptoms. An example of such a case study was published in the Indian Journal of Dermatology, which suggested a rare occurrence of allergic contact dermatitis caused by *Alstonia scholaris*. The study focused on the significance of acknowledging this plant as a possible allergen and advised being careful when interacting with its different parts this study also emphasizes the need for further research in this area and on this plant.

Another study published in the Asian Pacific Journal of Tropical Biomedicine documented respiratory allergies caused by *Alstonia scholaris* pollen. The *Alstonia scholaris* tree has a rich history of medicinal use, but it has been associated with causing allergic reactions in some individuals. While further research is necessary to fully understand the extent and mechanisms of these allergies, it's important for healthcare providers and individuals to recognize the potential for allergic reactions to this plant. A study by Sharma et al. Entitled "Prevalence of pollen allergy to *Alstonia scholaris* in patients with allergic rhinitis", published in the Indian Journal of Otolaryngology and Head & Throat Surgery studied the frequency of sensitization to *Alstonia scholaris* pollen in patients with allergic rhinitis in India. A recent research article titled "Airborne Pollen Survey and Allergological Study in Karnataka, South India" by D'Souza and colleagues, and published in the Indian Journal of Aerobiology, documented the prevalence of airborne pollen in various regions of Karnataka state. The study showed that during certain periods of the year, pollen from *Alstonia scholaris* can exacerbate allergy symptoms in susceptible individuals and is mainly an airborne allergen.

The present paper regarding allergies caused by *Alstonia scholaris* is mainly focused on urban trees which are present in Alwar city of Rajasthan and their effect on the life of residents of the city. In my research, I found many trees which have the potential of causing health hazard but the prevalence and their number in a particular area and the population of that area is deciding factor in my study *Alstonia scholaris* tree is present in high number in

some area and causing allergies as suggested by allergy clinics and pulmonologist and patients. Therefore, my study of urban forestry in Alwar City focused on planning and better management of urban trees by proper and planned introduction of trees in the city and managing trees that are already causing problems to give the city and its resident a healthy environment to live.

Research Methodology

* Observation and data collection during the field study of *Alstonia species* in different areas of Alwar City. An assessment of the number of *Alstonia species* in different areas.

* Data collection on allergies caused by urban trees, especially *Alstonia species*, seasonal variability of allergies, and disease symptoms from healthcare professionals and allergy clinics.

*· Collection of data from many individuals to determine the prevalence of allergies due to urban trees. In this study, we are referring to *Alstonia species* although other trees are there in Alwar City which are causing allergies and other diseases but their study is still not completed.

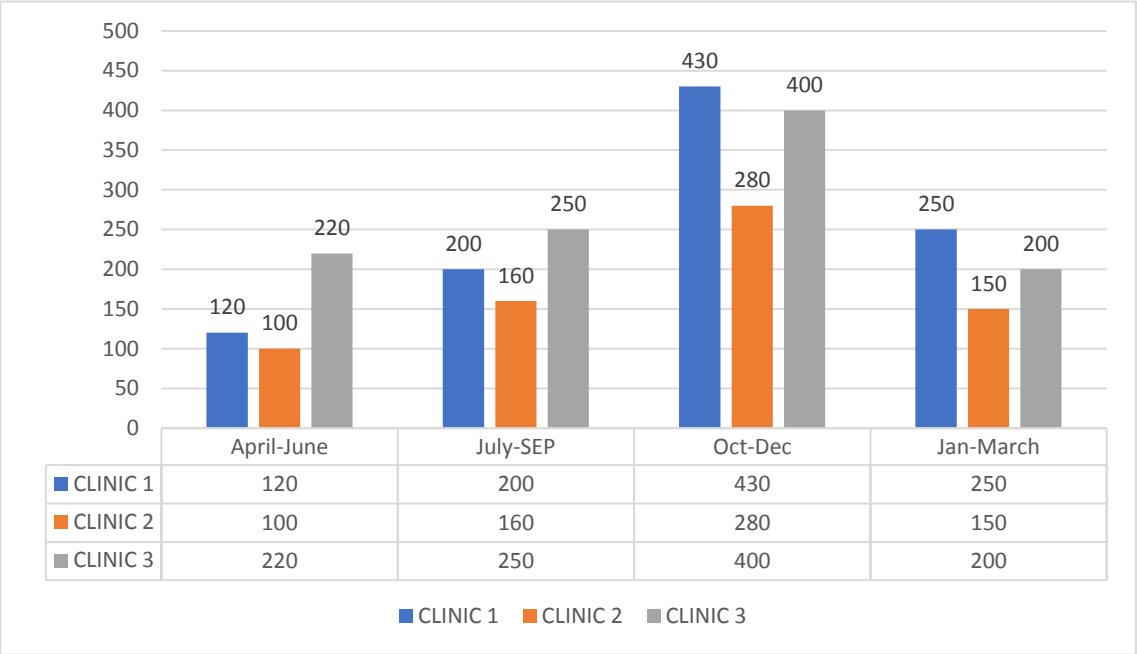
Result and Discussion

Alstonia species may contain various chemical compounds called allergens like pollen proteins that cause allergy to individual that are susceptible. However, the symptoms and severity are different for different individuals.

The common symptoms which are reported by patients and also by pulmonologists and other allergy clinics and doctors are sneezing, skin rashes, nasal congestion, itching, redness of the nose and eyes, and asthma-like coughing, etc. depending on exposure like inhalation, skin contact, and also depend on time and season of exposure.

The prevalence of symptoms also depends on the climate of the region and season and the susceptibility of individual. It is possible for an individual to be hypersensitive to more than one tree species, which may result in symptoms of allergy to a species containing similar chemical compounds.

To further make this study strong a live example came during the study in which a resident of Ambedkar Nagar in Alwar City has a nine-year-old daughter who has a sneezing problem and his father took her to a pulmonologist who asked about trees in their surroundings and school etc. After several visits, he came to know that *Alstonia species* is growing just outside their home so he suggested removing the tree after removal, the patient who is a nine-year-old girl had very less sneezing problems as told by the doctor and the patient both.



Based on the data, it's evident that patients visit three allergy clinics in Alwar City throughout the year. The highest number of allergy patients visits during the winter season coincides with the flowering of *Alstonia species*. This suggests that the species could be one of the reasons for allergies, although other factors such as prevalence, season, and patient susceptibility also play a role.

To gain a more comprehensive understanding of Alstonia-related allergies, it would be beneficial to conduct large-scale surveys and collect data from various regions and climates. Longitudinal studies tracking reactions to Alstonia exposure over multiple seasons and years could reveal patterns and determine the long-term effects of allergen exposure. The study provides evidence that *Alstonia species* may contain allergenic compounds that cause allergic reactions in susceptible individuals. The severity and prevalence of symptoms are influenced by factors such as climate, season, and individual susceptibility. The nine-year-old girl's case strengthens the evidence of the potential impact of *Alstonia species* on allergies. Further research and investigation are required to fully understand Alstonia's allergenic properties and its implications for public health.

Conclusion

A thorough understanding of the allergenicity of Alstonia scholaris is crucial in effectively managing and preventing allergic reactions in Alwar City. Individuals living in areas where this plant is prevalent must be aware of its potential to cause allergies. It is imperative to conduct further research to identify the specific allergens responsible for the reactions and to plan and manage urban forests in the city accordingly.

This study is a valuable resource for urban planning and forest management in Alwar City, ensuring a healthy environment for its residents and promoting public awareness about the potential health risks of Alstonia scholaris. The findings of this research underscore the importance of considering the allergenic potential when introducing and managing urban trees, contributing to better public health in the city.

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Ethnobotanical importance of medicinal plants with particular reference to Rajasthan and conservation of these plants

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Abstract

Since ancient times, it is well known that plants can cure many life-threatening diseases. The use of plant parts for medicinal purposes is very common among tribes. Although, this practice is depleting daily and may lose essential knowledge among future generations. So preservation of this knowledge is essential to spreading the scientific basis for using plants for medicinal purposes. The medicinal properties of plants are due to the presence of many phytochemicals such as flavonoids, phytosterols, terpenoids, alkaloids, etc. This review is based on traditional knowledge of ethnomedicinal plants in India, particularly Rajasthan. We also focused on the threat and conservation strategies of these ethnomedicinal plants.

Keywords: *ethnomedicinal plants, phytochemicals, threat, conservation, etc.*

Introduction

Medicinal plants have been used countless times to cure diseases, mainly in developing countries. They are readily available with little to no side effects compared to modern medicine (Laldingliani *et al*., 2022). Traditional knowledge is gaining more and more credibility as a solution to the issues of primary healthcare services and natural resource management on a global scale, as a growing body of research backs it up (Ragupathy & Newmaster, 2009). However, the societal dominance of Western medicine and a lack of due recognition to the stakeholders of biological resources, place, and value of traditional knowledge base have been impeding the entry of traditional medicine into mainstream healthcare services and its related field of human welfare, such as nutrition, environmental assessment, and natural resource management. This has been a barrier for traditional medicine to enter mainstream healthcare services and its related field of human (Usher, 2000).

It has been determined that medicinal plants still play a vital role in the primary healthcare of this local community. Traditional medicines also have the potential to form the basis of pharmaceutical drugs for treating various diseases. Further, the information requires validation for further clinical usage (Sahu *et al*., 2023).

According to a survey by the World Health Organisation (WHO), more than 80 percent of the world's population relies directly on natural diversity and its related traditional system of medicine for their primary healthcare needs (WHO, 2000). Even though traditional medical practices are based on anecdotal evidence, it is estimated that over 200 million people in India, many of whom have limited access to organized primary healthcare service centers, rely on various components of traditional systems of medicine to meet their healthcare requirements (Farnsworth, 1998). India has a complex social, cultural, and regional tradition of indigenous medical heritage, which has been passed down uninterruptedly over the course of several millennia, giving it global legitimacy in this regard. Despite the fact that this particular type of medical legacy dates back quite a few centuries, numerous millions of people in rural and isolated areas of this subcontinent continue to rely on traditional methods of medicine to meet their needs in terms of healthcare (Jain, 1967).

For both their means of subsistence and their medical care, indigenous peoples living in isolated areas are reliant on the forest because of its vast Biodiversity in plant and animal life (Chopra *et al*., 1986). Since ancient times, they have been treating illnesses with medicinal plants instead of conventional pharmaceuticals. On the other hand, there needs to be more reliable scientific data regarding the application of ethnomedicinal plants. Recent experiments conducted by Schmidt *et al.* (2009) demonstrated conclusively that plants provide a vast amount of opportunity for researchers who are attempting to validate traditional claims in order to produce novel medications. Since there has been a growing interest in traditional medicine all over the world, particularly in poor countries, ethnobotanical studies have become increasingly popular as a means of investigating the traditional knowledge that exists there (Joshi & Joshi, 2000). Therefore, the gathering of ethnobotanical information and the documentation of traditional knowledge has become more important with regard to the development of drugs (Ragupathy *et al*., 2008).

More than 427 different tribal clans may be found in India, each with its own unique indigenous traditions. The old knowledge base and practices, on the other hand, have been pushed to the background due to political and socioeconomic factors. In recent years, there

has been a rise in interest in traditional medicine, and ethnobotanical studies have been launched in order to investigate the knowledge base held by diverse ethnic groups located all throughout the country (Pei, 2001; Jain & Patole, 2001; Sandhya *et al*., 2006; Ignacimuthu *et al*., 2006; Ragupathy & Newmaster, 2009). According to the findings of a number of studies, the indigenous people who live in remote areas not only rely on plant-based resources for things like medicine, food, forage, and fuel, but they also play an essential part in the administration of natural resources (Ignacimuthu *et al*., 2006; Ragupathy *et al*., 2008; Ragupathy & Newmaster, 2009).

Rajasthan is one of the largest states in India. About 12.44% of the population belongs to tribes such as the Bhil, Bhil-Meena, Damor, Dhanka, Garasia, Kathodi, Kokna, Kolidhor, Naikara, Patelia, Meena, and Seharia and reside in remote areas devoid of basic infrastructure facilities. Nomadic tribes (Banjara et al.) further enrich the ethnic heritage of Rajasthan. These ethnic groups are widely distributed throughout the state and have considerable communication with each other. As a result, most of the ethnobotanical information is passed from one group to the other. Although the flora of Rajasthan has been compiled by Bhandari (1990) and Sharma (1993), detailed information about their medicinal properties is lacking. The present review highlights the importance of ethnomedicinal plants from different regions of Rajasthan.

In recent times, the use of traditional herbal medicines in healthcare has declined, particularly amongst the rural population. This implies a risk of losing vital information from previous generations regarding plants and their use in traditional medicine (Kumar *et al*., 2021). So, it is necessary to conserve this traditional knowledge for the future.

Ethnobotanical Status in Rajasthan

The plants have become the never-ending source of new biodynamic compounds of potential therapeutic value. Ethnobotanist brings out from the field the suggestion as to which raw plant material may be tapped, and for this, he gets clues from the tribals.

The tribals who depend on forest (mostly their surrounding vegetation) wealth are the real custodians that safeguard the medicinal plants till now. Rapid deforestation caused by over–harvesting and exploitative trade of medicinal plants has significantly reduced the availability of medicinal plants in arid and semi-arid zones. Generally, the folk people are well

acquainted with the medicinal properties of their surrounding vegetation, particularly for their well-being (Mishra & Kumar, 2001).

Nowadays, natural products and herbal medicines have been recommended for the treatment of diabetes (Gupta & Kumar, 2002). Over 50 plants are present in the arid zone of Rajasthan, having anti-diabetic potentials (Menghani & Ojha, 2010). In the Dang region of Rajasthan, 36 plant species are used as cooling agents during summer (Sharma & Khandelwal, 2010). An extensive survey of the southern part of Rajasthan, including Chittorgarh, Udaipur, Banswara, and Dungarpur districts, was made to document the traditional knowledge of medicinal plants used by tribal communities (Meena & Yadav, 2010).

The tribals who depend on forest (mostly their surrounding vegetation) wealth are the real custodians that safeguard the medicinal plants till now. Rapid deforestation caused by over–harvesting and exploitative trade of medicinal plants has significantly reduced the availability of medicinal plants in arid and semi–arid regions of Rajasthan. For sustainable development, the in-situ strategy of conservation is needed.

About 610 species of medicinal plants have been used by 42 lakhs population of tribals of Rajasthan (Singh & Pandey, 1998). Rajasthan, where 80% of its people live in rural areas and cannot afford costly medicine. They depend on the vegetation surrounding them and make perfect use of them for their medicinal needs. A floristic survey of ethnomedicinal plants occurring in the tribal area of Rajasthan was conducted to assess the potentiality of plant resources for modern treatments. A large number of medicinally important tree species are present on the Aravalli hill range and other areas, including less hospitable North–West Rajasthan. An attempt was made to characterize tree species of the region, and detailed ethnobotanical studies on them are in progress. In a floristic survey, 61 ethnomedicinal plant species belonging to 38 families were recorded from the Aravalli hills of the Mewar region of Rajasthan (Katewa *et al*., 2004; Katewa, 2009). Ethnomedicinal uses of Biodiversity from the Tadgarh-Raoli wildlife sanctuary of Rajasthan were reported by Jain *et al.* (2007). An ethnobotanical survey of the Sariska and Siliserh regions from the Alwar district was reported by Jain *et al.* (2009). A categorical list of plant species along with their plant part/s used and the mode of administration reported to be for effective control of different ailments is prepared.

Table 1 represents the plant of Rajasthan which is commonly used to treat various ailments.

Table 1: Details of ethnomedicinal plants in Rajasthan.

S. No.	Name of plant	Used part	Medicinal uses
1.	***Azadiracta indica* A. juss**	All plant parts	Anti-inflammatory, anti-oxidant, anti-diabetic, anti-microbial, antimutagenic, anti-carcinogenic, etc.
2	***Sida acuta* Burm. f.**	Roots	Neurological disorders, headache, diabetes, malaria, rheumatic problems, asthma, etc.
3	***Calotropis procera***	Leaves	Sinus fistula, skin diseases, diarrhea, jaundice, etc.
4	***Ricinus communis***	Seeds	Abdominal disorders, muscular pain, arthritis, menstrual cramps, insomnia, the expulsion of the placenta, etc.
5	***Withania somnifera***	Roots	Cancer, anxiety, microbial infections, neurodegenerative diseases, immunomodulation, etc.
6	***Argemone Mexicana***	Leaves, flowers	Skin diseases, jaundice, leprosy, microbial infections, malaria, etc.
7	***Ocimum sanctum***	Leaves	Microbial infections, cold, cough, fever, hepatic problems, diabetes, etc.
8	***Hemidesmus indicus* L.**	Roots	Skin disorder, leprosy, fever, asthma, urinary disorders, etc.
9	***Abrus precatorius***	Leaves	Tetanus, rabies
10	***Hygrophila auriculata***	Seeds, roots	Jaundice, edema, gout, kidney infections, etc.

11	***Vitex negundo***	Leaves and roots	Diabetes, cancer, microbial infection, inflammation, etc.
12	***Acacia catechu* Willd.**	Hartwood	Inflammation, free radical damage, etc.
13	***Acanthospermum hispidum***	Leaves and flowers	Jaundice, malaria, vomiting, abdominal pain, etc.
14	***Aegle marmelos* Correa. Bel**	Fruit, leaves	Fever, viral infections, bacterial infection, infertility, inflammation, etc.
15	***Barleria cristata* L.**	Flower leaves, stem	Toothache, inflammation, anemia, snake bite, etc.
16	***Cassia fistula* L.**	Roots	Joint pain, migraine, chest pain
17	***Commiphora wightii* (Arn.) Bhandari**	Stem	Arthritis, rheumatism, urinary disorders
18	***Crinum defi*ned Ker-Gawl**	Leaves	Inflammation, ear pain
19	***Emblica* Officinalis**	Fruits	Inflammation, diabetes, microbial infections, free radical damage, etc.
20	***Holoptelea integrifolia***	Stem bark	Swelling, skin diseases, digestive fire
21	***Tinospora cordifolia***	Leaves stem	Fever, malaria, jaundice, bone fracture, skin diseases, snake bite, etc.
22	***Tribulus terrestris***	Whole plant	Chest pain, heart issues, skin diseases, kidney stones, low sperm count
23	***T. bellirica* (Gaertn.) Roxb.**	Fruits	Hepatitis, bronchitis, piles, diarrhea, cough, cold, etc.

24	***Mucuna pruriens* Baker**	Roots	Male infertility, urinary problems, fever, etc.
25	***Terminalia arjuna***	Stem bark	High Blood pressure, heart problems, diabetes, etc.
26	***Hibiscus rosa sinensis***	Flowers	To enhance hair growth
27	***Cissus quadragulasis***	leaves	Rheumatoid arthritis
28	***Nyctonthes ambergris***	Whole plant	As a laxative, rheumatism, skin ailment
29	***Bacopa monnieri***	leaf	Brain related disorders
30	***Sesame indicum***	seeds	Blood purification
31	***Taraxacum officinale***	leaves	Diuretic, anti-inflammatory, choleretic
32	***Cymbopogen citrus***	leaves	Antispasmodic, hypotensive, antoconvulsant, antirheumatic
33	***Matricaria recutila***	flower	Insomnia, anxiety, digestive upsets
34	***Saraca asoca***	Bark, flowers	Dyspepsia, fever, burning sensation
35	***Curcuma domestica***	rhizome	Wound healing, anti-microbial
36	***Cassia occidentalis***	Fruit, flowers	Anti-microbial, antidiabetic, anti-inflammatory, anti-cancerous
37	***Centella Asiatica***	Whole plant	Blood purifier
38	***Carissa calendars***	fruits	Digestive problems, enhancing brain

			activity
39	***Dalbergia sissoo***	Leaves	Sore throat, Dysentery, syphilis, hernia
40	***Asparagus racemosus***	root	Anti-fertility
41	***Syzygium cumini***	fruits	antidiabetic
42	***Terminalia catalpa***	leaves	Diarrhea, Dysentery, liver diseases
43	***Merremia gangetica***	leaves	diuretic
44	***Crateva religiosa***	leaves, stembark, roots	Urinary disorders
45	***Ficus virens***	stembark	Antimicrobial, antidiabetic
46	***Euphorbia thymifolia***	Whole plant	Worm infection, stimulant
47	***Ficus religiosa***	bark	Asthma, poor appetite
48	***Vetiveria zizanioides***	root	Nervous and circulatory disorders
49	***Boerhvia diffuse***	Whole plant	Inflammation, diuretic
50	***Manikarna Alexandra***	Fruit	Excess thirst, emaciation
51	***Oxalis corniculata***	Whole plant	Anti-inflammatory, anxiolytic, anti-ulcer
52	***Solanum nigrum***	leaves	Stomach irritation, cramps, spasm, pain
53	***variegate***	Leaves	Anti-microbial, antioxidant

54	***Bombax ceiba***	Whole plant	Pimples, diarrhea, constipation, piles
55	***Euphorbia royleana***	leaves	Rheumatism, sciatica bronchitis
56	***Achyranthes aspera***	Whole plant	Scorpion bite, ophthalmic disease
57	***Arachis hypogaea***	seeds	Anti-inflammatory, decoagulant
58	***Balanites roxburghii***	Whole plant	Cold cough
59	***Barleria priorities***	Whole plant	Dropsy, rheumatism, swelling
60	***Butea monosperma***	Whole plant	Urinary disease, diabetes
61	***Centella Asiatica***	leaf	Skin disease
62	***Cissampelos barrier***	Root, bark	Hormonal imbalance
63	***Cleome gynandra***	Shoot, leave	Fungal diseases
64	***Clerodendrum inerme***	Leaves root	Rheumatoid disease
65	***Commelina benghalensis***	flower	Sore throat
66	***C. Karzai***	Whole plant	Diabetes, fever, dropsy
67	***Dioscorea bulbifera***	bulbils	Piles, ulcers, Dysentery
68	***Elytraria acaulis***	Whole plant	Skin worm infections
69	***Euphorbia hirta L.***	stem	Female disorders, respiratory diseases
70	***Ficus carica***	Fruits, roots,	Gastrointestinal, respiratory disorders

		leaves	
71	***Tridax Procumbent L.***	Leaves, stem, flowers, roots.	Anticoagulant, Skin diseases. The juice extracted from the leaves are directly applied on wounds.
72	***Triumfetta rhomboidea Jacq.***	Bark, leaves	Skin diseases, Dysentery,
73	***Vernonia cinerea (L.) Less.***	Root, leaves, stem, bark	Diaphoretic, Conjunctivitis, Strangury, Promotes perspiration.
74	***Zaleya Govinda (Buch. Ham. Ex G.Don) Nair***	leaves	Syphilis, Swellings of sex organs and Ladies take root extract to regularize menstruation.
75	***Tephrosiapurpurea (L.)Pers.***	Whole plant	Skin disease, Curehaematuria.
76	***Trachyspermumammi (L.) Sprague***	Seeds, root	Gastric problems, cure indigestion, Diarrhea, Typhoid, Pneumonia.
77	***Rhus myogenesis G. Don***	Leaves, fruits	Antidiabetic, Hepatoprotective, Wound healing, Anti-inflammatory.
78	***Mollugo nudicaulis***	Leaves	Laxative, Stomachic,

	Lam.		Antiseptc,Emmenagogue.
79	***Lindenbergia indica(L.) Vatke***	Leaves	Toothache, Stone diseases.
80	***Digera muricata (L.) Mart.***	Leaves, roots, shoot	Astringent, Laxative, Biliousness, Urinary discharge.

Threat to ethnobotanical plants

In India, more than 90% of medicinal plants are facing threats due to excessive and unsustainable collection, utilization, overexploitation, or un-skilled harvesting (Kumari *et al*., 2011). Based on global rates of plant species threatened with extinction, it is estimated that around 1,000 medicinal plant species may be under threat in different ecosystems across India (FRLHTENVIS 2016a). As per the IUCN Red List, a total of 457 species out of 2,143 species are listed under medicine for human and veterinary groups. Of these, 73 are threatened (CR et al.), 8 (NT), 1 (DD), and 366 (LC). Although there are publications enlisting threatened plants of medicinal value at state, regional, national, and global levels prepared by Conservation Assessment and Management Prioritization (CAMP), Botanical Survey of India (BSI), and IUCN, etc., there is no consolidated compilation at one place, to get an accurate assessment. Therefore, in this paper, an attempt has been made to review the existing information and compile an exhaustive list of threatened medicinal plants in India. This easy, one-stop-shop-ready reckoner for information related to Indian threatened medicinal plant species will be beneficial, especially for young researchers to strategize conservation, repatriation, and use of such species. It will help not only the researchers but also policymakers in developing strategies for efficient conservation/cultivation to ensure the availability of these precious resources for utilization by future generations.

According to IUCN, 2020, ethnomedicinal plants have been categorized into critically endangered (CR), endangered (EN), vulnerable (VU), near threatened (NT), and least concern (LC).

National efforts toward the conservation of medicinal plants

The Government of India (GoI) has taken due cognizance of medicinal plants since the early 1990s, and several activities have been undertaken to protect and conserve these species both in situ (biosphere reserves, national parks, wildlife sanctuaries, sacred groves, etc.) and ex-situ (botanical gardens, field gene banks, seed gene banks, in vitro gene banks and cryo genebanks). For in situ conservation, of the total geographical area of India, about 16.5 million ha (5.02%) is under protected areas, and 70.8 million ha (21.54%) is under forests. In India, a total of 870 protected areas are earmarked, which include 104 national parks, 551 wildlife sanctuaries, 127 community reserves, and 88 conservation reserves (WIIENVIS 2019). Further, an estimated 100,000 – 150,000 sacred groves are present in India (Kandari *et al*., 2014). For ex situ conservation several institutes/organizations have been established by GoI, especially to undertake research on medicinal plants viz., "Central Council for Research in Ayurvedic Sciences (CCRAS), Central Council for Research in Homoeopathy (CCRH), Central Council for Research in Siddha (CCRS) and Central Council for Research in Unani Medicine (CCRUM) under Ministry of Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homoeopathy (AYUSH), Botanical Survey of India (BSI) and its regional circles and experimental gardens at different geographic regions of India, Kerala State Council for Science, Technology and Environment (KSCSTE)-Jawaharlal Nehru Tropical Botanic Garden and Research Institute (KSCSTE – JNTBGRI, formerly TBGRI), Indian Council of Forestry Research and Education (ICFRE), Council of Scientific and Industrial Research (CSIR) institutes *i.e.*, Central Drug Research Institute (CDRI), Central Institute of Medicinal and Aromatic Plants (CIMAP), National Botanical Research Institute (NBRI) and the Regional Research Laboratories (RRLs), Institute of Himalayan Bioresource Technology; Institutes under the Indian Council of Agricultural Research (ICAR) namely ICAR-National Bureau of Plant Genetic Research (ICAR-NBPGR), ICAR-Directorate of Medicinal and Aromatic Plants (ICAR-DMAPR) and ICAR-Indian Institute of Horticultural Research (ICAR-IIHR), ICAR-All India Network Research Project on Medicinal and Aromatic Plants (AINRP MAPs)". In addition, several other government and non-government organizations, industries, and ayurvedic practitioners are also involved in the conservation and cultivation of these medicinal plants (Bhattacharyya *et al.*, 2006).

A network of four National Gene Banks for Medicinal and Aromatic Plants (GEBMAP) was set up in 1993 at (1) ICAR-NBPGR, (2) KSCSTE – JNTBGRI, (3) CSIR-CIMAP, (4)

Regional Research Laboratory (RRL) Jammu (added later) under the G-15 GEBMAP program with Department of Biotechnology (DBT), Ministry of Science and Technology, GoI, as nodal agency. This has not only given better focus and thrust, especially on the collection and conservation of medicinally important threatened species but also helped in consolidating the ongoing efforts in the country (Sharma & Pandey, 2013; Sharma *et al*. 2019, 2020). JNTBGRI herbal garden has a collection of 1,200 taxa herbals in an area of 10 acres (KSCSTE-JNTBGRI 2019). At CSIR-CIMAP, a total of 3,334 accessions in the seed bank (2,476 accessions) and field gene bank (868 accessions) are being maintained (Rajpurohit & Jhang, 2015).

ICAR-NBPGR is the nodal agency for all the activities of introduction, collection, conservation, documentation, evaluation, and distribution of plant genetic resources (PGR) in the country. It has ten regional stations located in different agro-climatic zones of the country and the 59 National Active Germplasm Sites (NAGS), which are based at ICAR institutes (specific crops groups) and are assigned with multiplication, evaluation, and conservation of active collections of germplasm and their distribution to users both at the national and international levels. In addition, several ICAR institutes, State Agricultural Universities, and other stakeholders are also linked to the network (Singh *et al.*, 2016). The National Gene Bank of ICAR-NBPGR has four types of conservation facilities, i.e., seed gene bank, cryo-genebank, in vitro gene bank, and field genebank. At ICAR-NBPGR, 8,071 accessions of MAPs in seed genebank, 178 accessions in vitro genebank, and 1,041 accessions in cryo-genebank are being conserved (Singh & Pandey, 2019; Sharma *et al.*, 2020**)**.

The GoI also established NMPB in 2000 under the Ministry of AYUSH and provided funds for research on medicinal plants. In addition to NMPB, DBT and the Department of Science and Technology (DST) have also supported researchers to undertake research on medicinal plants. Recently (2019), NMPB prioritized 32 medicinal plants for conservation (*Aconitum* et al. ex Ser., *Aconitum heterophyllum* Wall., *Aegle marmelos* (L.) Corr., *Andrographis paniculata*, *Asparagus racemosus* (Burm.) Nees, *Bacopa monnieri* (L.) Wettst., *Berberis aristata* DC., *Cassia Angustifolia* M Vahl. = *Senna alexandrina Mill., Chlorophytum borivillianum Sant., Coleus barbatus Benth., Commiphora wightii* (Arn.) Bhandari, *Crocus sativus L., Embelia ribes* Burm.f., *Emblica officinalis Gaertn.* = *Phyllanthus emblica L, Garcinia indica Choisy, Gloriosa superb* L., *Glycyrrhiza glabra* L., *Gymnema sylvestre* (Retz.) R. Br., *Nardostachys jatamansi* (Retz.) R. Br., *Ocimum sanctum* L.,

Phyllanthus amarus Schum. & Thonn., *Picrorhiza kurroa* Royle ex Benth., *Piper longum L, Plantago ovate* Forsk., *Rauvolfia serpentina* Benth. ex Kurz., *Santalum album* L., *Saraca asoca* (Roxb.) De Wilde, *Saussurea costus* (Falc.) Lipsch, *Solanum nigrum* L., *Swertia chirata* Roxb. ex Flem., *Tinospora cordifolia Miers.*, *Withania somnifera* Dunal (NMPB 2020b). NMPB has also taken initiatives for in situ conservation of medicinal plants through the establishment of 72 Medicinal Plants Conservation and Development Areas (MPCDAs) across 13 states of the country, covering an area of 10,935 ha in forest areas (Biswas *et al*., 2017) and 36 State Medicinal Plant Boards in State/UT. FRLHT, in collaboration with the State Forest Departments and with financial support from Danish International Development Aid (DANIDA), Netherlands, and the United Nations Development Programme (UNDP), has established 108 Medicinal Plant Conservation Areas (MPCAs) across 13 states and 18 Medicinal Plants Conservation Parks (MPCPs) in southern India for focusing on conservation of prioritized wild medicinal plants occurring in different regions of the country (FRLHTENVIS 2016b). In 2012, DBT initiated a mega-network program on 'Preventing extinction and improving the conservation status of threatened plants through the application of biotechnological tools and conserved 100 threatened species of India (Barik *et al*., 2018). Under this project, 115 species were reintroduced, micropropagation protocols were standardized for 106 species, and micropropagation protocols were standardized for 76 species (Barik *et al*., 2018).

Regulatory and policy framework in India

The medicinal plant species in trade (both domestic and international) are sourced from many different agro-climatic zones in the country from the wild, and only a very small number of species are cultivated (Pareek *et al*., 2005; Sharma & Pandey, 2013). Besides these, there is no data documented regarding the consumption levels of botanicals by the non-codified and non-commercial folk healthcare traditions, based primarily on the ecosystem and region-specific plant material practiced by around one million folk practitioners and ~ 140 million rural households in the country. It is important to note that of 242 species in high commercial demand (> 100 MT per year), 72% of these species are sourced largely from wild plants as roots, bark, wood stem, or the whole plant. This poses a major concern as it affects the survival of these species. Unsustainable collecting activities coupled with limited or no efforts of replenishment/cultivation, long duration life cycle of plants, climate change, and developmental activities have led to a rapid decline in the availability of many medicinal

plant species in the country during the last three decades. This has culminated in a large number of species falling into threatened groups at the country as well as global levels. In order to minimize this, the GoI has developed a few regulatory frameworks and policies, viz.,

- Indian Forest Act, (1927).
- Panchayat Raj Act, 1933;
- The West Bengal Forest Produce Transit Rules, 1955;
- Andaman and Nicobar Island Forest Produce Transit Rules, 1966;
- Wildlife (Protection) Act, 1972 (Amended 2003) Also 2006;
- The Convention on International Trade in Endangered Species of Wild Fauna and Flora, 1975;
- Kerala Forest Produce Transit Rules, 1975;
- The Forest (Conservation) Act (Amended), 1980;
- Environment Protection Act, 1986;
- National Forest Policy, 1988;
- Negative List of Plants for Exports and Imports (Revised), 1994;
- Panchayat (Extension to Scheduled Areas) (PESA) Act, 1996;
- National Biodiversity Strategy and Action Plan, 2002;
- The Biological Diversity Act, 2002;
- Biological Diversity Rules, 2004;
- Negative list of MAP Collection from Wild, 2004;
- Scheduled Tribes and Other Traditional Forest Dwellers Act (FRA), 2006;
- Maharashtra Forests Rules, 2014, The HP Forest Produce Transit (Land Route) Rules, 2013;

- Export-Import Policy, (2015).–20;
- National Wildlife Action Plan 2017–31;

As per Sect. 38 of the Biological Diversity Act, 2002, the Central Government, in consultation with the Government of states, notifies the plants which are on the verge of extinction. The NMPB has developed several policies, strategies, and programs for conservation, proper harvesting, cost-effective cultivation, research and development, processing, and marketing of raw materials to promote and develop the medicinal plants sector. Recently a Memorandum of Understanding (MoU) was signed between ICAR-NBPGR and NMPB on July 6, 2020, for the safe conservation of Medicinal and Aromatic Plants Genetic Resources for long-term storage at the National Gene Bank of ICAR-NBPGR (ICAR-NBPGR 2020).

Conservation efforts for medicinal plants by village folks

In spite of the expanding use of medicinal plants, their future is vulnerable to smugness relating to their conservation. The capital of herbs and medicinal plants in developing countries is receding; several important species are at the age of extinction as a result of growing trade demands for safer and cheaper healthcare products and new plant-based therapeutic markets in preference to more expensive target-specific drugs and biopharmaceuticals. Such concerns have stimulated action (Upadhyay *et al*., 2010).

Conclusion

This paper provides an easy, updated, ready-to-use guide for information on ethnomedicinal plants of India with special reference to Rajasthan, Indian threatened medicinal plant species, as designated by Indian and global agencies and conservation efforts. This will help not only the researchers but also policymakers in developing strategies for efficient conservation/cultivation to ensure the availability of these precious resources for utilization by future generations.

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Biosynthesized of Fe-Ni Bimetallic nanoparticles and their ecofriendly application in water treatment

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Abstract

The development of an eco-friendly process for the green synthesis of Fe-Ni bimetallic nanoparticles is an important aspect in the field of nanotechnology. In recent years the use of secondary metabolites from plant leaf broth has emerged as a new technology for the synthesis of various nanoparticles. Plant has antimicrobial, antioxidant and antibacterial property. Biological method for synthesis of Fe-Ni bimetallic nanoparticles is cost effective, eco-friendly, non-hazardous in nature and employ low amount of energy which is reduced economy in nature. In this report, Fe-Ni bimetallic nanoparticles were synthesized by the Azadirachta indica leaf extract and their application in water treatment. The colour changes from golden to brown indicating formation of Fe-Ni bimetallic nanoparticles. Synthesized bimetallic nanoparticles will be applied in the field of Agriculture, pharmaceutical and environmental remediation sectors. Fe-Ni BMNPs has important applications to the catalytic removal of nitrates from water, crystal violet (CV) dye from aqueous solutions, environmental pollutants.

Key words: Nanotechnology; Green Synthesis; Azadirachta indica; Bimetallic nanoparticles

Introduction

Nanotechnology is an interdisciplinary field of study and can be used in all fields of science such as chemistry, physics, materials science, biology, and engineering. The structure of nanomaterials has at least one dimension with a size range of 1 to 100 nm (1). Nanoparticles have different sizes, shapes and structures such as liposomes, dendrimers, carbon based and metal based (2). Metallic nanoparticles are classified as monometallic, bimetallic, trimetallic, etc. (3). The synthesis of bimetallic nanoparticles (BNPs) is a combination of two metal nanoparticles, depending on the number of metallic components. Several biological and biogenic routes have been developed to synthesize bimetallic nanoparticles (4). Recently, the plant-based synthesis of Ag-Au BMNPs has attracted increasing attention due to its low cost, simplicity and environmentally benign synthesis protocol. For example, Ag-Au bimetallic NPs have been synthesized using plant products from sago pondweed (Potamogeton pectinatus L.) (5), Persimmon (6). The efficiency of iron-based bimetallic nanoparticles in the remediation of pollutants is highly dependent on the surface property of iron nanoparticles as the reduction reaction of contaminants mainly occurs on the surface of Fe and other metals such as Ni and Pd. Such metal not only acts as a catalyst to enhance the degradation rate but

also prevents the oxidation of nanoparticles when exposed to air (7-10). This study will discuss the environmental applications of plant extracts for synthetic nanoparticles such as dyes, adsorbents of metals and other organic pollutants.

Applications

Bimetallic Fe-Ni NPs have lower cost and better corrosion stability and therefore can be widely applied in environmental remediation and wastewater treatment (11). This work investigated the effectiveness of zerovalent iron and Fe-Ni bimetallic nanoparticles in the remediation of water polluted by high concentrations of nitrate. The results showed that almost complete nitrate removal (>99.8%) was always achieved after 15 min at concentrations of bimetallic nanoparticles greater than 0.2 g L−1 (12). Reduced-graphene-oxide-supported bimetallic Fe-Ni nanoparticles were synthesized in this study for the elimination of crystal violet (CV) dye from aqueous solution. Kinetic studies show that the adsorption processes can be satisfactorily described by a pseudo-second-order model (13). This study investigated the removal of tetracycline (TC) by Fe-Ni bimetallic nanoparticles and nanoscale zero-valent iron (NZVI) in aqueous solution. The decrease of TOC in solution and the presence of intermediate products on the surface of Fe-Ni BMNPs indicated that both adsorption and degradation were involved in the reaction process (14).

Conclusion

Nanotechnology has straightened out a wide area of research with different applications. Many researchers prefer biological methods over physical or chemical methods. The described biogenic techniques are useful for controlling specific composition, size and unique properties based on the current state-of-the-art to develop the field of potential applications of BMNPs beyond monometallic nanoparticles. The biosynthesis of bimetallic nanoparticles is considered to be a safe, cost-effective, non-toxic, eco-friendly character, and uses a small amount of energy. Bimetallic nanoparticles are of great interest as they hold many applications in the field of nanomedicine, for drug delivery, as catalysts, as anti-microbials, as antibacterial, agriculture, overcoming environmental pollutant and many others which are a topic of further study.

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Experimental Investigation on Synthesis of zero valent metal nanoparticles in degradation of organic pollutants

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Abstract

Researchers from all over the world are particularly interested in the environmentally friendly production of nanoscale materials. We outline a straightforward, cost-effective, long-lasting, and environmentally friendly method for synthesizing iron nanoparticles that makes use of a number of proteins and phytochemicals as possible stabilizers and reducers. The use of plant leaf extracts forms the foundation of the environmentally friendly method for the controlled synthesis of nanoparticles with various morphologies. Eco-friendly synthetic nanoparticles can be used in place of conventional cleaning solutions to remove a variety of organic contaminants. The use of biochemically functionalized nanoparticles in engineering may be greatly aided by the kinetic enhancement of nanoparticles for the degradation/removal of contaminants. In this study, morphology dependent nanoparticles for the degradation of iron are briefly outlined together with current plant-mediated approaches to producing nanoparticles of iron. Overall, the approach presented in the article supports environmental protection and is a promising alternative to other synthesis techniques.
Keywords: Eco-friendly synthesis; Metal nanoparticles; UV-Visible and FT-IR spectroscopy; wastewater treatment.

Introduction

Nowadays, nanotechnology is one of the most active fields of study when it comes to the creation of nanomaterials, particularly metal nanoparticles (MNPs) with sizes between 1 and 100 nm. Due to its ability to synthesize nanoparticles of different materials with special physical and chemical properties that set them apart from the corresponding bulk materials, it has become the center of attention. Chemists, biologists, physicists, and engineers have all shown a keen interest in these unique features, which are connected to the high surface to volume ratio of nanoparticles or quantum effects [1]. For diverse purposes, there has been an increase in interest in the last ten years in the synthesis of tailored nanoparticles made of metals, metal oxides, non-metals, lipids, and polymers, as well as different nanocomposites, in emerging technologies and in consumer products such as optical, electrical, and catalytic devices, sensors, electronic devices, and other products used for personal care, biomedicine, antibacterial purposes, agriculture, renewable energy, water and soil treatment etc. [2,3] [Figure1].

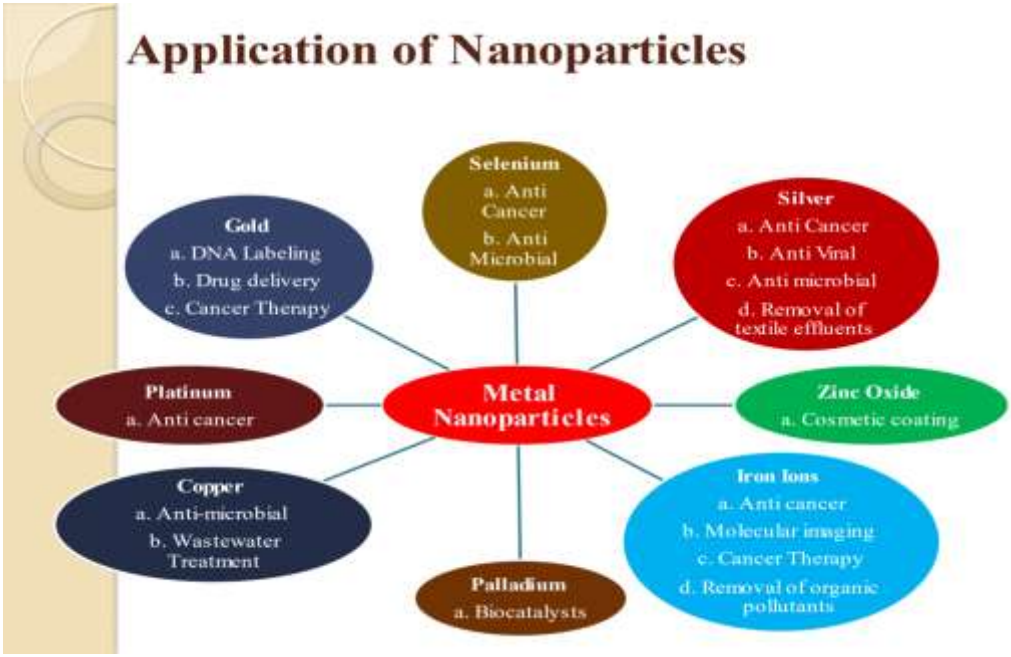

Figure1- applications of Metal Nanoparticles

In the last few decades, a great deal of research on nanoparticle synthesis has emphasized their use in biological procedures and applications in the engineering and biomedical fields. Bottom–up approaches are preferred over top–down approaches for the fabrication of nanoparticles, and it can be carried out through physical, chemical, and bio-assisted methods. Surface-modified metal nanoparticles can be synthesized by the reduction of metal ions followed by the capping or surface functionalization of nanoparticles; agents such as gallic acid, citric acid, polyphenols, starch, polysaccharides, proteins, terpenoids, saponins, surfactants, and polymers have been used to enhance the stability of nano-particles [4]. The stability of the surfaces of organically capped metal nanoparticles could be influenced differently by environmental conditions such as temperature, pH, humidity, the presence of interfering ions, and light when compared to the typical inert conditions for nanoparticles [1].

To date, various popular physical and chemical methods have been involved in nanoparticle synthesis, including solution-phase synthesis, chemical reduction, the sol–gel technique, evaporation–condensation, hydrothermal synthesis, the wet chemical method, sonochemical synthesis, the microwave method, the laser ablation method, and ball milling [5], in which a large amount of solvent is required to obtain pure and well-defined nanoparticles. However, these methods are costly and create various problems for the ecosystem and the environment. To overcome these issues, safe, inexpensive, environmentally friendly, green methods that can be easily scaled up for the large-scale production of nanoparticles are recommended using various plant materials/biomolecules due to the generation of environmentally benign products and byproducts after the com completion of nanoparticle synthesis [6]. In recent decades, wastewater or effluent containing non-biodegradable dyes and organic pollutants from various industries, factories, and laboratories have been discharged into water reservoirs without any treatment, and it poses a growing global environmental hazard [7]. In general, chromophores and auxochromes are both key components of organicdyes: chromophores are the main coloring group that is responsible for producing the color variety in the visible region due to delocalized electron systems with conjugated double bonds, whereas auxochromes are responsible for intensifying

the color of the chromophore. They are usually electron-donor or electron-withdrawal substituents that enhance the color intensity by altering the overall energy of the electronic systems. The usual chromophores are –C=C–, –C=N–, –C=O, –N=N–, –NO2, and the quinoid rings, whereas the auxochromes are –NH3, –COOH, –SO3H, and –OH groups. Different groups of dyes can be distinguished and easily identified according to the chemical or chromophore structure. The generic name of the color index (CI) of each different organic dye is given to determine its application characteristics and its color [8]. These dyes are papers, leathers, foodstuffs, cosmetics, laser materials, xerography, laser printing, gasoline, additives, etc. In most cases, byproducts discarded from industriescontain dyes and heavy metal ions, or both [9]. It is estimated that over 15% of the total worldwide production of dyes is lost in their synthesis and dyeing process [10]. Most of these anthropogenic dyes are toxic, carcinogenic, and reduce the light penetration into aqueous systems. Consequently, it causes serious concern to society because of its complex structures and non-biodegradable nature, which has a negative effect on photosynthesis, is toxic for living organisms, is harmful to human health, and contributes significantly to the overall imbalance of the ecosystem [11]. Wastewater with high concentrations of biodegradable pollutants could be treated using biological treatment methods. However, wastewater from many industries such as pharmaceuticals, textiles, and agriculture often contains toxic pollutants with low biodegradability [12].

Conclusions

In this review article, we have discussed the most used iron nanoparticles in wastewater treatment. All metallic nanoparticles were synthesized using different plant materials as reductants and a stabilizer without using fancy experimental equipment. Its beneficial effects include the solar light-harvesting potential for the degradation of organic dyes, shorter reaction time, low-cost reagents, and possible environmentally friendly alternatives to toxic chemical methods. The use of plant extracts is an alternative to explore the control in the shape and broad size distributions, and it is also attractive for the scaling up of metallic nanomaterials.

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Methods of Synthesis of Metal nanomaterials

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Abstract

Due to its numerous uses, nanotechnology is a rapidly developing scientific field that has received a lot of attention in recent years. Nanotechnology is a method for using and manipulating materials at very small scales, typically between one and one hundred nanometers. As compared to the same materials at greater scales, the materials at this scale have significantly different characteristics. formulation of So many physical, chemical, and most recently green procedures use metal nanoparticles. The utilization of metal nanoparticles (MNPs) varies by industry. To have an impact on the industrial and manufacturing sectors, the new nano-based entities are being vigorously made and incorporated into daily personal care goods, cosmetics, medications, drug delivery, and clothes.

Keywords: Nanotechnology, Metal nanoparticles, Physical, Chemical, Biosynthesis methods.

Introduction:-

Nanotechnology is concerned with nanoparticles with at least one dimension of 1 to 100 nanometers. Nanotechnology is becoming an emerging field in recent years and is getting more attention due to its wide variety of potential applications in optical, biomedical and electronic fields [1]. Nanomaterials usually have large surface area that is more chemically reactive, in addition to this it can also in a position to bind, adsorb and carry other particles such as probes, drugs and proteins to the site of action [2]. Different preparation methods have been used
for the formation of Nanoparticles along with controlled structure and size.

Approaches to synthesis of Nanoparticles:-

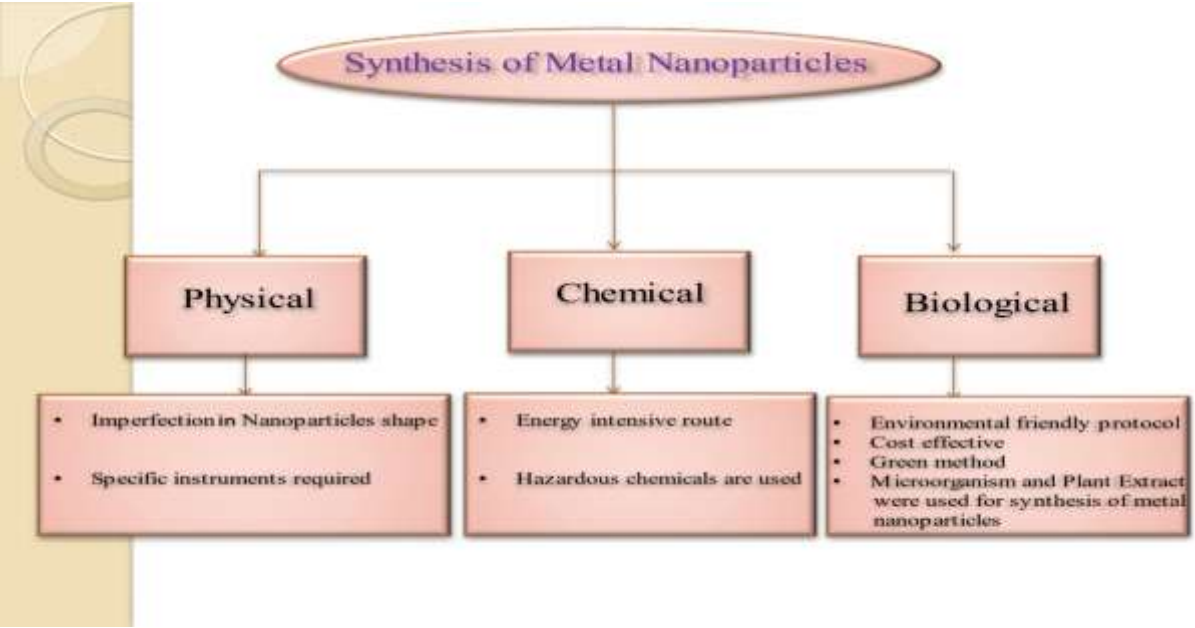

Figure 1. Methods for Synthesis of Nanomaterials

Top down Method

The synthesis of Metal nanoparticle may be done by using Top down method. This method is also named as destructive method in which reduction of bulk material takes place into nano scale particles. Laser ablation, Sputtering, Mechanical milling, Electro-deposition, are some of the most widely used nanoparticle synthesis methods [3].

Laser ablation.

It is a solvent based method in which production of nanoparticles are takes place by different solvent. The irradiation of a metal submerged in a liquid solution by a laser beam condenses a plasma plume that produces nanoparticles [4]. By using this method carbon based and metal oxide based nanoparticles are synthesized.

Mechanical milling

It is a reliable top-down method that provides an alternative solution to conventional chemical reduction of metals to synthesis metal based nanoparticles. The mechanical milling is used for milling and post annealing of nanoparticles during synthesis where different elements are milled in an inert atmosphere [5]. In mechanical milling process metal, oxide and polymer based nanoparticles are synthesized.

Sputtering

Sputtering is the deposition of nanoparticles on a surface by ejecting particles from it by colliding with ions [6]. Sputtering is usually a deposition of thin layer of nanoparticles followed by annealing. The thickness of the layer, temperature and duration of annealing, substrate type, etc. determines the shape and size of the nanoparticles [7]. Using this method metal based nanoparticle are formed.

Bottom up approach:-

Bottom-up or constructive method is the assemble of material from atom to clusters to nanoparticles. Sol-gel, spinning, chemical vapor deposition, and biosynthesis are the most commonly used bottom-up methods for nanoparticle production [8].

Sol-gel.

The sol is a colloidal solution of solids suspended in a liquid phase and the gel is a solid macromolecule submerged in a solvent. Sol-gel is the very useful bottom-up method due to its simplicity and as most of the nanoparticles can be synthesized from this method. In wet-chemical process containing a chemical solution acting as a precursor for an integrated system of distinct particles. In sol-gel process Metal oxides and chlorides are the typically used as precursors [9].

Spinning. The synthesis of nanoparticles by spinning is carried out by a spinning disc reactor (SDR). The reactor is generally filled with inert gases to remove oxygen inside and avoid chemical reactions [10]. The spinning causes the atoms or molecules to fuse together and is precipitated, collected and dried [11]. The various operating parameters such as the liquid flow rate, disc rotation speed, liquid/precursor ratio, location of feed, disc surface, etc. determines the characteristics nanoparticles synthesized from SDR.

Chemical Vapor Deposition (CVD)

Chemical vapor deposition is the deposition of a thin film of gaseous reactants onto a substrate. A chemical reaction occurs when a heated substrate comes in contact with the combined gas [12]. Result of this reaction is a thin film of product on the substrate surface that is recovered and used. Substrate temperature is the influencing factor in CVD. The advantages of CVD are highly pure, uniform, hard and strong nanoparticles.

Bio synthesis

Bio synthesis, a bottom-up approach, is similar to chemical reduction but in this method expensive chemical reducing agents are replaced by extract of a natural product such as leaves of trees or fruits, bacteria and fungi etc. for the synthesis of metal or metal oxide NPs. These biological entities acquire capping and stabilizing agents which are required as growth terminator and for inhibiting aggregation/ agglomeration process [13,14].

Conclusion

Nanotechnology gives different way for the application and handling of materials at nano-scales. In this paper we discuss about various methods but green synthesis method is the most appropriate and sustainable to synthesize nanoparticles. The reaction provided an environmentally friendly, simple, and efficient route for synthesis of nanoparticles Biosynthesis has suggestively enhanced NPs production without the application of toxic conditions and chemicals. It prevents waste accumulation and suggest us for the development of degradable products.

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SYNTHESIS AND APPLICATIONS OF NANOPARTICLES USING GREEN METHOD

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Abstract:

Nanotechnology is an innovative technology that deals with nanosized materials. The green chemical strategy of synthesizing nanoparticles (NPs) from plants combines nanotechnology and plant biotechnology. The green extract is used for the bioreduction of metal ions by forming nanoparticles. Plant biomolecules have been shown to play an important role in reducing metal ions to metal nanoparticles (MNPs) and aiding their subsequent stability. Green synthesis is preferred today because it is safe, clean, inexpensive, and scalable for well-designed NP scale syntheses. Environmental nanotechnology plays significant role in designing novel, cost effective and eco- friendly methods for detection, degradation and elimination of organic pollutants. Among various green synthesized metal nanoparticleshave broad spectrum of applications in the field of antimicrobial, medicinal, analytical, environmental, and nano-chemistry:

Keywords: Nanotechnology, Nanoparticle, Green synthesis, Applications

1. Introduction

Nanotechnology is a fast-expanding and multidisciplinary field with many applications in science and technology [1]. Nanoparticles are types of materials with a 3D structure, changing in magnitude from 1 to 100 nanometers [2].Nanotechnology includes two main approaches (Figure:1), (i) top-down (ii) bottom-up approach [3].Environmentally friendly, non-toxic, and safe chemicals are used in the "green synthesis" of nanoparticles. Because they are produced in a single process, nanoparticles generated with biological or green technology offer a variety of features, including higher stability and appropriate dimensions [4-5]. Nanoparticles are very important for the development of sustainable technology for the future, for humans and the environment.Nanoparticles can be divided into different types depending on the size, morphology, physical and chemical properties. Some of them are carbon-based nanoparticles, ceramic nanoparticles, metal nanoparticles, semiconductor nanoparticles, polymeric nanoparticles and lipid-based nanoparticles. There are two types of Metal-based nanoparticles which is monometallic NPs (MNPs) and bimetallic NPs (BMNPs). Monometallic NPs are composed of a single metal. Bimetallic NPs are composed of two metal components with unique properties, such as chemical stability and reactivity, as well as electrical and optical properties depending on size.There are many applications of green

synthesized nanoparticles such as pharmaceutical cosmetics, food and beverage, agriculture, surface coating, polymers and catalytic applications in organic pollutants dye degradation. Nanotechnology has found many applications in agricultural applications such as nanofertilizers, nanopesticides, nanobiosensors or as environmental remediation agents. Nanomaterials offer solutions to many global problems, but theirdevelopment and implementation lies largely outside the field of green chemistry and sustainability, with processes, products, and wastesthat are toxic, non-renewable, and unsustainable.

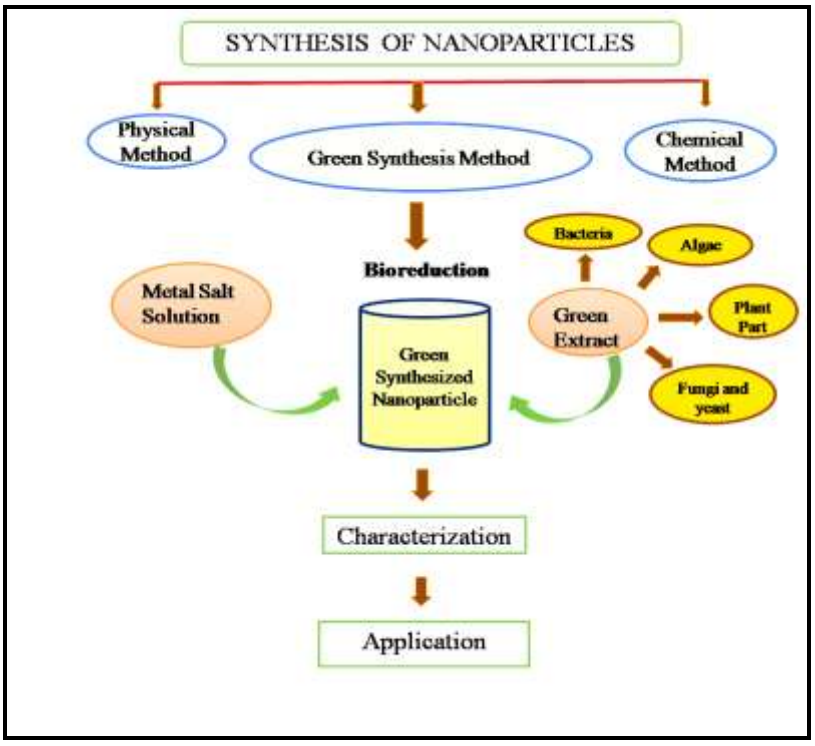

Figure:1 Various methods for synthesis of Nanoparticles

2. Synthesis of Nanoparticles

Many biological processes, including plant extracts such as Steams, leaves, latex, flower, seeds, and microbes such as Bacteria, fungi, and yeast, have been shown to transform inorganic metal ions into metal nanoparticles throughout the last decade (Figure:1). Among all the methods used in green synthesis of MNP (phytological, phycological, mycological and bacteriological fabrication), the plantbased synthesis emerges as the best choice, since it produces stable NPs, in a quick and effective synthesis. Microorganisms used in biosynthesis require a culture media and aseptic conditions for their growth, Due to the ease of development and availability, the use of plant extract is considered more beneficial than the use of micro-organisms [6-8].This can be explained by all the benefits of using plant extracts, for instance their easy accessibility, safety to handle, vast range of metabolites, elaborated

metabolic pathways, and stable and quicker synthesis that generate stable, benign and side effects-free MNPs [9-10]. Plant-based synthesis is more valuable than microbe-based synthesis due to elimination of biohazard, time consuming and elaborated isolation procedures. Additionally, it avoids development and maintenance of cell cultures, as well as high costs, since it can be narrowed for non-aseptic large productions and circumvents the arduous surface modification steps and the time consuming process of microbial screening and vector's building [11].Flavonoids are the most famous polyphenols present in many fruits and vegetables in the form of flavones, isoflavones, flavanols, and anthocyanins. Phenolic acids, such as salicylic acid, syringic acid, and gallic acid, are common in many plant species, and lignans are abundant in cabbage, broccoli, carrots, or cereals [12-13].

3. Applications of Green Synthesized MNPs

Nanotechnology has the potential to revolutionize a wide range of clinical and environmental applications, including drug delivery, diagnostics, imaging, sensors, gene delivery, artificial implants, tissue engineering, parasitology and pest control. Nanoparticle materials are of great interest for many such applications due to their unusual optical, chemical, and photo electrochemical properties[14].Hoag et al. [15] report the green tea (GT) synthesized iron nanoparticles to catalyze hydrogen peroxide to break down organic pollutants (bromothymol blue). The catalytic activity of the nanoscale green synthesis zero valence iron was greater than that of Fe-EDTA and Fe-EDDS. From the experiment, it was observed that by increasing the concentration of GT-nZVI, more hydrogen peroxide was catalyzed, which in turn increased the degradation of bromothymol blue.Wang et al. [16] used biosynthetic iron nanoparticles for eutrophic wastewater treatment. Polydispersion iron nanoparticles were synthesized using eucalyptus leaf extract obtained from the leaves. Due to the presence of various phytochemicals, each with different reducing strengths, in the form of an extract, the nanoparticles are polydispersed, in contrast to the more common practice where nanoparticles are synthesized using chemical reducing agents. Biologically synthesized nanoparticles are used for the first time to treat eutrophic wastewater.

There are many publications reporting the excellent antibacterial activity of green synthesized nanoparticles against gram-negative and positive bacteria. Al-Zakri et al. [17] showed good antibacterial activity against gram-positive and gram-negative bacteria. They accepted the major role of biomolecules contained in Wrightia tinctoria leaf extract to enhance the properties of green ZrO_2 nanoparticles. particles with small size and large surface area, where

the antibacterial activity is enhanced. Besides plant extracts, ZrO_2 can be biosynthesized from other green materials such as fungi and algae to study antibacterial activity.

Biosynthesized metal nanoparticles have an unlimited number of pharmaceutical applications, including drug or gene delivery, pathogen or protein detection, and tissue engineering. Effective drug delivery and tissue engineering through the use of nanotechnology have made important contributions to translational research related to drugs and their applications. [18].Biogenesis nanomedicine has great potential for cancer treatment through the development of potent anticancer nanomedicines and drug delivery systems that efficiently deliver potent drugs to specific target areas. Plant-based AuNPs are likely to be particularly useful in fighting cancer due to their biocompatibility and strong therapeutic and diagnostic potential against cancer. [19].Using phycocyanin biosynthesized AgNPs have been reported to have antimicrobial and anticancer activities.Cytotoxic activity was examined against breast cancer cell line and Ehrlich ascites carcinoma bearing mice (IC50 − 27.79 ± 2.3 μg/mL) [20].Other applications include the use of nanoscale carriers for the efficient delivery of fertilizers, pesticides, plant growth regulators, and other similar compounds. Nanoparticles can be added to conventional fertilizers to increase nitrogen storage capacity, resulting in less nitrogen loss and better nutrition of agricultural products [21]. MNPs such as silver, gold, cadmium, copper, zinc, iron and selenium have applications in agriculture including plant growth stimulation, antimicrobial and antifungal effects, nanofertilizers, nanobiosensors, plant micronutrients and plant disease control [22].

4. Conclusion

Green extracts is an excellent source of phytoconstituents. The benefits of green synthesis provide a long range of options for researchers to synthesize NPs from different plant parts. Persistently, we should motivate the green synthesis of NPs from plant sources or genetically modified plant sources to synthesize NPs in a superior and more stable. The intensification of optical, biological, magnetic, electrical, mechanical, and catalytic properties is widely used for industrial scale-up and globally use in different sectors such as medicine, food, agriculture and industries.

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IDENTIFICATION & IMPORTANCE OF ORTHOPTERA FOR ENVIRONMENT IN LADPURA REGION OF KOTA, RAJASTHAN

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ABSTRACT

Rajasthan is known for their various kinds of climate changes or important groups of insects as orthoptera for their environmental and ecosystematic values. Orthoptera also maintain the homeostasis of the environment. The order is subdivided into two suborders: Caelifera – grasshoppers, locusts, and close relatives; and Ensifera – crickets and close relatives. An orthopteran in Rajasthan had a variety of acrididea family. They were herbivore and dominant in nature. They are terrestrial in nature with the temperature of 25 and 30°C. Over the course of year, the temperature typically varies from 57^{o} F to 107^{o} F. These variation activities are from mid March to mid April and from early October to early November. In this particular time Orthopterans show there abundance. Making more efficient place for plant and other animal to thrive. Their waste is good fertilizer. Their life is belongs from primary source of food chain and secondary food source of many animal. They keep plant life under control and balance. So I observe a speies from urban area of ladpura is *Melanoplus bivittatus* also known as two-striped grasshopper and Poekilocerus pictus also known as painted grasshopper. A pair of pale yellow stripes running along the top of its body from above its eyes to the hind tip of its wings help to easily identifies this species.

Keywords: Orthoptera, Environment, Ecosystem

INTRODUCTION

Grassland, water and air comprise and make our atmosphere and it affects our life and also all resources. It also maintains the homeostasis of the environment. This forestry affected by many of substances. Forestry mainly includes grasslands. This grassland has enormous ecosystem, food web and food chain. Ecosystem includes variety of animal. After producer, primary consumers include small insects. This belongs from the invertebrate phylum arthropod. In arthropods there is a largest class insect and insect including order orthoptera. The Order Orthoptera which includes the dreadfully destructive locusts is one of the largest orders of insects having over 17,250 species known to science global wise, of which more than 900 species recorded from India. The Orthopterans (Grasshopper) are distributed throughout the physiographic zones of the world but their distribution largely depends upon the vegetations prevailing in grass fields, forests and agricultural lands. Temperature, seasonal precipitation of rain falls and soil conditions is some important factors which also determine the distribution of orthoptera. India provides a unique habitat for this group of insects, for there exist humid grasslands in East and North-East India, semiarid grass plains in North West and Southern parts of India, vast agricultural fields, simultaneously forests and

scrub jungles, vegetation adjoining lakes, river basins and numerous water 1 bodies scattered throughout the country (Dey, Anita, 1994).
Temperature of Rajasthan is suitable for this body. Any of a group or a single individual of jumping insects that are found in a variety of habitats known as grasshopper. orthoptera found in greatest numbers in lowland tropical forests, waterless regions, and grasslands. They are mostly active in day but feeds in night. They have huge range in colour from green to olive or brown and may have yellow or red detailing. They do not have nests. Orthoptera always seen by us in migratory form to find new supply of food. It has 3 pairs of legs in his body. It has a specific plant or host plant called as oak. orthopterans have a seasonal abundance nature. It has an economical importance for environment. orthoptera has worldwide distribution. Human day by day have chiefly affected grasslands and scrub jungle areas of India. Much of the areas have been converted into agricultural land or huge industrial complexes. Due to shrinkage of the grassland habitat, the population as well as diversity of species is reducing very fast. And to study the differences of the population we can use population dynamics. It comprises the size of population, density of population, distribution of population. As we all know gr need 25
-30`C temperature so that in district Kota has a number of species and Varity of distribution of grasshoppers.

RESEARCH METHODOLOGY

Materials and methods are very important part in the research. Materials help to technical support and methods help in getting good results. A minor change in the method may give the major change in results may be positive or negative. Therefore, materials and methods have uncountable value in the research.
Following materials and methods were used for studying grasshopper diversity.

1. **Collecting of sample**
    - Insect Collecting Net
    - Plastic Containers
    - Specimen bottles
    - Camel hair brushes
2. **Storation of specimen**
    - Spreading board
    - Oven
    - Insect storage box
    - Hand lens
3. **Identification of specimen**
    - Glass cage
    - Compound microscope
    - Photographs
    - Slides and cover slips
    - Entomological pins
    - Card sheet paper
    - Chemicals

METHODS: -

Orthoptera species were collected from various agro and forest ecosystems of Ladpura region from district Kota. Studies were made morphology and taxonomy of the species by using hand lens and compound microscope. Thus, collected common species of grasshoppers were killed in killing jar by using chloroform. Killed orthoptera species were settled on spreading board in a scientific manner and pinned and then dried in oven at 60° c temperature up to 1 hr. After observation, rare and live species of grasshoppers were released where from they were collected. Dried specimens preserved in insect storage box. 4 to 5 naphthalene balls were also used for avoiding the fungal and other infections into storage box.

Orthopters species were collected from various agro and forest ecosystems of study area. Thus, collected common orthoptera species killed in killing jar by using chloroform. Then they putted in 2 lit capacity plastic containers filled with 70% alcohol and closed. Specimen identification and statistical methods relation to population dynamics are given in respective chapters.

RESULT AND DISCUSSION

I found two of orthropterans in the urban area of ladpura area and these two are environmentally friendly and help to thrive for plants.

- *Melanoplus bivittatus* or Two striped grasshopper
  Kingdom: Animalia
  Phylum: Arthropoda
  Class: Insecta
  Order: Orthoptera
  Suborder: Caelifera
  Family: Acrididae
  Subfamily: Melanoplinae
- Poekilocerus pictus or painted grasshopper
  Kingdom: Animalia
  Phylum: Arthropoda
  Class: Insecta
  Order: Orthoptera
  Suborder: Caelifera
  Family: Pyrgomorphidae
  Subfamily: Pyrgomorphinae

CONCLUSIONS

Rajasthan state is broadly divided into western desert and eastern semiarid region. Orthopteran species particularly acridids and tettigonids are found abundantly in western and

southern part of the Rajasthan. The present study elucidates the diversity and distribution of Orthopteran species on the basis of earlier studies and systematic surveys in various regions of Rajasthan. Hence, the review gives comprehensive knowledge of Orthoptera fauna which would be utilize for future aspects of the development of insect resources and their industrialization. Orthopteran biodiversity can also be assessed for the insect farming to explore nutritional value and therapeutic uses in sustainable manner.

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Ecological role of Barn Owl *(Tyto alba)* in Agricultural pest management

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Abstract

In present study an effort has been made to document the Ecological role of a owl species the Barn Owl *(Tyto alba)*. Over the last decades, the Barn Owl population has markedly declined in range and breeding numbers in most countries of western Europe. Probably this concerns long-term downward trends, which are unconnected with periodic population fluctuations as caused by cycles in the abundance of voles, the main prey of the Barn Owl.

In Europe the Barn Owl *Tyto alba* is widely distributed in lowland and hilly country where there is a sufficient supply of small mammals, particularly voles (Microtidae), mice (Muridae) and shrews (Soricidae). Within its European range, the Barn Owl usually avoids natural or semi-natural habitats such as dunes, marshes, heaths and woodland. Nowadays, it inhabits predominantly man-made landscapes, generally areas which have been cultivated for various agricultural practices **(Glutz von Blotzheim & Bauer 1980, Cramp 1985).**

In a number of countries, the Barn Owl has been enlisted as a threatened species ('Red Data Bird'. The long-term decrease of the Barn Owl is variously attributed to natural factors such as adverse climate conditions **(Honer 1963, Shawyer 1987),** deaths by human intervention (trapping, shooting, being locked in), the use of toxic pesticides**,** increase in road deaths and the loss of breeding sites.

Keywords: Ecological, Environment, Semi-natural, Agricultural, Natural-indicator.

Introduction

Owls in India are disrespected at many places and considered as a symbol of bad luck. Following a myth, they are even brutally killed or sacrificed by "*tantriks"* during auspicious occasion of Diwali in order to bring good luck in certain families. While some consider this nocturnal bird to be associated with bad omen and misfortune, it is often engrained in culture and worshipped by others and is associated with deities specially goddess Laxmi.

Owls are birds of the Order Strigiformes, which includes about two hundred species of mostly solitary and nocturnal birds of prey typified by an upright stance, a large, broad head, binocular vision, binaural hearing, sharp talons, and feathers adapted for silent flight. Exceptions include the diurnal Northern Hawk-Owl and the gregarious Burrowing Owl. Owls

hunt mostly small mammals, insects and other birds although a few species specialize in hunting fish. They are found in all regions of the Earth except Antarctica and some remote islands. Owls exhibit very sharp binocular vision and exceptional hearing ability. They vary in size from miniature owlets to giant owls. They are known for speed and efficient hunting. Birds of prey are a herald of wellness of environment **(Das *et al.* 2011).**

Owls are divided into two families: the true owls or typical owls, Strigidae; and the barn-owls, Tytonidae. Owls can rotate their heads and necks as much as 270º. Sexual dimorphism is a physical difference between males and females of a species. Reverse sexual dimorphism is where females are larger than males and it has been observed across multiple owl species. The degree of size dimorphism varies across multiple populations and species, and is measured through various traits, such as wing span and body mass. Overall, female owls tend to be slightly larger than males.

Owls are nocturnal avian predators, which possess large home range and occupy multifaceted habitats to conquer certain life history characteristics *viz*., breeding, roosting and foraging. Altogether 216 species of owls are found in the world of which 15 % are found in India **(Grimmet and Inskipp, 2003).** It is often claimed that Barn Owls show no food preferences **(Bunn *et al.* 1982)** and that the numbers of each species represented in the diet are a true reflection of prey abundance **(Hanney 1962, Glue 1971),** or accessibility. However, this claim is based almost wholly on circumstantial evidence and thus is controversial. **Glue (1971)** believed that the claim is apparently justified for assemblages of small rodents, and that the species representation in Barn Owl pellets is proportional to the relative abundance of the prey. Similarly, **Mikkola (1983)** concluded that the Barn Owl is a nonselective predator, whose diet reflects the abundance of small nocturnal mammal species within its hunting territory. However, **Andrews (1990)** suggested that "Barn Owl's prey reflects the particular needs and hunting behaviour of the predator rather than being representative of any one habitat." In South Africa, Barn Owl prey determined from pellet analysis appears to have a different proportion of species than samples of the same prey species obtained by trapping, whereas the opposite was found in a similar comparison in Great Britain. The prey size is an obvious limiting factor in comparing pellet analyses with data from field trapping **(Andrews 1990),** as large prey species are taken in greater numbers during the breeding season than at other times of the year.

Origin of the Research Problem

Over the last decades, the Barn Owl population has markedly declined in range and breeding numbers in most countries of western Europe. Probably this concerns long-term downward trends, which are unconnected with periodic population fluctuations as caused by cycles in the abundance of voles, the main prey of the Barn Owl (**Taylor *et al.* 1992).**

Besides these, a number of authors attribute the widespread numerical decline of The Barn Owl mainly to the loss of habitat as caused by urbanisation of the countryside, and by changes in agriculture, leading to a decrease in foraging areas and food supply. Long-term integrated studies are urgently needed to gain insight into these complicated processes.

In such studies, surveys of internal (demographic) population parameters are required in combination with external (environmental) data in order to determine the factors, which are limiting the Barn Owl numbers. For, the study of environmental limiting factors is essential for effective conservation and population management **(Newton in Perrins *et al.*1991).** Throughout most of Britain and much of continental Europe Barn Owl *Tyto alba* numbers have declined considerably in recent years (**Bunn *et al.*1982).** The decrease has been attributed mainly to changes in farming practice affecting the availability both of suitable hunting areas and of nest sites.

Methodology

During present investigations extensive fieldwork was carried out along with collection and review of available data. Various reports of NGOs, newspaper reports, annual publications of CAD were also consulted. An extensive survey for birds were conducted. As feathered creatures and mammals are protected under Wildlife (Protection) Act, 1972, maximum efforts were made for their direct sighting records, calls and nesting patterns. Interviews of different section of people were also taken in villages and cities. Various equipments and gadgets were used for the study. Different census methods were used for sampling populations, Line transect, point count method, species richness methods, mist netting, call counting, nest counting and nest recording, capture and tagging, and encounter rate are few methods generally applied for bird counting. Reports and research articles of previous authors were consulted and their observations were compared with the present scenario of owl diversity. The comparison gave idea about global climatic changes and other anthropogenic activities. The breeding biology of bird were studied through continuous monitoring of several nests till the young ones leave it. Survival success was calculated through calculating the mortality rate at various levels of development. Various threats to species was also be noted through field observations so that strategies for the species can planned.

Results and Discussion

The findings of the research may have relevance to the Animal behaviour and Ecology as the methods those was used to study and observe owl bird are related to both. It was also relevent to Environmental studies because impact of climate and temprature on owl bird also studied during research. This may add a new dimension to the environment and behaviour of the owl in later phase. During the entire research work population estimation, nesting behaivour food and feeding behaivour, activity patterns and interaction with predators were done.

Conclusion

The research is significant to the humans as the birds acts as natural indicators of rapid environmental changes and hence, help in studying the effects on mankind. Also, new methods can be used to resolve the problems posed by the current methods.The study was benefit the human, the environment and other researchers. Hence, this research was beneficial to us. The Barn Owl *Tyto alba* is one of the most widely distributed owl species in the world **(Burton 1984).** The diet of Barn Owl is well known throughout the world because

of their cosmopolitan distribution and ease of pellet analysis **(Taylor 1992).** Food habit studies can provide the foundation for additional investigations, besides documenting the existence of certain prey species within the owl's range, its capability to take such prey, and relative abundance of prey species in the owl's diet. The Barn Owl is widespread in the tropics, where it is the most important nocturnal avian predator on many tropical islands. It can be beneficial to man as an agent to control commensal rodents, or it can be undesirable as an important threat to endemic animals or seabirds. In regions such as Malaysia its proliferation was stimulated in oil palm monocultures, resulting in successful rodent control. However, its introduction to some islands in the Indian Ocean (e.g. granitic Seychelles), in order to achieve the same goal, resulted in catastrophic predation on seabirds **(Penny, 1974)** rather than rodent control. In the nearby Comoros (including Mayotte), where it occurs naturally, it does, however, feed to a very large extent (over 90%) on commensal rats **(Louette, 1996).** The insectivorous and predatory birds are pondered useful to agriculture and ecosystem since they play an importatnt role in suppressing the population of insect and rodent pests, but there exists a dearth of studies to explore the role of birds in agriculture. The abundance and presence of insectivorous bird species is mainly associated with the vegetation structure or type and composition of an agro-ecosystem. Expansion of agriculture has resulted in the blooming of agro-ecosystem as more important and managed terrestrial ecosystem.

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