IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

A Study On Ecological Importance Of Wasp In Taranagar Region Of Churu District (Rajasthan)

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ABSTRACT:- The research was conducted within the Taranagar (Churu) region of Rajasthan, focusing on the diversity of wasps and their respective habitats. This study offers valuable insights into the insect species inhabiting the Taranagar region and their ecological environments. However, it also demonstrates that stinging wasps are valuable allies, not purposeless adversaries; they are friends to humans and always play a crucial role in various fields such as ecology, the economy of plants, human health, agriculture, etc. Despite their often negative reputation, wasps fulfill vital roles in the ecosystem, despite occasional displays of aggression.

KEYWORDS:- Churu, Wasps, Agriculture, Habitat, Environments, Ecology, Ecosystem, Plants, Wasp's venom, Taranagar.

INTRODUCTION:- Insects are fascinating creatures placed within the Arthropoda phylum of the Animal Kingdom, are uniquely classified in the Insecta class and are omnipresent throughout the Earth. A wasp is an insect of the narrow-waisted suborder Apocrita of the order Hymenoptera, which is neither a bee nor an ant. Wasp first appeared in the Jurassic period and it diversified into different superfamilies. Wasps are a diverse group, estimated at well over a hundred thousand described species around the world, and many more as yet undescribed.

In addition, the term wasp is sometimes used more narrowly for members of the

Vespidae, which includes several eusocial wasp lineages, such as yellowjackets (the genera Vespula and Dolichovespula), hornets (genus Vespa), and are members of the subfamily Polistinae. The insects we most commonly identify as "wasps (*Vespula vulgaris*)" are the social wasps. Social wasps live in colonies consisting of hundreds or thousands of more-or-less sterile female workers and their much larger mother, the egg-laying queen.

Social wasps, distinguished by their potent stings and vivid black-and-yellow hues, often serve as models for Batesian mimicry among non-stinging insects. Moreover, all social wasps construct their nests using primarily plant fibers, typically wood pulp, though they may incorporate mud, plant secretions like resin, and their secretions. These nests consist of multiple fibrous brood cells arranged in a honeycombed pattern, often encased within a larger protective envelope.

LITERATURE REVIEW:-

A study on Occurrence of the common wasp, *Vespula vulgaris* in New Zealand was done by Donovan (1984). In this study author examine the colour pattern of *Vespula vulgaris*. Also they collect the nests and specimen to study.

A study on Population Dynamics of the Social Wasps - *Vespula vulgari* in England was done by Archer (1985). This study investigate about the life cycle and population dynamics of the social wasps with their habit and habitat.

A study on Ecological effects and management of invasive alien Vespidae was done by Beggs, *etal*. (2011). They identified 34 vespid species known to be introduced around the world, but the seven most invasive species are all eusocial. Most introduced Vespidae only occur in one or two countries, but some areas have become geographic hotspots of invasion: Hawaii (15 species), North America (eight species), New Zealand (five species), Australia (four species) and South America (four species). Two invasive species, *Vespula vulgaris* and *V. germanica* have become particularly widespread and abundant with a range of impacts on biodiversity and ecosystem function.

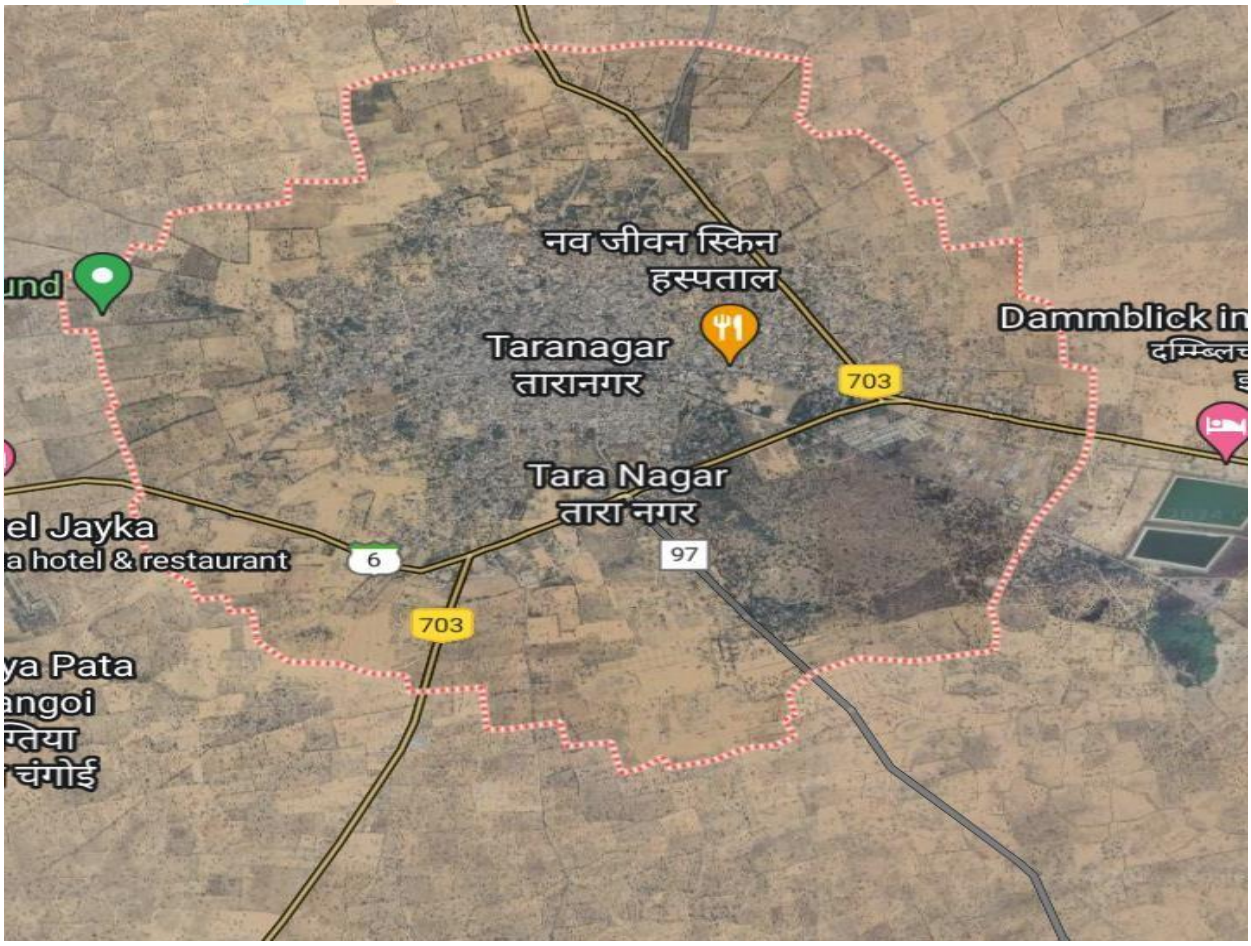
A study on Bias and perspectives in insect conservation: A European scale analysis was done by Leandro, *et al*. In this study, they aimed to measure bias in the selection of species for conservation by comparing protected and unprotected species in Europe. To this end, they considered 15 characteristics divided into five main categories: ‘Taxonomy’, ‘Morphology’, ‘Diet’, ‘Knowledge’ and ‘Distribution’.

A study on Research trends in ecosystem services provided by insects was done by Noriega, *etal*. (2018). In this study they examined publication trends in the research on ES provided by insects, ascertaining which ES and taxa have been more intensively investigated, and which methodologies have been used, with particular emphasis on experimental approaches. They first performed a systematic literature search to identify which ES have been attributed to insects.

A study on Climatic and environmental effects on Phenotypic variation in common wasp *Vespula vulgaris* was done by Badejo (2021). In this study author studied the effect of climate change using variation in latitude and weather condition of different cities on the growth (body size) and colouration (melanisation degree) in Vespula vulgaris.

A study on Adaptive significance of early reproduction in Vespula shidai social wasps was done by Tatsuya Saga, *et al*. (2024). This study investigated the group decision-making process regarding when and under what circumstances *Vespula shidai* initiates its reproductive phase. During the early reproductive period, they estimated the number of workers and new queens that emerged from the meconia in the cells

STUDY AREA:- Taranagar, located in the Churu district of the Indian state of Rajasthan, is both a city and a municipality, positioned at approximately 28° 66'N latitude and 75° 3'E longitude, approximately 28 miles south of Churu city. Moreover, Taranagar(Churu) is also situated in the nearby "Thar Desert of Rajasthan", India, where the majority of the population depends on farming. This region is spread out in 2470 square kilometer. 123 villages are established in Taranagar tehsil. In the range of 130 km there are a blackbuck sanctuary named Tal Chapper is located. The temperature here is very high in summer around 50°**C** and in winter it goes very down to around -2°**C**. The average rainfall in this region is around between 300-500 mm. last year it goes around 413 mm. The average climate is dry except during the monsoon month {August}. The humidity level is very high around 80%. The soil moisture level is very low. The quality of soil is very bad because it contain a high amount of soluble salts. The pH level of soil is very high due to these inorganic components. The bio diversity is very high in this region. There are many types of insects and organisms found. Therefore, the study area is ecologically best suited, where wasps predominantly inhabit grasslands and agricultural areas and are also found in some other places for instance, woods, houses, etc.



METHODS AND MATERIALS:- The study was conducted in the Taranagar region of Rajasthan on a monthly basis from March 2024 to April 2024. Stinging insect wasps were collected from the study area during field visits using a sweep insect net. Various methods including fieldwork, surveys, direct observation, and photography were employed to study the behavior of these stinging insects. Additionally, laboratory work was conducted by the researcher to investigate the stinging nature and venomous sting of these insects.

RESULTS AND DISCUSSION:- Insects represent an integral component of terrestrial ecosystems, providing numerous benefits to both humans and the environment. Among them, wasps hold particular significance, contributing significantly across various domains. Hence, the following elucidates the importance of these wasps.

ROLE IN ECOLOGY:- Out of the 100,000 identified wasp species, 70,000 are parasitic, lacking stingers, and extensively researched. These parasitic wasps are already employed in agriculture to manage pests, offering a pesticide-free solution. Additionally, there areapproximately 22,000 species of bees. The word "wasp" immediately evokes thoughts of pain, reflecting our narrow understanding of these creatures. We tend to associate them with aggressive social species like hornets, yellowjackets, and paper wasps, influenced by societal conditioning from family, friends, pest control agencies, and media portrayals that instill fear anddisdain. However, in reality, the majority of wasps are solitary, often small or tiny, and either lack stingers altogether or use them sparingly for self-defense.

Humanity's relationship with wasps has been tumultuous. They are often regarded with disdain, unlike bees, despite both having stingers. While we go to great lengths to save a bee trapped indoors, we typically react with aggression toward a wasp in the same predicament. This bias against wasps is deeply rooted in our culture and stems from a lack of understanding about their ecological role and the benefits they bring to our ecosystems.

POLLINATION:- Pollination is a vital ecological process ensuring the reproduction of flowering plants, is commonly associated with bees, but wasps also play a significant role. While bees primarily collect nectar, wasps are attracted to the sugary secretions of plants. During their visits to flowers for these secretions, they inadvertently transfer pollen from the male to the female parts of the flower, facilitating fertilization and seed production.

Additionally, wasps use a unique pollination technique called "buzzing." By vibrating their wing muscles at a specific frequency, they prompt flowers to release pollen. This buzzing is particularly effective for pollinating certain plant species like tomatoes, blueberries, and peppers. Without wasps buzzing, the diversity and abundance of these plants would be reduced greatly. According to a survey, generally, wasps visit 960 plant species, and in the survey, it was found that 164 species out of 960 are completely dependent on wasps for pollination, such as some orchid species that have evolved adaptations to attract the wasps they rely on, such as an appearance that mimics the back end of a female wasp.

PEST CONTROL:- As mentioned, in this region the population often relies on agriculture. Therefore one of the most valuable roles that wasps play in the ecosystem is natural pest control. Many wasp species are predators of insects and help regulate their populations. However, wasps feed on a wide range of insects, including caterpillars, flies, beetles, and aphids. By preying on these pests, wasps help protect crops, gardens, and forests from infestations and damage.

In contrast to many other predatory species, wasps are good at hunting. They have a strong sense of smell and can find and go after specific insects. Once they find their target, they either paralyze or kill it and then take it back to their nests to feed their larvae. This natural way of controlling insect numbers by wasps means we don't need to use as many chemicals to kill pests, which helps keep the environment healthier and more balanced. Hence, wasps play an important role in controlling pests and taking care of crops.

ROLE IN BIODIVERSITY:- Wasps also play a significant role in plant diversity, bio-loss and controlling insect populations which is important for keeping ecosystems balanced. Lots of wasp species hunt insects and help control their numbers by eating them. They go after a variety of insects like caterpillars, aphids, and flies.

Furthermore, wasps' hunting habits are essential for stopping certain insect species from becoming too numerous, which can harm plants and other creatures. For instance, if there are too many plant-eating insects, they can cause a lot of damage to plants, which lowers the variety of plants. By eating these plant-eaters, wasps help control their numbers and lessen the damage they do to plant communities. So, wasps contribute to maintaining biodiversity stability.

ROLE IN MEDICAL SCIENCE:- Human interactions with insects involve diverse applications, including practical uses such as food, textiles, and dyes, as well as symbolic representations in art, music, and literature. Additionally, wasp venoms are intriguing animal venoms due to their therapeutic usefulness. Several bioactive peptides and proteins isolated from wasp venom have been reported for their medical application. Medicines made with its venom used to treat some diseases such as smallpox, leprosy, fever, and wounds. Wasp venoms also present challenging therapeutic targets due to the varied chemical contents delivered upon wasp stings.

Moreover, Wasp venom has a wide variety of chemical constituents, which includes proteins, peptides (e.g., mastoparan, eumenitin, eumenitin-R, rumenitin-F, EpVP, decoralin, and anoplin), enzymes (hyaluronidase, α-glucosidase, phosphatase phospholipase A2, and phospholipase B), and small molecules. The isolated compounds from wasp venom have several beneficial activities such as antimicrobial, anticancer, and anti-inflammatory effects.

Additionally, a better understanding of the structure, function, physicochemical properties, and pathology behind these peptide and protein components is critical for developing improved wasp sting remedies and innovative medications.

CONCLUSION:- In this paper, we focused on stinging insects, especially wasps, which are useful for nature, and play an important role in the ecology of the Taranagar (Churu) region of Rajasthan. We discussed that stinging wasps are not usually harmful, they are the friends of humans. Wasp also play a key role in medical science, pest control and pollination.

Therefore, our understanding of the role of wasps in supporting our crops remains limited. We aim to improve this understanding and rehabilitate their negative reputation, enabling us to maximize the benefits derived from these intriguing creatures.

ACKNOWLEDGEMENT:- The author expresses gratitude to the Principal, and Head of the Department of Zoology at MJD Govt. College, Taranagar, Churu, for generously providing laboratory facilities and guidance.

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