



A Study On Ecological Importance Of Honey Bees In Nua, Region Of Jhunjhunu District (Rajasthan)

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ABSTRACT:- This research explored the ecology of Honey Bee and their habitats in the Nua, Jhunjhunu, Rajasthan. It offers valuable insights into Honey bee species and their ecological importance in this area. The honey bee is a eusocial animal that builds hives and lives in colonies. In the eusocial behavior, a sterile female worker caste takes on the responsibility of feeding and maintaining the colony. Honey bees belong to the genus *Apis* and are known for their eusocial behavior, forming large, complex societies. They build hives to store honey and are commonly farmed for this purpose. There are 5 species of honey bees, found in Rajasthan such as, *Apis mellifera*, *Apis cerana indica*, *Apis dorsata*, *Apis florea* and *Trigona*. Each with slight differences in appearance, but all share the same basic anatomy. Honeybees play a vital role in the ecosystem, agriculture, and human well-being.

KEYWORDS:- Jhunjhunu, Honey bee, Agriculture, Plants, ecosystem, pollination.

INTRODUCTION: Insects, fascinating creatures belonging to the Arthropoda phylum, are uniquely classified in the Insecta class and are found all over the Earth. The honeybee (tribe Apini) belongs to the family Apidae within the order Hymenoptera. This group of insects broadly encompasses all bees known for producing honey. Moreover, Hymenoptera are vital to humans because they pollinate wild and cultivated flowering plants, act as parasites to harmful insects, and produce honey. Honey bees are essential for honey production and crop pollination. They are highly social insects that form colonies or hives, with a single queen bee responsible for laying eggs. Numerous worker bees perform various tasks, including collecting nectar and pollen, caring for young bees, and building and maintaining the hive.

The honeybee has a distinctive body with specialized parts that help it function efficiently in the hive and its surroundings. The body of the honeybee is divided into distinct segments. The honey bee's head is large and holds important sensory organs. It has big compound eyes on the sides for great vision and detecting movement. Between the eyes, it has two segmented antennae that sense touch, smell, and chemical signals. Additionally, the bee has a proboscis, a long tube-like structure for drinking nectar and water.

Moreover, The honey bee has three pairs of articulated legs, which it uses for walking, gripping, and handling various materials. On its thorax, it has two pairs of wings that allow it to fly and hover skillfully. Apart from this, wax glands located on the abdomen produce beeswax, which worker bees use extensively to construct honeycomb cells. Overall, the honeybee's body structure is perfectly adapted for its role as a social insect. It navigates its environment effectively, facilitates communication within the hive, and performs essential tasks for the colony's survival.

Honey bees are very precious creatures in the animal kingdom. Bees are unique insects belonging to the classification Hymenoptera. There are approximately 20,000 distinct species. The lifecycle of a honeybee includes stages such as egg, larva, pupa, and adult. Each stage involves specific changes and duties that contribute to the hive's survival and productivity.

LITERATURE REVIEW:-

A study on Standard methods for estimating strength parameters of *Apis mellifera* colonies was done by Delaplane *et al.* (2015). This paper addresses metrics for gauging the strength of field colonies, focusing on population metrics of adult bees and broods.

A study on the Effects of wintering environment and parasite–pathogen interactions on honey bee colony loss in north temperate regions was done by Desai *et al.* (2016). In this study, The author observed colonies in two different environments (wintered indoors or outdoors) and analyzed how two parasitic mites, seven viruses, and *Nosema* affected honey bee colony mortality and population decline during winter.

A study on Bumble bee pollinators in red clover seed production was done by Rao *et al.* (2009). The aims of this study were to investigate pollination by the native bumble bee, *Bombus vosnesenskii* (Radoszkowski), identify the bumble bee species associated with red clover in Oregon and evaluate whether seed production is constrained.

A study on Complementary resource use by social vs solitary bees facing crops with contrasting flower supply was done by Bänisch *et al.* (2021). This research set up a pollination experiment using different pollination treatments (open, wind, and self-pollination) to examine how insect pollination affects the weight and quality of strawberry fruits.

A study on Bias and perspectives in insect conservation was done by Leandro *et al.* (2017). In this study, the researchers aimed to measure bias in the selection of species for conservation by comparing protected and unprotected species in Europe. They assessed 15 characteristics, which were categorized into five main groups: 'Taxonomy', 'Morphology', 'Diet', 'Knowledge', and 'Distribution'.

A study on Varroa-Virus Interaction in Collapsing Honey Bee Colonies was done by Francis *et al.* (2013). This research examined viral titers in honey bees and varroa mites across 23 colonies (from 15 apiaries) under three treatment conditions: organic acids (11 colonies), pyrethroid (9 colonies), and untreated (3 colonies). Approximately 200 bees were sampled monthly from April 2011 to October 2011, and again in April 2012.

STUDY AREA:- Nua is a village in the Jhunjhunu district of Rajasthan, India. Situated in Jhunjhunu Tehsil, it falls under the Jaipur Division and is located 18 kilometers west of the district headquarters of Jhunjhunu. Its geographical coordinates are 28° 4' 0" North latitude and 75° 17' 0" East longitude.

The district has a population of 2,139,658 and covers an area of 5,926 square kilometers, with a population density of 361 persons per square kilometer. It is located in the Shekhawati region and is bordered by Haryana to the northeast and east, Sikar District to the southeast, south, and southwest, and Churu District to the northwest and north. The district spans a total geographical area of 2,928 square kilometers and is divided into eight tehsils: Jhunjhunu, Malsisar, Buhana, Udaipurwati, Nawalgarh, Khetri, Chirawa, and Surajgarh.



Dundlod Fort is a renowned landmark in Jhunjhunu, attracting visitors from across the country. Its stunning architecture and interiors, adorned with numerous artistic items crafted by royals in their leisure time, make it particularly beautiful.

In Jhunjhunu, summers are long and sweltering, while winters are short, cool, and dry. The weather is mostly clear year-round. The temperature here reaches a high of around 47 degree Celsius in summer and drops significantly to around -2 degrees Celsius in winter.

Rainfall in Jhunjhunu varies significantly throughout the year. The rainy season lasts for 5.6 months, from April 25 to October 11, with a 31-day sliding rainfall total of at least 0.5 inches. July is the wettest month, averaging 4.1 inches of rain. The dry season spans 6.4 months, from October 11 to April 25, with November being the driest month, averaging just 0.1 inches of rainfall.

Agriculture is the primary occupation and main source of livelihood for most of the population in the region. Soil richness is a crucial factor affecting agriculture. The soil quality is poor due to high levels of soluble salts, leading to an elevated pH. However, the region has high biodiversity, with numerous insects and organisms.

METHODS AND MATERIALS:- The study was conducted in the Nua, Jhunjhunu region of Rajasthan from May 2024 to June 2024. Honey bee specimens were collected during field visits using a sweep insect net. To examine their ecological importance, various methods such as field surveys and photography were utilized.

RESULTS AND DISCUSSION:- Insects are a vital part of terrestrial ecosystems, offering numerous benefits to the environmental, agricultural, and medical fields. Bees play a crucial role in our food supply, from honey to almonds, fruits, and vegetables. They are responsible for one out of every three bites of food we eat. In addition to their role as pollinators, bees produce honey, propolis, and pollen, and provide habitats for other

species. They are also food for larger animals that play important roles in ecosystems. Overall, bees are essential keystone species that benefit both human and animal environments.

ROLE IN ECOLOGY:- Honey bees play a critical role in ecosystems, essential for the survival of many species, including humans. Beyond their vital role in pollination, they significantly impact biodiversity, ecosystem stability, and the economy through products like honey and beeswax.

ROLE IN POLLINATION:- Pollination is a crucial biological process where pollen grains move from a flower's male anthers to its female stigma, enabling plant reproduction and the production of seeds and fruits. Bees, with their specialized body structures and foraging habits, are exceptionally skilled at this task, establishing them as one of nature's most effective pollinators. Honey bees play an important role in pollinating plants by transferring pollen between flowers, enabling fertilization and seed production. When bees collect nectar, pollen grains adhere to their bodies. As they move from flower to flower, they deposit this pollen onto the female reproductive organs, crucially enabling fertilization. This process is vital for the reproduction of numerous plant species, encompassing both food crops and wild plants.

Additionally, Bees are highly effective pollinators because they can visit a wide range of flowers and travel long distances between plants. However, bees can travel up to five miles from their hive while searching for nectar and pollen. This extensive range allows them to visit diverse plant species, ensuring effective pollination. So, this process helps both plants and animals that rely on them for food and habitat.

ROLE IN AGRICULTURE:- Honey bee pollination significantly increases the production of fruits, vegetables, nuts, and seeds in agriculture. For example, the tomato plant, a staple vegetable crop used in many culinary dishes, relies 30 to 50 percent on bee pollination for its yield and quality. Additionally, cross-pollination by honey bees enhances the genetic diversity of plants, which is essential for their adaptability and resilience. This resilience helps plants withstand diseases, pests, and environmental changes, ensuring stability in ecosystems.

ROLE IN MEDICAL SCIENCE:- Honeybee (*Apis mellifera*) products, such as honey, bee pollen, propolis, royal jelly, beeswax, and bee venom, have a rich history in traditional medicine across cultures. These products display a range of beneficial properties including anti-inflammatory, antibacterial, antifungal, antiviral, and antioxidant effects. In Ayurveda, honey is used to treat a variety of illnesses and conditions, including stress, eczema, weakness, burns, cuts, coughs, and asthma.

Apart from this, bee venom contains peptides like apamin and adolapin, which, despite their toxic nature, exhibit anti-inflammatory and pain-relieving properties. These effects are particularly beneficial for conditions like rheumatoid arthritis, a painful inflammatory joint condition. Furthermore, bee venom is increasingly used in cosmetic products, with many skincare companies incorporating it into serums and moisturizers. This ingredient can benefit skin health by reducing inflammation, offering antibacterial properties, and diminishing wrinkles.

ROLE IN ECONOMY:- Honey bees are also beneficial for our economy. Bee pollination plays a crucial role in both the quantity and quality of crops. Economically, bee pollination is highly beneficial, contributing significantly to global food production and agricultural sustainability. By enhancing crop yields and ensuring consistency, bees strengthen food security and provide substantial economic advantages. Their reliable pollination supports sustainable agriculture by ensuring stable and abundant crop production.

In addition, managed bees, especially honey bee colonies like *Apis mellifera*, are crucial for global food production by pollinating a wide range of crops. Beekeepers transport these colonies to farms to ensure crops like fruits, vegetables, and nuts are well-pollinated, boosting their yield and quality. This not only supports agriculture but also contributes significantly to the economy worldwide.

CONCLUSION:- In this paper, the focus was on honey bees, which are crucial for nature and play an important role in the ecology of the Nua, Jhunjhunu region of Rajasthan. We discussed that bees are very important not only for producing honey but also for maintaining global biodiversity and food production. Their pollination is indispensable for countless plants, including many essential crops in our diet.

Protecting bees goes beyond saving a single species; it is about safeguarding ecosystem health and securing our food supply. Their role in pollinating plants is fundamental to ecological balance and the sustainability of food sources, underscoring the importance of conserving bees for both environmental stability and human nourishment.

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