REVIEW ON FORGING PROFILES AND POLLINATION WITH SPECIAL EMPHASIS TO DIFFERENT SPECIES OF HONEYBEES

Baishali Sahaand Dr. Meenakshi Solanki

Department of Zoology, Dr. A.P.J. Abdul Kalam University, Indore, M.P., India

Received : 07.10.2020 Revised : 06.11.2020 Accepted : 07.12.2020

ABSTRACT:

Honey bees, which are beneficial insects, are particularly important since they produce useful goods while also increasing crop productivity through pollination. The use of bees for commercial purposes has a long history in India. Beekeeping is a highly technical and scientific endeavourwhich has grown in popularity as an agricultural activity and is closely associated with rural living. Honeybee foraging efficiency is mostly determined by the quality and amount of accessible bee food, colony circumstances, and the foraging range of worker bees. The foraging activity of bees at various seasons of the year indicates the adaptability of bees in utilising bee food in a given area. Similarly, beekeepers with a broad understanding of pollen sources are better equipped to use those sources to their full potential, resulting in stronger colonies that are more productive. This article highlights the forging profiles and pollination with special reference to different species of honeybees.

Keywords: Beekeepers, Pollination, Foraging, Honeybee.

INTRODUCTION:

Beekeeping is a multidimensional activity [1] that has become the most feasible enterprise due to the worth of various components such as bee pollination, wax production, medicinal benefits of honey, and others. In the plains and hills up to 2700m, beekeeping is practised under a variety of agroclimatic conditions [2]. Honeybees, like any other animal, execute a wide range of tasks in order to get the essentials of existence, such as food and shelter.

The use of honey bees to pollinate a wide range of crops could be a realistic approach for increasing crop yield. Honeybees are social insects that are found all over the world and with

whom man has created a peaceful coexistence [3,4]. These insects are important pollinators for many plants, as well as producers of honey [5-6].

Bees acquire pollen, nectar, water, and propolis from plants as part of their foraging behaviour [7]. Foraging is the act of gathering all of these things, and the bee is a forager. The honeybee's foraging behaviour is determined by its innate capacity and responses to numerous environmental cues. Foraging is an important component of their biology since it allows them to adapt to the available vegetation and climatic circumstances. When honey bees begin foraging, they will make multiple visits per day if the weather conditions are favorable. A single foraging journey can last an hour or more, with pollen-gathering trips often taking longer than nectar-gathering trips [8]. Pollen and nectar are utilized as nourishment by bees, and nectar is transformed into honey, while pollen is used to build combs.

Honeybee foraging efficiency is mostly determined by the quality and amount of accessible bee food, colony circumstances, and the foraging range of worker bees. The foraging activity of bees at various seasons of the year indicates the adaptability of bees in utilizing bee food in a given area[9]. Similarly, beekeepers with a broad understanding of pollen sources are better equipped to use those sources to their full potential, resulting in stronger colonies that are more productive.

REVIEW ON FORGING PROFILES AND POLLINATION IN DIFFERENT SPECIES OF HONEYBEES:

Karacoban, Tugce (2018) stated that the Honey bees and wild bees provide important pollination services to numerous crops and native plants. In recent years, declines in bee populations have highlighted the importance of the ecological services they provide and the need for more research into the reasons for their decline. Currently, many conservation efforts to mitigate bee losses include increasing forage and habitat, however, there is growing concern over the role interspecific pathogen transmission plays in bee decline. Viruses commonly found in honey bees may be transmitted and pose a threat to other bee species when bees come together at foraging sites. To elucidate the impact of viruses in bee health decline, examined the roles flowers, bee management, land type, and foraging activity play in viral prevalence. Bees, pollen (collected from foraging bees), in-hive pollen stores, flowers, and other insects on flowers were analyzed for the presence of four common honey bee viruses using RT-PCR sequencing techniques. To

further examine the role bee management and life history traits, such as sociality, may play in the transmission and or persistence of viruses, we compared viral profiles from two species of managed social bees (Apis mellifera, Bombus impatiens) and two species of wild social bees (*B. griseocollis*, *Halictusligatus*). Bees were also collected from different landscapes (urban, agricultural, roadsides and conservation parks) and from short, medium, or long blooming plants to determine how floral traits and land management practices may impact viral profiles among bees. [10]

Cappa F et. al. (2018) stated that the honeybee colonies are under the threat of many stressors, biotic and abiotic factors that strongly affect their survival. Recently, great attention has been directed at chemical pesticides, including their effects at sub-lethal doses on bee behaviour and colony success; whereas the potential side effects of natural biocides largely used in agriculture, such as entomopathogenic fungi, have received only marginal attention. Here, we report the impact of the fungus *Beauveria bassiana* on honeybee nestmate recognition ability, a crucial feature at the basis of colony integrity. We performed both behavioural assays by recording bee guards' response towards foragers (nestmate or non-nestmate) either exposed to *B. bassiana* or unexposed presented at the hive entrance, and GC-MS analyses of the cuticular hydrocarbons (CHCs) of fungus-exposed versus unexposed bees. Our results demonstrated that exposed bees have altered cuticular hydrocarbons and are more easily accepted into foreign colonies than controls. Since CHCs are the main recognition cues in social insects, changes in their composition appear to affect nestmate recognition ability at the colony level. The acceptance of chemically unrecognizable fungus-exposed foragers could therefore favour forager drift and disease spread across colonies. [11]

Bhattacharyya M. et. al. (2017) stated that the Native bees are important pollinators of cultivated and wild plants. Although much importance has been accorded them in many countries of the world, India has largely ignored the role of these important ecosystem service providers for too long. The consequence is public apathy toward these beneficial insects. This study has attempted to find out the general ‘‘bee awareness’’ of people living in agrarian societies in a socioeconomically underdeveloped Indian district through picture-based questionnaire surveys and has also attempted to determine the effectiveness of information divulgation in changing people's perception toward native bees. Opinion of the people on honeybee health in this district

has also been explored. It has been found that traditional knowledge of bees is largely restricted to the honey-producing species of the genus Apis, and even though other native species are frequently encountered by the people, there is a substantial lack of awareness about their true nature and importance. However, the study suggests that through right training, this situation may favorably be altered. Multiple regression analysis of socioeconomic factors determining bee knowledge of respondents revealed that women were>4 times better at identifying native bees than men, both with or without given information, and the higher the level of education the better people were at identifying native bees. People considered pesticides and their irregular application to be the major killers of honeybees. This study generates hope for involvement of local people in native as well as honeybee conservation and management through proper awareness campaigns and right education. [12]

Thakur S. (2015) stated that the Indian Sundarban on northern Bay of Bengal is the largest contiguous mangrove forest on earth, is a highly productive and diverse ecosystem (ES) with an aerial coverage of 9629 Sq Km. This ecosystem is also providing a wide range of direct or indirect ecosystem services (ES) and livelihood opportunities for the society. The extent of aerial coverage of the forest has not changed much in the last decade, but the health of the forest degraded along with their ecosystem services, as found from several studies. Traditionally, people of this region are dependent on farm-based economy, else on the forest resources. Collection of natural honey from the forest is one such traditional practice while apiary beekeeping (Apiculture) started in the last decade only. This study is an attempt to understand the existing status of apiary beekeeping (Apiculture), their potential and constraints within the Satjalia Island, in the context of alternate livelihood option, either full time or as a seasonal profession. [13]

H.F. Abou-Shaara (2014) stated that the Foraging behaviour is one of the distinctive behaviours of honey bees, Apis mellifera. This behaviour is the link between the honey bee colony and the ambient environment. Therefore, various in-colony and out-colony factors have an impact on this behaviour, and many studies have been employed to investigate these factors. Foraging behaviour is not advantageous only for the colony and for plant pollination but also has other benefits. In contrast, some disadvantages have also been discovered to be linked with foraging activity. Practically speaking, the control over this behaviour is very important to maximize

colony products as well as to increase other agricultural benefits. This paper presents a review on foraging activity including; the regulation of foraging tasks, factors impacting this behaviour, foraging preference, variations between subspecies, monitoring methods as well as the possible methods for controlling this behaviour. As concluded from this review, more work needs to be performed in order to elucidate certain aspects of foraging behaviour. [14]

Sivaram, V et. al. (2012) stated that the present work refers to the pollen analysis of 15 honey samples collected from three locations from Karnataka region of Nilgiri Biosphere, South India. The honey samples were collected from the domestic bee hives of Apiscerena and wild bee hives of Apisdorsata from local honey hunters of forest regions during March 2010 to October 2011. Pollen analysis was performed using acetolysis method. The samples were subjected to both qualitative and quantitative analysis. Out of 15 samples analyzed one sample was recorded as unifloral, which contains Coffea sp., as predominant pollen and remaining 14 honey samples were recorded as multifloral. Fabaceae, Asteraceae and Myrtaceae were most represented families. There was a dominance of tree species which are the most preferred and highest contribution for nectar and pollen source for honeybees in the study area. This study discusses the honey plant resources and potentialities for commercial beekeeping in Nilgiri Biosphere. [15]

John C. Manning and Peter Goldblatt (2005) stated that the floral morphology and observations on insect and avian visitors to species of the southern African and largely Western Cape genus Tritoniopsis indicate that short-tubed pink flowers, ancestral in the genus, are pollinated by anthophorine bees forging for nectar. Multiple shifts to more specialized pollination systems have occurred in the genus during its evolution. Four species with elongate floral tubes and a pink to red bilabiate perianth are pollinated either by sunbirds (Nectarinia) alone or by sunbirds and the satyrid butterfly *Aeropetestulbaghia*. Another red-flowered species with an actinomorphic flower is inferred to be pollinated only by Aeropetes, while two species with pale pink flowers with red markings are pollinated by long-proboscid flies in the genus Prosoeca (Nemestrinidae). Tritoniopsis parviflora is unique in the African Iridaceae in producing floral oils as a reward to the short-tongued bee Rediviva gigas (Melittidae), as well as conventional sugar nectar. Tritoniopsis nervosa has white, sweetly scented, long-tubed flowers and is assumed to be pollinated by night-flying moths. Although relationships within Tritoniopsis are poorly understood, it is clear that at least five shifts in pollination strategy have occurred in this genus of

just 24 species. Studies also show that bimodal pollination systems using two different pollinator groups occur in several species, using sunbirds and Aeropetes, anthophorine bees and nemestrinid flies, or oil-collecting Rediviva and nectarivorous bees. Such bimodal systems are probably important for the successful reproduction of these plants. [16]

CONCLUSION:

Honey bees have been found to be the most effective pollinators of oilseeds, legumes, fruits, and vegetable. Abrol et al. (2002) conducted research in Jammu to determine the pollinating insects visiting flowers of temperate fruit plants in February and March 2002, and found that honey bees, *Apisdorsata F.*, *A.mellifera* L., *A.cerana F.*, and *A.florea F.* accounted for more than 80% of the total flowers visiting insects. Because of their special instinctual behavioural traits for pollen and nectar gathering and efficiency in pollen transport, honey bees are potential pollinators of the crop.

Flowers are the primary source of food for bees. Pollen, a protein-rich food utilised primarily to feed the brood, and nectar, a carbohydrate fuel required for flight, foraging, hive activity, and brood development, are both obtained from flowers. The bees are micromanipulators that work on their own. These micromanipulators also help with pollination, which is essential for economically important plants. Honeybees are the most significant pollinators in agriculture, despite the fact that many different insects visit blooms of crop plants, weeds, and natural flora. Insect visitors are classified as pollinators or non-pollinators based on their foraging behaviour, with pollinators delivering pollen intentionally or unintentionally. Pollen collectors are more effective pollinators than bees that collect only nectar or both pollen and nectar. The fitness of bees is thought to be closely linked to their foraging efficiency. Bees have developed pollen and nectar gathering tactics that boost cross-pollination efficiency.

REFERENCES:

1. Singh, Y.R.1997 Role of honeybee in farm production, agricultural growth and rural reconstruction in India. Indian Bee J. 59 (1&2): 24-30.

2. Melkania N. P; Pandey U. and Sharma T. 1983 Potentialities for bee pollination of crops in U. P. Indian Bee J. 45: (2 &3) : 58-61.

3. Mishra R. C.1995. Honeybees and their management in India. ICAR, New-Delhi, 1-168.

4. Nagaraja N., and Reddy C. C.1996 Hive and foraging index of hive honeybee species. Spl.issue Proc. of the National Symp. On Ani.Beh. 11 : 7-16.

5. Kapil, R.P., and Kumar, S. 1975 Foraging activity of *Apisdorsata* on *Brassica juncea*. Bombay. J. Natu. Hist. Soci. 7 : 327-331.

6. Jadhav.L.D. 1981 Role of insects in the pollination of onion in Maharastra. Indian Bee J. 43: 61-64.

7. Seeley T.D.1985.Honeybee ecology, Princeton University Press, Princeton, 201.

8. Rao. G M., and Suranarayana M. C. 1988 Studies on pollination of watermelon. Indian Bee J. 50(1): 5-8.

9. Abrol, D. P., Khan, M.S; and Monobrullah, M. 2002. Competition of fruit trees with a weed, Lepidagthus incurve for their pollination by Apis species in Jammu. Indian Bee J. 64 (182) 55-56.

10. Karacoban T (2018). Viral Prevalence Among Social Bees in Different Landscapes. University of Nebraska – Lincoln, Dissertations and Student Research in Entomology. 56.

11. Federico Cappa, Iacopo Petrocelli, Francesca Romana Dani, Leonardo Dapporto, Michele Giovannini, Jeferson Silva-Castellari, Stefano Turillazzi& Rita Cervo (2019). Natural biocide disrupts nestmate recognition in honeybees, Scientific Reports, 9:3171, 1-10.

12. Bhattacharyya M, Acharya SKR, Chakraborty SK (2017). Pollinators Unknown: People's Perception of Native Bees in an Agrarian District of West Bengal, India, and Its Implication in Conservation, Tropical Conservation Science, Volume 10: 1–14.

13. Thakur, Shruti. (2015). Scope and Constraint of Beekeeping in Satjalia Island within Indian Sundarban Delta. International Journal of Environmental & Agriculture Research (IJOEAR), Vol-2: 109-114.

14. H.F. Abou-Shaara (2014). Characterization of pollen profile of Apis mellifera L. in arid region of Pakistan. Saudi journal of biological sciences, 28(5), 2964–2974.

15. Sivaram, V et. al. (2012). Pollen Analysis in Honeys Collected from Karnataka Region of Nilgiri Biosphere, South India, Journal of Apiculture 27(3) : 223~231.

16. John C. Manning, Peter Goldblatt (2005). Radiation of Pollination Systems in the Cape Genus Tritoniopsis (Iridaceae: Crocoideae) and the Development of Bimodal Pollination Strategies, International Journal of Plant Sciences 2005 166:3, 459-474.