

Effects of Environmental Changes on Bee Forage with Special Reference to Bee Pollen

Sunaina Jaswal, Dalip Kumar, Neelam K Sharma

Department Of Zoology ,Post Graduate Govt. Collge For Girls, Sector – 42, Chandigarh

Abstract - Bee forage means food of honey bee which mainly constitutes pollen and nectar from blooming plants. The forage sources for honey bees are an important consideration for beekeepers. In order to locate hives for maximum honey production and brood one must consider the off season. Foraging behaviour is one of the distinctive behaviour of the honeybees. The behaviour is link between the honey bee colony and the ambient environment. Due to industrialization and various other factors that contribute to various environmental changes, highly influence the foraging behaviour of honey bees as well as affect the physiology and nutritional quality of bee pollen. As pollen is the main source of protein for the bee colony so change in its quality and quantity highly influence the bee hive health.

Keywords - Bee forage, Pollen, Forage sources, Environmental changes, Foraging behaviour.

I. INTRODUCTION

Pure bee pollen has been called “nature’s superfood”. Pollen collection by bees is natural behaviour of honey bee. Environment in which pollen collection takes place is, vitally important especially with regard to nutritional contents. Pollen foraging activity is usually measured by the pollen traps (2). Pollen is recognized by honeybees due to its odor, color, shape and also because of presence of essential amino acids and required proteins. All these components of pollen direct the foraging behaviour of honey bees. Foraging behaviour is affected mainly by in-colony and out-colony factors. In-colony factors include queen presence and case (virgin or mated) and out-colony factors include availability of plant resources and preference of foragers for some resources over others(3). All out-colony factors are highly environment dependent. Changes in the environmental conditions may cause changes in the physiology of plants, chemical composition of plant products i.e. pollen and nectar which are also known as bee forage and this results in change in foraging preferences by honey bees(3). Because of these changes honeybees cannot meet their nutritional requirements which result in poor colony growth or ultimately death of the whole colony.

II. DISCUSSION

The key factors affecting the climate changes are temperature and humidity. These factors play important role in maintaining a bee hive. The humidity in the hive must be

maintained as low as possible and the temperature of the brood must be maintained at 34°C and in winter the core temperature of the hive must not fall below 13°C. Foraging behaviour is one of the distinctive behaviour of the honey bee(1). Bee foraging can classified into water, nectar, pollen or resin foraging. The type of foraging whether for pollen or nectar is highly colony level trait with genetic component.

Foraging activity of honeybees usually initiated in the early morning and finishes in the evening. In many cases, honey bee workers start foraging at 6:00 am but this time can be changed due to various regional and environmental factors. Most of the pollen is collected during early morning and less in the afternoon(2). More than hundred previous studies have shown that elevated levels of atmospheric carbon dioxide decreases the nutritional value of plants, such as wheat and rice. The rising environmental carbon dioxide levels lower the protein levels in pollen which undermine the bee nutrition and its reproductive success.

In polluted areas, fuel exhaust can diminishes the foraging efficiency of honey bees by reducing the ability of worker bees to recognize floral odours (6). Hence honey bees cannot recognize their preferred or required pollen for colony growth. This interference of fuel exhaust also affects the pollination of plant species basically that are native to particular area under adverse climatic changes.

Changes in the climatic temperature also affect the foraging activity of honey bees(4) and (5). A negative correlation is found between temperature and foraging activity. Foraging activity of honeybees is inversely proportional to temperature(5).

Pollens collected from farms that utilize chemicals or near heavily polluted areas such as industrial areas, exhaust ridden cities and major highways, then the nutrients in the pollen will be lower. The nutrients will probably be compromised by harmful effects of pollutants and toxins that seep into the different flowers that the bees collect pollen from.

Due to climatic changes, many plants become prone to various diseases, they are easily attacked by various pathogens. At that time forager bees spread these pathogens with pollen transfer from plant to plant e.g. forager bee transfer pollen – borne blue berry leaf mottle virus (BBLMV)

which has the ability to remain infectious within the honey bee colony for at-least 10 days (8). Sometimes bees collect poisonous pollen from some plant species either during dearth period or because of contamination of pollen with various pollutants or chemicals and then store these pollen in colonies with harmful effects on colony's health

The colour and texture of the flowers are important features that mainly attract the pollinators. Various climatic changes causes changes in flowers that deter the honey bees from landing on that flowers. This result in decline in the pollination of that plant species and unavailability of pollen of that plant for honey bees(6).

III. CONCLUSION

Pollen is the sole source of protein for the honey bees, hence, it is very important for bee colony growth and development. Pollen is obtained from plants which are highly influenced by environmental changes. Pollen is also known as bio-indicator of climatic changes. The climatic changes highly affect the quality and quantity of the pollen which directly or indirectly affect the bee colony growth and the quality & quantity of bee products.

ACKNOWLEDGEMENTS

The authors would like to express sincere thanks to Principal, Ms Mani Bedi, P.G. Govt. College for Girls, Sector-42, Chandigarh for providing necessary facilities. We are thankful to Department of Science & Technology, h for providing the financial support under INSPIRE scheme to the research scholar .

IV. REFERENCES

- [1] ABOU-SHAARA .H.F. (2014).The foraging behaviour of honey bees, *Apis mellifera*: a review.*Veterinari Medicina*,**59** (1):1-10
- [2] Reyes-Carrillo JL, Eischen FA, Cano-Rios P, Rodriguez-Martinez R, Camberos UN (2007): Pollen collection and honey bee forage distribution in Cantaloupe. *Acta Zoologica Mexicana* **23**, 29–36.
- [3] Free JB, Ferguson AW, Simpkins JR (1985b): Influence of virgin queen honeybees (*Apis mellifera*) on queen rearing and foraging. *Physiological Entomology* **10**, 271–274.
- [4] Tan K, Yang S, Wang Z, Radloff SE, Oldroyd BP (2012): Differences in foraging and broodnest temperature in the honey bees *Apis cerana* and *A. mellifera*. *Apidologie* **43**, 618–623.
- [5] Joshi NC, Joshi PC (2010): Foraging behaviour of *Apis* Spp. on Apple Flowers in a subtropical environment. *New York Science Journal* **3**, 71–76.
- [6] Girling RD, Lusebrink I, Farthing E, Newman TA, Poppy GM (2013): Diesel exhaust rapidly degrades floral odours

used by honeybees. *Scientific Reports* **3**, 2779. DOI:10.1038/srep02779.

- [7] Bilu A, Dag A, Elad Y, Shafir S (2004): Honey bee dispersal of biocontrol agents: an evaluation of dispensing devices. *Biocontrol Science and Technology* **14**, 607–617.
- [8] Boylan-Pett W, Ramsdell DC, Hoopingarner RA, Hancock JF (1991): Honeybee foraging behavior, in-hive survival of infectious, pollen-borne blueberry leaf mottle virus and transmission of the virus in highbush blueberry. *Phytopathology* **81**, 1407–1412.