



Investigating New Pollinator in India: Bumble Bees

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Introduction

Insects are one of the diversified organisms on earth which comprises of beetles, butterflies, flies, grasshoppers, wasps, bees etc. All insects play an important role in the conservation of plant germplasm and hence diversity of both crop and wild flora which further supports the existing fauna. This maintenance of flora balance in nature is the result of an indispensable process i.e. pollination and the agents are termed pollinators. Among the different pollinators, bumble bees have a very important place. These are wild pollinators and belong to order Hymenoptera, family Apidae and genus *Bombus* and are being widely used in eastern and western continents for the pollination of crops.

Nest Architecture

Bumble bees nests below the ground in the forests, fields and barren lands. The hibernated queens of bumble bees come out from hibernating places and starts searching for the nesting places which could be an abandoned nests or cavaties underground. After finding a suitable place for nesting, it starts building up of the nest. The nests are located mostly in North-West direction. The nesting place may be a piece of barren land, uncultivated fields or bunds along the fields with a hidden nest entry. The underground nests are oval to circular in shape, covered by involucre from outside. Queen secretes wax from the ventral side of the abdomen and lays 2-6 eggs in the wax covered cups. These eggs are then incubated by the queen. After 2-5 days, the eggs hatch into white coloured larvae. Queen feeds the larvae and the size of the nest increases with the brooding activity and finally reaches to its maximum population which varies in different species. Size of the nest depends on the geographical conditions and species of bumble bee.

Division of Labour

After the emergence of the first workers, the queen performs only the work of egg laying. The workers took all the duties (pollen, nectar gathering, feeding of young brood and building and maintenance of nest etc.). The colony grows gradually and becomes full developed. During autumn, the queen starts laying sexual forms (new daughter queens and drones) that can be found mating in the day time. The queens are larger in size while the drones are smaller than queens.

Foraging Behaviour

After locating a suitable habitat, queens start foraging on blooming flora for the collection of pollen and nectar. Queens generally forages during early morning (0530-0800h) and evening (1700-1900h) time. The queen forages till the first batch of workers emerged. The workers forage for nectar and gather pollen. Different species of bumble bees have different flower preferences, but all bumble bees need to visit a variety of different plant species, as they are active from early spring through to late summer. These are active fliers and have good pollination efficiency.

Conservation of Flora by Bumble Bees

Bumble bee depends on large number of floral sources for their survival and sustenance in nature hence delivering unknowingly pollination services. The flora comprises of many wild and cultivated plants such as Caryopteris, Scutellaria, Jasmine, Tobacco, Rosmary, Salvia, Chrysanthemum, Antirrhinum, Larkspur, Lupin, Callundula, Poppy, Radish, Sarson, Brinjal, Chillies, Pepino, Cucurbits, Peas, Plum, Peach, Pear, Apple, Kiwi, Orange, Lemon, Pomegranate, clover, Wisteria, Olive and some wild bushes. Besides pollinating these plants, bumble bees also help in pollination of many fodder crops. Pollination ultimately results in conservation of germplasm of pollinated plants.

Mating in Bumble Bees

Queens after emergence of 6-8 days, leaves the nest for mating. After mating, the mated queens come back to their nests while drones do not. Bumble bees mate during the day time. The mating lasts for 15-40 minutes. Polyandry exhibited. After mating, the drones flew away while the queen returns back in the nest and remains in the nest till onset of winters.

Hibernation in Bumble Bees

Before the winters, the queens search for the hibernating sites. After getting a suitable hibernating place, queens leave the nest and with the first showers of the winter, the queen undergoes hibernation and spends whole winters inactively.

Diapause in *Bombus haemorrhoidalis*

In subtropical bumble bees it was found that these do not undergo diapause and after mating, starts the building up of the nest in 30-45 days. The possible reason of delaying of nesting could be the proper development of the ovum and activation of the semen stored in the spermathecae of the queens. The development of the oogonium could also took time for proper oviposition.



Bumble bee natural nest



Bumble bee artificial nest



Bumble pollinating duranta



Pollination of cucumber under protected conditions

Conclusion

Bumble bees are native wild pollinators nests underground, have an annual life cycle comprising of queen, workers and drones. Queens are the mentors of the nest while workers help in maintenance. Drones mates with new queens and conserves the next progeny. Studies from last one decade on this pollinator revealed that it can be domesticated and used for the pollination of crops both under protected and open field conditions. Successful trials of laboratory reared bumble bees for pollination (cucumber, apple) were made which disclosed their efficiency and now a days, stress have been given for the commercialization of this pollinator in India as it could also be a backup pollinator for honeybees which are suffering a setback due to disease attacks and inclement weather conditions.