



Bumble Bees As Crop Pollinators

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Abstract

The bumble bees play important role in the production of seeds and fruits of cultivated as well as wild flora by way of pollinating the flowers. The pollination effectiveness of bumble bees makes them important pollinators of specific plant species. A very little attention was paid in India in respect of biology, nest architecture, nesting habitat, domestication of bumble bees and utilization of laboratory reared bumble bees in pollination of crops. This article discusses shortly about peculiarities of bumble bee in respect to pollination of crops.

Key words: Bumble bees; buzz pollination, bombiculture, Tomato, cross pollinator

1. INTRODUCTION

Bumble bees are large, robust insects with black and yellow coloration. The bumble bee has a black or yellow hairy abdomen which is a character from a carpenter bee which has a black shiny, hairless abdomen. The foraging bumble bee has a large pollen basket on each hind leg that is often loaded with pollen. The bumble bee queens are typically twice as large as workers or males. A female bumble bee has a pointed abdomen with a stinger. Males do not have a stinger and the tip of the abdomen is rounded.

The bumble bee (*Bombus* spp.) comprises a group of several hundred species found primarily in temperate regions. Bumble bees are highly social, like honeybees, but with smaller, less structured nests, consisting of one to five hundred bees. Bumble bees work harder, faster, and at cooler temperatures than honey bees. Bumble bees play a vital role in pollination of plants. Bumble bees are excellent pollinators of a wide variety of crops although in some plant species they cut a hole in the base of the corolla and "rob" the nectar without effecting pollination. Red clover is an excellent forage crop for bumble bees as it provides forage plants that bloom eight to nine weeks.

Read (1983) reported that honeybees foraged for pollen only, but the longer tongued *Bombus* sp. and anthophorids collected nectar and pollen in *Salvia carduacea* L. in USA.

The genus *Bombus* comprising 239 known species the world over. Rearing of bumble bees and their utilization in pollinating crops grown in poly houses has taken the shape of industry in western world. In India very little attention was paid in respect of their biology, nest architecture, nesting habitat, domestication of bumble bee colonies artificially and utilization of laboratory reared bumble bees in pollination of crops. The pollination



effectiveness of bumble bees makes them important pollinators of specific plant species in this way. The bumble bees play important role in the production of seeds and fruits of cultivated as well as wild flora. Recently, several species of *Bombus* has been managed in laboratories with the aim to use for pollination of greenhouses tomato in Europe. Sih and Baltus (1987) observed the most important floral visitors on catnip in USA were honeybees (*A. mellifera* L.), solitary bees (halictidae) and bumblebees (*Bombus* sp). Visitation rate was higher in larger patches for honeybees and bumblebees, but lower for solitary bees.

2. IMPORTANT SPECIES OF BUMBLE BEES



Bombus terrestris



Bombus lucorum



Bombus pascuorum



Bombus hortorum

Kumar and Kumar (1998) observed that there are eight different types of insects visiting the *Ocimum* in bloom. The indigenous honeybee, *A. cerana* was the predominant visitor, followed by bumblebees.

Proper pollination is needed for optimal fruit set and production. In the past, greenhouse tomato growers had depended on manual pollination, which can be very time consuming. Using bumble bees for pollination is an effective alternative and can completely replace manual pollination. In addition to saving on labor, bumble bee pollination has many advantages.

3. TOMATO POLLINATION BY BUMBLE BEES

Bumble bees are reared commercially for shipment to growers especially for greenhouse grown crops such as tomatoes which require "assistance" with pollination. Tomato pollen does not loosen easily. Each flower must be vibrant to ensure pollination. Tomato blossoms require slight movement for sufficient pollen from the stamens to fall onto the stigma of the flower. Bumble bees cause movement by hanging upside down on the flower, fastening their jaws onto the staminal tube, and then setting the flower into vibration by activating their flight muscles. This is called "buzz pollination." These jaw marks will soon appear as a brown discoloration on the blossom assuring the



grower that flower has been visited and “set.” Bumble bees are most active in the morning and in the afternoon at temperatures between 50 and 86°F. They function best at temperatures between 59 and 77°F.

4. ADVANTAGES OF BUMBLE BEE IN CROP POLLINATION

- The bumble bee is capable of vibrating the flower using the unique "buzz pollination" mechanism. A bumble bee provides a back up pollinator and capable to pollinate crops effectively than other modes of pollination.
- The bumble bee is less affected by extreme weather conditions than the honey bee. Bumble bees are cool weather operators. Unlike honey bees, bumble bees are active at low temperatures (5°C), in windy conditions and under cloudy skies.
- The bumble bee is better adapted to perform under confined greenhouse conditions. Bumble bees are not only excellent pollinators in open air, but are especially valuable in greenhouses and plastic tunnels.
- Many species have longer tongues than honeybees, so they can pollinate flowers with long, narrow corollas. They are very hairy and their hairs are branched and so are perfect for picking up and transferring pollen.
- Bumble bees can completely replace manual pollination resulting in less labour costs. In crops, such as tomatoes, peppers and blue berries Bumble bee pollination results in higher yield as well as larger and higher quality fruits.

Other crops pollinated by bumblebees (some of the crops are pollinated for seeds).

Blue berry/Straw berry	Sunflower	Field beans
Cherry	Cotton	Soya beans
Pear/Peach/Plum	Lucerne	Cucumber
Melons	Clovers	Squash
Apple	Buck wheat	Pumpkin
Orange	Turnip	Gourds
Black berry	Peppers	Coriander/Fennel
Lemon	Mustard	Eggplant (Brinjal)

5. PROBLEMS IN UTILIZING BUMBLE BEES AS POLLINATOR

- Advancement in the field of bombiculture is lacking as compared to other countries where bumble bee industry has been adopted as entrepreneurial activity and bumble bee colonies are supplied by commercial enterprises to fulfill the need of pollination.
- Decreasing number of bumble bees due to clearance of waste lands and wild plants as major flora and nesting sites of bumble bees.
- Systemic pesticides (pesticides that are absorbed through the roots) may damage the bumble bee population.

6. CONCLUSION

Nest architecture studies helps in designing artificial domiciles for bumble bees which can be efficiently utilized for pollination of various cash crops under open as well as protected conditions. Bumble bees can be utilized as a backup pollinator for honey bees as it is not infested by Varroa and other diseases known to honey bees.



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Bumble bee rearing should be enhanced to develop the Bombiculture industry in the country or to conserve the native pollinators.

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