e ISSN–2321–7987 | ●●● Article ●●● |Visit us : *www.researchjournal.co.in*|

Honeybees and their importance in sustaining life on earth

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Honeybees are an amazing and highly beneficial insect species that quite literally underpins the sustenance of life as we know it on planet earth. Honey bees are not native to the U.S. They are immigrants, but they are an essential part of both our agricultural economy and the overall ecosystem, including homeowners, wildlife and anyone with an interest in nature. Honey bees are the important components of agro-ecosystem as they provide free ecosystem services in the form of pollination which not only enhance the productivity of agricultural crops but also help in conservation of biological diversity through propagation of wild flora besides, providing honey and other hive products. Currently, only seven species of honey bee are recognized, with a total of 44 subspecies, though historically, from six to 11 species have been recognised. Honey bees represent only a small fraction of the roughly 20,000 known species of bees. Some other types of related bees produce and store honey, but only members of the genus *Apis* are true honey bees. The study of rearing of honey bee and commercial production of honey is known as Apiculture. Apiculture (Beekeeping) as non land based income and employment generating activity is fast becoming a prime component of present day strategies for integrated rural development and off farm employment.

Why bees are important: There are various ways in which honey bees are important :

Each year, honey bees kept by beekeepers, produce more than $6 million worth of that delicious food. Even though honey is a popular food product, it is not the real reason for the importance of the honey bee. There are also a number of valuable non-food products produced by the honey bee, such as beeswax, royal jelly, bee pollen, beauty products and other hive products. These products have a variety of uses, such as beeswax for candles and cosmetics, royal jelly for cosmetics, bee pollen as a protein source, and more. These products are very popular as health foods and cosmetics, but they are not the main importance of honey bees in the state. Besides these honey bees also pollinates a number of crops.

Globally there are more honey bees than other types of bee and pollinating insects, so it is the world's most important pollinator of food crops. It is estimated that one third of the food that we consume each day relies on pollination mainly by bees, but also by other insects, birds and bats. Many domestic and imported fruits and vegetables require pollination. Examples include avocados, soybeans, asparagus, broccoli, celery, squash and sunflowers for oil, cucumbers, citrus fruit, peaches, kiwis, cherries, cranberries and melons. For crops such as blueberries and almonds, the honey bee plays an essential role in pollination of commercial crops, around 80 per cent of the crop said to be dependent on honey bees. Honey bees can also pollinate clover and alfalfa, which are fed to cattle, so there are implications for the meat and dairy industry too. And that is not to mention the huge range of manufactured food products made from all these ingredients. In addition, honey bees play a significant role in the pollination of other important crops such as cotton and flax. Cross pollination of entomophilous crops by honeybees is considered as one of the effective and cheapest method for triggering the crop yield both qualitatively and quantitatively. It has been reported that there are more than 25000 described species of bees in the world and account for 65 per cent pollination of various flowering crops. Primarily two honey bee

species *viz.*, *Apis cerana indica* and *Apis mellifera* have been successfully domesticated and practices for their management for pollination of crops have been standardized for many crops. Being the pollination service provider bees contribute handsomely inenhancing the productivity and production of cross as well as self-pollinated crops through efficient pollination in an inconspicuous and silent manner. So, we can say that the Honey bees are undoubtedly the most important pollinators of food crops for humans and probably of food for entire nation. This is the main importance of honey bees.

Some facts about bee pollination:

- In India 50 million hectares of land is under bee dependent.
- More than 50 per cent of the existing species of plants propagated by seeds are dependent upon insects for adequate pollination and only 15 per cent of the 100 crops that fed the world are pollinated by domestic honey bees while 80 per cent are pollinated by wild bees and other wild life.
- Value of additional yield obtained due to bee pollination alone is 15-20 times more than the value of all the hive products put together. The total value of pollination services rendered by all insects globally comes in excess of 100 billion annually.
- It has been estimated that bees are gainfully tapping only about 1/4th of the available floral resources of the country. Of the 90 per cent of flowers which are cross pollinated, 85 per cent depend upon insects for pollination.
- Being a mega diversity country there are about 1000 species of bee forage plants offering rich food to all the four important species of honey bees.
- The estimated losses in India due to complete absence of bee pollination has been measured to be somewhere between Rs.10,000 to Rs.55,000 per hectare in some crops.

Advantages of bee pollination : Honey bees are the most efficient pollinators of several agricultural, horticultural, silvicultural, fodder and wild plants because of their following characteristics:

- Body parts are specially modified to pick up many pollen grains
- Flower fidelity and constancy
- Potential for long hours
- Maintainability of high populations as and when needed
- Adaptability to different climates and niches
- Through micromanipulation of flowers.

Qualitative and quantitative changes in crop plants due to bee pollination: As a result of cross pollination by bees, somatic, reproductive and adaptive heterosis or hybrid effect occur in plant progeny. Such hybrid effect brings the following qualitative and quantitative changes in plants:

- Stimulate germination of pollen on stigma
- Increase viability of seeds, embryos and plants
- More nutritive and aromatic fruits
- Stimulate faster growth of plants
- Increases number and sizes of seeds and yield of crops
- Increases nectar production in the nectaries
- Increases fruit set and reduces fruit drop
- Enhances resistance to diseases and other adverse climatic conditions
- Increases the oil content in oil seed crop.

Increase in yield due to bee pollination: It has been established through research that, installation of 3-5 bee colonies of *Apis cerana indica*/acre of crop increased the seed yield in sunflower by 79 per cent, mustard by 55 per cent, niger by 33 per cent, sesamum by 15 per cent, safflower by 64 per cent, cotton by 18 per cent, litchi by 20 per cent, coconut by 40 per cent and gourd crops by 20 per cent.

Major bee flora : *Agricultural crops*: Niger, Sunflower, Mustard, Arhar, Sesame.

Horticultural crops: Litchi, Coconut, Guava, Ber, Drumstick, Citrus, Coriander.

Agro-forestry: Eucalyptus, Cashew, Bael, Silk cotton, *Sesbania* sp. Acacia, *Cassia* sp. Siris (*Albizia lebbeck*), Arjun (*Terminalia arjuna*).

Forestry: Teak, Tamarind, Mahua, Amla, Sal, *Gravillea pteridifolia*, Karanj, Palas, Sisoo (*Dalbergia sissoo*).

Conclusion: Applied pollination, pollinator management, and managed pollination are the common efforts recently being practiced for maximization of production in cross pollinated crops and to bring the pollinator to the target crop. In view of great role of bees in pollination of various crops, they need to be conserved, augmented and supplemented with domesticated honey bees.

Received : *10.09.2014* ***Revised :*** *18.04.2015* ***Accepted :*** *04.05.2015*