Role And Importance Of Honey Bee In Pollination

Introduction

The importance of pollinators to the agricultural sector demands that we increase our knowledge about which crops need which pollinators and establish how best to protect and enhance both yield and managed species.

- Pollinators are essential for orchards, agricultural crops, horticultural crops and forage production.
- For the production of seed for many root and fibre crops.
- Pollinators such as bees, birds and bats affect 35 per cent of the world's crop production, increasing outputs of 87 of the leading food crops worldwide.
- Food security, food diversity, human nutrition and food prices all rely strongly on animal pollinators.
- Maintaining and increasing yields in horticultural crops under agricultural development is critically important to health, nutrition, food security and better farm incomes for poor farmers.
- In the past, pollination has been provided by nature at no explicit cost to human communities.
- As farm fields have become larger, and the use of agricultural chemicals has increased, mounting evidence points to a potentially serious decline in populations of pollinators under agricultural development.

What is pollination "The transfer of pollen from the male anther to the female stigma"

Pollination is an important reproductive process happening in higher plants, without which they normally do not produce fruits and never any fertile seeds. Pollination refers to the transfer of pollen from the anthers or male reproductive organs of the flowers to the stigmas. Pollen grains are tiny reproductive spores produced in the anthers, the male reproductive organs of the flower. These microscopic spores on getting transferred to a stigma of the gynaecium, the female reproductive organ, germinate producing long narrow pollen tubes growing through the style into the ovules produced inside the ovary. The pollen tube carries the male gametes produced inside the pollen grain towards the female gamete, the egg, inside the ovule. The union of the male and the female gametes, the process of fertilization, makes the ovary develop into the fruit, and the ovule into the seed.

Many crop and wild plant species are partially or completely self-incompatible as they cannot produce fruit or seed without cross-pollination. It is not just self-incompatible plants that benefit from cross-pollination, but self-fertile varieties also produce better quality fruit and seeds on getting cross-pollinated (Free, 1993). This advantage is obvious because of greater genetic variation, as the zygote or fertilized egg contains a new mixture of chromosomes from the two parents, due to cross-pollination. Cross-pollination is facilitated by various agencies which may be animals (zoophily), most of them insects (entomophily), wind (anemophily - especially in

grasses) and water (hydrophily - mainly in submerged water plants).

Bees are estimated to pollinate 16% of the total of 0.25 million flowering plant species known so far. One-third of the human diet is said to be derived from products of bee pollination. About 90% of the world's plant food production is mainly based on 82 products derived mainly from only 63 plant species. The importance of bees can be realized from the fact that for 39 of these plant species bees are the major pollinators.

Why is pollination important

The right balance of wild and managed pollinators is instrumental in achieving the necessary pollination services for a good crop harvest. Yet, land-use changes like urbanization, the intensification of agriculture and other factors have negatively affected local pollinator populations in different parts of the world. A range of conservation measures in intensively-farmed regions can help to maintain diversity, by preserving the resources that pollinators need (figure five). These measures protect the dominant crop pollinators in agro-ecosystems and contribute to maintaining the biodiversity of the ecosystem, including the less agriculturally-important pollinators.

- Sexual reproduction is important for evolution:
- Sexual reproduction produces variable offspring, creating diversity and variation among populations (shuffling of genes)
- You need variation for Natural Selection to occur
- Sexual reproduction is advantageous to an organism only if it happens with someone other than itself!
- Outbreeding = good! (inbreeding = bad…)

Insects and Crop Pollination

- Entomophily is by far the most common mean of pollen transfer and it played a vital role in the evolution of angiosperms.
- The mutual association of insect and flowers is believed to exist since 60 – 100 million years ago.
- There are about 2,50,000 species of flowering plants globally which are pollinated by 2,00,000 species of animals.
- Out of 95 per cent of the flower which are cross-pollinated, more than 85 per cent depend on insects for pollination.
- 50 per cent of the plant species propagated by seeds are dependent on insect pollination.
- 1/3rd of the food supply is either directly or indirectly dependent on insect-pollinated plants.
- Currently, more than 65 per cent of all flowering plants are insect-pollinated.
- Many wild plant in nature are being propagated through insect pollination which maintains the sustainability of ecosystems, environmental quality and help in the conservation of biodiversity.
- In India, of the 160 million hectares of cropped area, more than 55 million is under bee dependent crops.
- Bee husbandary in agricultural systems is a crucial link in food and fibre production and

sustainability.

Pollinators

World Crop Pollination by Insect.

- 73% Bees.
- 19% flies.
- 6.5 % bats.
- 5% beetles.
- 5% wasps.
- 4% birds.
- 4% butterflies and moths.

Insect pollinators as important input in crops

- About 85 per cent crop plants- cross-pollinated.
- About 50 million ha of land in the country under pollinator-dependent crops especially honey bees like fruit, vegetables, oilseeds, legumes and pulses.
- Not all fruits develop simply as a result of ovule fertilization.

Honey Bees as Pollinators

- According to estimates, the value of additional yields obtained by pollination service rendered by honey bees is 15-20 times more than the value of all hive products put together.
- The value of bee pollination in Western Europe is estimated to be 30-50 times the value of honey and wax production in the region.
- It is being increasingly realized that bees could be less expensive input for promoting sustainable and eco-friendly agriculture and enhancing crop productivity.
- Honey Bees play vital role in sustaining plant bio-diversity with environmental stability.
- Crops/flowers are essentially required for the development of honey bees. In present Indian agricultural scenario honey bees should be treated as input for overall development for agriculture.

How Pollinators enhance Crop Yield and Quality

There are many examples of the major significance of pollinators to farmers, especially in terms of increasing the volume and quality of crops produced. One example is a project ran by Crop Life India, which aimed to raise farmers' awareness of the importance of honey bees to their crop yields. The project used a number of approaches, such as providing subsidized honey bee hives and training farmers how to use them for managed crop pollination, as well as training in Integrated Pest Management, the responsible use of pesticides32 and practical beekeeping. Overall, the project helped 230 farmers in the Maharashtra district to increase their onion seed and pomegranate yields by 17 per cent and almost 35 percent, respectively. Importantly, the farmers also saw their incomes increase, by 19 per cent on average for onion farmers and a staggering 42 per cent for those growing pomegranates. These increased profits were not only

due to higher yields but also improved quality: For example, the colour and shape of the pomegranates were more attractive to consumers. High pollinator diversity can improve several commercially-important crops. For example, strawberries that has not been pollinated by a diverse group of insects like flies, solitary bees and honey bees can be smaller and irregular in shape, whereas those which are pollinated by these diverse insects are larger and have fewer deformations34, enabling farmers to charge a higher price. Coffee is another globally-important crop where it seems that a high diversity of pollinators can improve the quality. A four-year Bayer Bee Care Center project in Colombia aims to establish the extent of this relationship.

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