

## Bee Pollination in the context of Agricultural Development in Odisha:

The salubrious climate and diverse bee flora of Odisha make the state paradise for Apiculture.

- ❖ The state has an area of about 115 thousand hectares under fruit crops like mango, guava, citrus, litchi, ber, and coconut.
- ❖ Similarly, agricultural crops like arhar, sesamum, sunflower, mustard, and niger are grown over an area of about 526 thousand hectares.
- ❖ Further, the crops needing pollination services of the bees are spread over an area of about 486 thousand hectares.
- ❖ At the minimum requirement of 3 beehives /hectare there is a need of 14.5 lakh colonies which is 25.3 times higher than the existing figures (i.e. 57,491) to exploit the flora simultaneously contributing to conservation of floristic diversity of the state.
- ❖ Thus, creating awareness supported by technical know how for expansion of bee keeping will not only add to the production of honey and other hive products of the state but also immensely to the productivity of the crops.
- ❖ 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.



## BEE POLLINATION

Pollination is a simple process involving transfer of pollen from anthers to the stigma of the same or different flower. In several cross pollinated crops, external bio agents are required to accomplish this process and help in conservation of biological diversity through propagation of wild flora. Pollination is the most important contribution that honey bees and bees make to human economy.



It has been reported that there are more than 25000 described species of bees in the world and account for 65% 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 in enhancing the productivity and production of cross as well as self pollinated crops through efficient pollination in an inconspicuous and silent manner.

### SOME FACTS ABOUT BEE POLLINATION:

- ❖ More than 50% of the existing species of plants propagated by seeds are dependent upon insects for adequate pollination..
- ❖ Only 15% of the 100 or so crops that fed the world are pollinated by domestic honey bees while 80% 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 US dollars annually (2003 valuation).
- ❖ In India 50 million hectares of land is under bee dependent
- ❖ Being a mega diversity country there are about 1000species 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 Rs10,000 to Rs 55,000 per hectare in some crops



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### 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 micro-manipulation 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 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%, mustard by 55%, niger by 33%, sesamum by 15%, safflower by 64%, cotton by 18%, litchi by 20%, coconut by 40%, and gourd crops by 20%.



### Management of bee hives for pollination:

Honey bee colonies used for pollination require a certain minimum management besides protecting them from diseases and natural enemies.

- Strength of colony:** Large and stronger colonies (6-7 brood frame) are four to five times better pollinators than smaller and weaker ones as it has greater foraging bee population at all the times. There should be enough adult bees to fully cover 8 frames and a young prolific queen.
- Number of colonies required:** In general three colonies of *Apis cerana indica* and two colonies of *Apis mellifera* are required per hectare.
- Time and placement of colonies:** For better pollination, bee colonies should be placed in the field or orchard at night times when 10 to 20 per cent of the crop is in bloom.
- Distribution of colonies in the field:** Honeybees as a rule visit primarily those sources of nectar which are within 0.3 to 0.5kms radius from the apiary. The pollination activity diminishes significantly at a distance more than 0.5kms. For effective pollination *Apis cerana indica* hive should be placed singly instead of groups.
- Attracting bee pollinators to a crop in bloom:** Bees should be fed sugar syrup flavored by the flowers required to be pollinated in order to attract large number of bees for effective pollination.



### Protecting the bees from pesticide poisoning:

Irrational and indiscriminate application of non specific broad spectrum pesticides give devastating set back to the non target useful fauna mainly pollinators and biocontrol agents. Various ways to reduce bee poisoning are:

- ▶ Persuade the farmers not to use pesticides or use selective pesticides that are less harmful to bees at recommended concentrations.
- ▶ Avoid the use of dust formulation as they are harmful to bees than spray formulation.
- ▶ Prior information about spraying would help in reducing poisoning of bees.
- ▶ Avoid spraying of pesticides during flowering of the crop and peak foraging time of the bees would help in reduction in the mortality of foraging bees.
- ▶ Spraying may be done in the evening hours when bees do not forage.
- ▶ Colonies may be temporarily shifted if heavy spraying schedule is fixed.