

RESEARCH ARTICLE

Beekeeping for pollination – Sustainable approach to enhance the crop yields in Vidarbha region

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Manuscript details:	ABSTRACT
<p>Available online on http://www.ijlsci.in</p> <p>ISSN: 2320-964X (Online) ISSN: 2320-7817 (Print)</p> <p>Editor: Dr. Chavhan Arvind</p> <p>Cite this article as: Rahile BS, Ghugal SI, Bramhankar KB, Gedam PA (2016) Beekeeping for pollination – Sustainable approach to enhance the crop yields in Vidarbha region, <i>Int. J. of Life Sciences</i>, A6: 195-197.</p> <p>Copyright: © Author, This is an open access article under the terms of the Creative Commons Attribution-Non-Commercial - No Derives License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.</p>	<p>The decline of bee populations around the world is alarming, it leads to the situation of a global “pollination crisis” where pollination services by bees are limited which may cause the yield and quality of crops to deteriorate. A study was conducted related with role of Indian honeybee, <i>Apis cerana indica</i> F. for pollination of crops for benefit of small farmers to enable them importance of pollinators in Vidarbha region of Pauni taluka in Bhandara district of Maharashtra. It showed a considerable increase in productivity between 60-70% of different vegetable, horticultural crops as compared to farms with no bee boxes. The study indicates beekeeping has the potential to increase and even double the yields of local crops with no extra efforts. It could be a major input for marginal farmers and has potential to replicate on a larger scale. It has immense possibility to overcome the incidences of farmers’ suicide due to crop losses in Vidarbha region of Maharashtra.</p> <p>Keywords: Tropical region, Beekeeping, Pollination crisis, Indian honeybee, <i>Apis cerana indica</i>.</p>
	<p>INTRODUCTION</p> <p>Honey bees play an important role as pollinators of pulses, oilseeds, vegetable crops and horticultural crops to insure global food security. Bees are important pollinators being rewarded with pollen, nectar or other resources from several plant species and most of angiosperms are pollinated in general by multiple insect species (Waser <i>et al.</i> 1996) and bees in more specific manner. The decline of bee populations recorded in recent years around the world is alarming, it leads to the situation of a global pollination crisis where pollination services are limited which may cause the yield and quality of crops has been deteriorating.</p> <p>The stability of yields for pollinator- dependent crops has been noticed worldwide as a result of decreased bee population (Garibaldi <i>et al.</i> 2011). In tropical countries like India having rich floral and faunal biodiversity, the traditional system of agriculture, pollination by wild insects was sufficient. However, intensive agricultural methods are now-a-days adopted for higher agricultural yields. More and more land is being brought under irrigation system every year to step up agricultural production. This involves sometime excessive use of insecticides, destroying useful pollinating insects along with harmful insects. In irrigated areas mono cultivated crops are taken twice or</p>

thrice in a year. Non-cultivated flowering plants and weeds which are useful to bees are destroyed. This reduces food supply to useful insects and their population is drastically reduced. Further, the natural insects are not adapted to the changed system of cropping patterns and flowering of the crops. Thus, their population may not be available in adequate numbers when needed most because of their hibernation or inactive phase of life cycle. As honeybees are available throughout the year, it can be domesticated in wooden hives, the use of honeybees as an essential input in cross-pollinated crops becomes inevitable under such conditions. Hence, the present study has been aimed to study the role of Indian honey bee, *Apis cerana indica* F. domesticated in wooden hives as pollinators in agricultural crops with particular reference to their economic benefits to the farmers and ecological benefits to the entire society.

MATERIAL AND METHODS

Six frame hives of honey bee colony of *Apis cerana indica* F. domesticated in wooden box placed in the field of farmer beneath the shade of tree. The farmer selected for study designated as farmer (A) (managed pollination) is growing vegetable crops by adopting traditional cultural practices since last ten years growing brinjals, bitter guard, lady's finger, chavli beans, citrus and drumsticks in his farm. The farmer (A) was requested to not apply any chemical pesticide on the crops at the period of flowering. The bee hive has been monitored regularly to ensure no pest and predator attack and smooth functioning of colony. Another farmer (B) (natural pollination) has chosen whose field is located three kilometer away from field of farmer (A) and selected as control who rely on wild bees and insects for pollination of various crops grown in the farm. Both the farmers A and B are cultivating the crops on the basis of their traditional knowledge. The farmers agreed to follow agronomic practices as

suggested by research team and same things followed by them. Both the farmers monitored for increase in yield the crop viz. brinjal and bitter guard.

The quantitative parameters such as flower drop (counting number of flowers dropped from ten sampled) and fruit set (deducting the number of dropped flowers from total) along with fruit weight and fruit length were recorded. The total yield of crop was measured from an acre of land under cultivation for each crop.

RESULT AND DISCUSSION

The effect of bee pollination on the quantity and quality of brinjal and bitter guard are summarized in Table 1 and Table 2. Quantitative increase was found in the farm with managed pollination over the natural pollinated farm. The managed pollination significantly increase the fruit set in brinjal (9.44%) and bitter guard (10.54%) over natural pollinated farm and significantly decreased the flower drop in both crops over naturally pollinated farm. The yield of brinjal and bitter guard in managed pollinated farm per acre calculated was found to be 5000 Kg and 4500 Kg respectively, while in naturally pollinated farm the yield was 3500 Kg and 344 Kg for these vegetable fruit crops. The increase in yield was found to be 70% and 77% in case of brinjal and bitter guard in managed pollinated farm as compared to naturally pollinated farm.

Qualitative improvement was found to be in managed pollinated farm with respect to fruit weight, fruit length and diameter. The fruit weight of brinjal increased from 59.04g to 84.32g in natural pollinated farm to managed pollinated farm with increase in 25.28g. The weight of bitter guard was found to increase from 14.73g to 24.78g in natural pollinated to managed pollinated farm with increase in 10.72g.

Table 1: Impact of *Apis cerana indica* pollination on yield and quality of fruit in Brinjal in Vidarbha region.

Pollination Type	Flower drop (%)	Fruit Set (%)	Fruit Weight (g)	Fruit Length (cm)	Diameter (cm)	Yield /Acre(Kg)
Managed Pollination	8.33	91.67	84.32 ±2.95	7.42 ±0.31	5.14 ±0.14	5000
Natural Pollination	17.77	82.23	59.04 ±2.61	6.08 ±0.12	4.32 ±0.10	3500
Increase over Natural Pollination	-9.44	9.44	25.28	1.34	0.82	1500 (70%)

Table 2: Impact of *Apis cerana indica* pollination on yield and quality of fruit in Bitter Guard in Vidarbha region.

Pollination Type	Flower drop (%)	Fruit Set (%)	Fruit Weight (g)	Fruit Length (cm)	Diameter (cm)	Yield /Acre(Kg)
Managed Pollination	7.65	92.35	24.78 ±1.85	6.31 ±0.19	3.27 ±0.13	4500
Natural Pollination	18.19	81.81	14.73 ±0.85	4.99 ±0.16	2.57 ±0.09	3500
Increase over Natural Pollination	-10.54	10.54	10.05	1.99	0.7	1000 (77%)

The fruit length of brinjal increased from 6.08cm to 7.42cm in natural pollinated farm to managed pollinated farm with increase in 1.34cm. The length of bitter guard was found to increase from 4.99cm to 6.31cm in natural pollinated to managed pollinated farm with increase in 1.32cm. The diameter of bitter guard was found to increase from 4.32cm to 5.15cm in natural pollinated to managed pollinated farm with increase in 0.82cm while these values improved from 2.57cm to 3.32cm respectively in case of bitter guard with increase in 0.7cm.

The present results confirm the study by Grażyna Kowalska (2008) who find out the pollinating insects, including bumble-bee, honey bee play very important yield-forming role at cultivating brinjal. Therefore, their presence on the vegetable plantation should be considered as one of the necessary agro technical factors

Studies carried out in Africa by Amoako and Yeboah-Gyan (1991) indicate usefulness of a honey-bee (*Apis mellifera*) under tropical climate conditions to increase the brinjal, tomato, and pepper yields. Number of set fruits in relation to number of formed flowers was significantly larger from plants, that flowers of which were pollinated by insects than self-pollinated ones.

Among indigenous species of honey bees recognized from India, the Indian hive bee *Apis cerana* and rock bee *Apis dorsata* are the most abundant and predominant pollinators for cross pollinated crops including vegetables which constitute 46 and 42%, respectively of the total pollinators population (Sharmah et al 2015).

Thus, encouraging the use of beekeeping for pollination of horticultural crops will benefit to both the farmer whose income will be increased through enhanced crop productivity because of pollination services of bees, the beekeeper who will receive money by renting the hives for pollination services

and harvesting honey. It will help to ensure food security and enhance the socioeconomic status of both the farmers and the beekeepers. This system of hiring and renting honeybee colonies could be applied on large scale to increase the per hectare production of various crops.

Several factors are responsible to decline in horticultural productivity but pollination crisis plays a crucial role. The agro inputs are provided in optimum level viz. use of quality seed, high yielding varieties, good agronomic practices, irrigation and pesticides fertilizers, but without pollination, neither fruit nor seed will be formed. Pollinator scarcity is the main factor responsible for inadequate pollination and it can be overcome by managed pollination by domesticating bees. Many agricultural organizations, growers are underestimating the ecological and economic benefits of bees. Even the researcher and extension agencies are unaware of potential of bees to increase the crop productivity through this sustainable approach.

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