

Sweet Revolution in India: Bee Keeping an overview

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Abstract

Honey bees are mankind friend since long back as they provide honey and also helps in pollination of crop plants. Bees has long association with human being as man is cultivating them since last two centuries as an ancillary activity in agriculture. Bee cultivation helps in economic empowerment and nutritional security to rural communities across the globe. Pollination activities of honey bees helps in increasing the agriculture and horticultural production in cross pollinated crops which varied from 20-80% depending upon the type of crop. Hence, it is now considered as an important agri-input and deserves to be recognized as an organic technology in raising farm production.

Key words: Agriculture, Bee Honey

Introduction

Honey bees are nature's gift to mankind that helps in many ways. It provides a nutritional product- the honey and also helps in pollination of plants. Mankind is cultivating them since last 200 years as an ancillary activity in agriculture which helps in economic empowerment and nutritional security to rural communities across the globe. It is now part of integrated farming system and it can be adopted as profession by rural youth and marginal/landless farmers. Honey bees, birds, bats and insects are important pollinators of most of the fruits, vegetables and field crops. Bees play important role in pollination of oilseeds (rapeseed-mustard, sunflower, safflower), fruit crops (citrus, grapes, mango, strawberry, raspberry, litchi, coconut, guava, cucumbers, melons) legume crops (Beans, tur, alfalfa, berseem, clovers) and vegetable crops (turnip, carrot, onion, gourds, cole crops etc). Pollination activities of honey bees helps in increasing the agriculture and horticultural production in cross pollinated crops which varied from 20-80% depending upon the type of crop. Hence, it is now considered as an important agri-input and deserves to be recognized as an organic technology in raising farm production. Honey is produced by bees from floral



nectar or from honeydew by regurgitation and enzymatic activities. After production honey is stored by bees in honeycombs. Over 90% of all flowering plants and over three-quarters of the crop plants rely on animals for pollination.

Significance in nutritional Security

Honey is a great source of simple carbohydrates. It consists of digestive enzymes, sugar (fructose and glucose), natural minerals (calcium, copper, iron, magnesium, manganese, phosphorus, potassium, sodium and zinc), vitamins (B-complex), antioxidants (phenolic acids and flavonoids) and amino acids which help in reducing cholesterol, obesity and promoting better health. Honey is used in traditional medicines like Ayurveda, due to its varied properties like calms, antibacterial and antioxidant. In general it is widely used in different health drinks, (green tea, milk, yoghurt or fruit juices) and foods (vegetables, meats) and dishes including bakery products (cakes, sauces). Beekeeping acts as a source of employment generations to landless labourers and rural youth, hence provides social security.

Honey Production Statistics in India

The honey market in India was worth Rs. 15,579 Million (2018), registering a Compound Annual Growth Rate (CAGR) of 10.9% during 2012-2018. It provides employment to about 3 lakh rural people. Presently India is having 34 lakh bee colonies which can be increased up to 200 million bee colonies as per its potential. During 2014-15 to 2017-18 the honey production of India increased from 81.3 thousand tonnes to 105.0 thousand tonnes which can be increased many fold by increasing the number of bee colonies as per our potential up to 200 million. This increase in honey production resulted from an increase in bee colonies during this period (2014-15 to 2017-18) from 22 lakh to 34 lakh. During the last four years domestic consumption of honey was about 50 thousand tonnes while the export of honey increased from 29.6 to 51.5 thousand tonnes during 2014-15-2017-18. Presently there are 9698 registered beekeepers with National Bee Board till December, 2019 which maintains 15,59,771 bee colonies (Source: NBB, MoA&FW; RBDC, 2019; SRBKHP, 2019-20).

During 2017-18 maximum honey production was in Uttar Pradesh (18.9 thousand tonnes), followed by West Bengal (16.5 thousand tonnes), Punjab (15.5 thousand tonnes) and Bihar (10.0 thousand tonnes). These four states contribute more than 50% of total honey

production in India (Fig. 4). Rajasthan, Himachal Pradesh and Haryana also produce considerable quantities of honey (Report of the Beekeeping Development Committee, June, 2019). Bharatpur district in Rajasthan contributed significantly in honey production and emerged as leading honey producing district in the country, as it alone produces close to 1800 tonnes. Credit for this goes to honey produced in mustard crop fields of Bharatpur. In this endeavour Lupin Human Welfare and Research Foundation has played a pivotal role in making Bharatpur district a honey hub in the country (Times of India, 2019). These states derive the honey mostly from *A. mellifera* colonies while part of its honey comes from the wild bees or rock bees *A. dorsata* particularly in Sundarbans of West Bengal. In south India 25% of total honey is produced which is derived mainly from *A. cerana* and some from *A. dorsata*. More than 50% of the honey produced, or 75-85% of apiary honey is being exported now. During 2017-18, 61333.88 MT of honey of worth of Rs.63218.78 Lakh was exported from India (RBDC, 2019; SRBKHP, 2019-20; TOI, 2018).

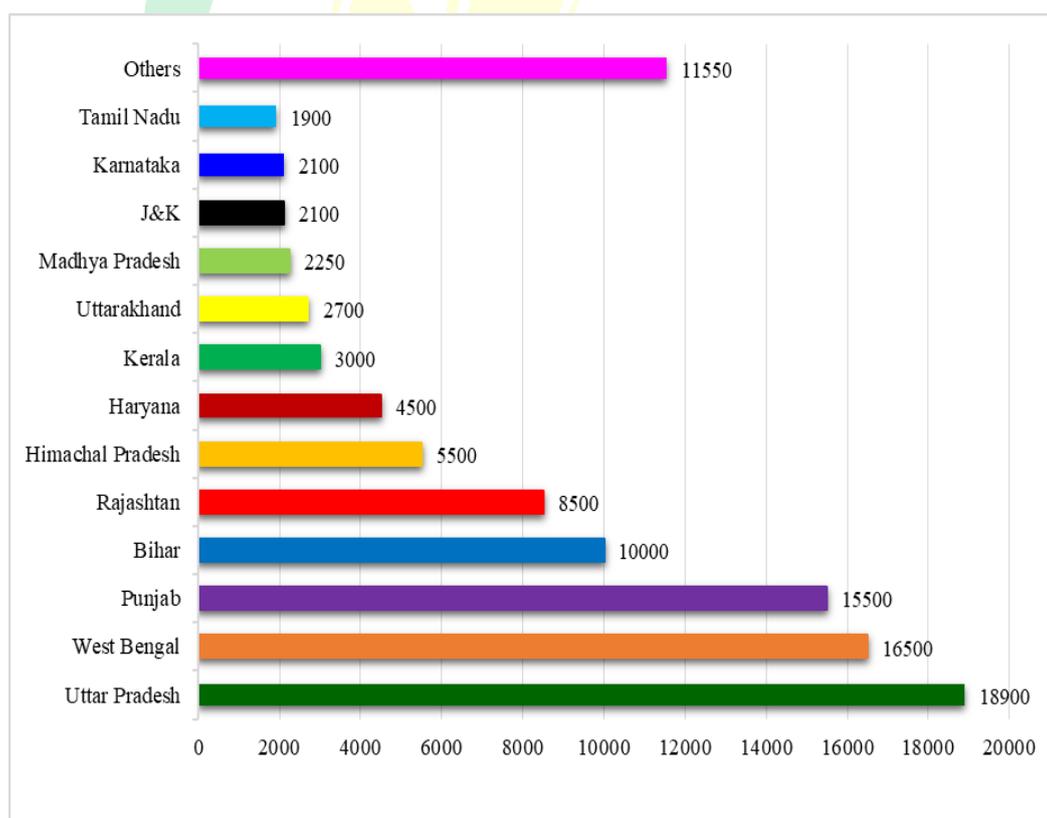


Fig. 1: Honey production (in tonnes) in various states of India during 2017-18 (Source: NBB, MoA&FW; RBDC, 2019)

Economics of honey production

Economically, bee-keeping is highly remunerative business. It cost around Rs. 3 lacs to set a colony of 50 boxes to initiate bee keeping business. Our Government also provides subsidies up to 40% to set up the business. The entrepreneur can earn about Rs 2.40 lakh from selling of honey. Raw honey is sold at Rs 100-125 per kg. Each box yields about 50 kg honey annually (TOI, 2018).

Biology of Honey bees, classification and social system

Honey bees are insects that come under the order Hymenoptera and family Apidae that exhibit complete metamorphosis. Honey bee species are characterized by particular functional traits that facilitate pollination services. Out of the seven documented *Apis* species four are reported in India. Two of these (*Apis cerana*: oriental honey bee; *A. mellifera*: occidental/ European honeybee) are domesticated species while two are wild species (*Apis dorsata*: giant/rock honey bee or dumna; *A. florea*: (dwarf honey bee). India is the place of origin of the genus *Apis*. Honey bees social insects as they live in colonies with highly organized system of labour distribution. There are three castes: queen, workers and drones. In a normal colony there is one queen, 10,000 to 30,000 workers and a few hundred drones. Worker honey bees are responsible for collection of pollens which are used in production of honey.

Table 1: Bee species and their description

Bee species	Scientific name	Description	
Rock Bee	<i>Apis dorsata</i>	Build single vertical combs, on large cliff faces, tree branches and ceilings of tall buildings. It is found in Asia. 20% of the total honey produced in India	 Source: https://beekeeping.fandom.com/wiki/Apis_dorsata
Little bee	<i>Apis florea</i>	Dwarf honey bee; It is found in Asia; Build single vertical combs around twigs or branches of trees and shrubs. The quantity of honey is negligible. They act as good	 Source: https://www.reddit.com/r/Beekeeping/com

		pollinators and need to be conserved. Smallest of <i>Apis</i> species	ments/bmyupx/apis_florea/
Indian Honey bee	<i>Apis cerana</i>	Indian (Tamil Nadu, Kerala, Karnataka, Andhra Pradesh, Telangana, Odisha and North Eastern States), Eastern or Asiatic honey bee. Three sub-species of <i>A. Cerana</i> are found in India: <i>A. cerana indica</i> , <i>A. cerana cerana</i> and <i>A. cerana Himalaya</i> . The average yield of honey: 7 to 10 kg/hive/year.	 Source: https://naturewildlife.org/events_updates/re-introducing-apis-cerana-indica/
Italian Honey bee	<i>Apis mellifera</i>	Native to Africa, Europe and Middle East. Construct combs in dark places like hollows of trees and holes in the rocks, clay pots, logs, wall. It is found in North India because of the rich flora viz., safflower, mustard, sun flower. Average honey production: 50 to 60 kg/hive/ year	 Source: https://carnegiemnh.org/honey-bee-apis-mellifica/
Stingless bee	<i>Tetragonula iridipennis</i>	Stingless or dammer bees. Family Apidae and sub family Meliponinae. Honey yield: approximately 100g/hive/year, honey has medicinal value in traditional Indian medicine.	 Source: http://www.sci-news.com/biology/trehalulose-stingless-bee-honey.html

Bee products

The honey is the primary products of beekeeping. Apart from honey, wax, pollen, propolis, royal jelly and bee venom are also produced. (Table 2).

Table 2: Beekeeping products and their applications

Product	Description	
Honey	Honey is referred as golden liquid immense health benefits owing to its composition. It is primarily of fructose and glucose, amino acids, vitamins, minerals and enzymes. Composition of honey varies based on the nectar it was made.	 <p>Source: https://www.jessicagavin.com/honey-benefits/</p>
Royal jelly	It is a secretion of hypopharyngeal glands and mandibular glands of nurse bees in a ratio of 1:1. It plays a vital role in caste differentiation of honey bee castes. Royal jelly is composed of lipids, proteins, mineral salts, vitamins, enzymes, oligo-elements and natural antibiotics.	 <p>Source: https://en.wikipedia.org/wiki/Royal_jelly</p>
Bee pollen	Pollens collected and carried back to the hive by bees are called bee pollens. Bee pollens contain protein, lipids, amino acids, minerals, vitamins etc. It possesses medicinal properties (antifungal, antimicrobial, antiviral, anti-inflammatory, immune stimulating, local analgesic, burn wound healing).	 <p>Source: https://selfhacked.com/blog/bee-pollen/</p>
Bees wax	Bees wax is produced by bees from the wax-secreting glands and used for construction of comb, in which their immature stages live and they also store pollen and honey. The beeswax is used in several industries like cosmetic, textiles, candles, metal, shoe polishing, and carbon paper.	 <p>Source: https://www.indiamart.com/productdetail/honey-beeswax-12364886512.html</p>

Propolis	It is produced by Italian and stingless bees for repairing of hive; for spreading around the hive entrance as repellent to the intruders like ants. Propolis has different compounds such as esters, carbohydrates, fatty acids, terpenoids, vitamins, and inorganic substances and has therapeutic properties (antibacterial, anti-inflammatory, healing, anesthetic, anti-cariogenic, antifungal, anti-protozoan and antiviral activities).	 Source: https://www.hiveandhoneyapiary.com/health-benefits-of-propolis.html
Bee venom	Bee venom is injected by honey bees to defend themselves from the intruders. Bee venom is used as medicine to treat back pain, musculoskeletal pain, and skin diseases. Worker bees produce 100 to 150 microgram of bee venom.	

Bee keeping in India

The practice of keeping bees in India dates back to ancient times when people hunted honey from feral colonies of the rock bee (*A. dorsata* Fab.), the little bee (*A. florea* Fab.) and the Indian hive bee (*A. cerana indica* Fab.). The Indian hive bee was a domesticated species but was kept in wooden logs or walls until the end of 19th Century. Later on in south India, Rev. Father Newton in 1909 designed a hive for Indian hive bees (Newton hive), honey extractor and set up apiaries in Tamil Nadu. Later on Indian hive bee rearing in India started (1917- 1938) in Travancore, Mysore, Kashmir, Punjab and Uttar Pradesh. Presently it is being reared in Tamil Nadu, Kerala, Karnataka, Andhra Pradesh, Telangana, Odisha and North Eastern States and to lesser extent in Kashmir and Himachal Pradesh. In India, the exotic honey bee, *A. mellifera* Linn. Was successfully introduced in erstwhile Punjab in 1962, through “Interspecific Queen Introduction Technique” and later on through the import of disease-free nuclei India. Presently *A. mellifera* is reared in Punjab, Haryana, Himachal Pradesh, Uttar Pradesh, Bihar, Rajasthan, Jammu and Kashmir, Gujarat, Maharashtra, Madhya Pradesh, Chhattisgarh, West Bengal and recently introduced in Andhra Pradesh, Telangana, and Tamil Nadu to some extent.

Table3: Host crop species for beekeeping in different states of India (KVIC, 2018)

State	Crop for beekeeping
Jammu & Kashmir	<i>Robinia pseudoacacia</i> , <i>Isodon rugosus</i> , <i>Brassica campestris</i> , <i>Wendlandia</i> & <i>Toon</i>
Himachal Pradesh	<i>Isodon rugosus</i> , <i>Guizota abyssinica</i> , toria, <i>Prunus</i> , <i>Wendlandia</i> & <i>Acacia</i>
Haryana	Rapeseed-mustard, berseem, sunflower, eucalyptus, litchi
Punjab	Rapeseed-mustard, berseem, sunflower, eucalyptus, litchi, citrus, prunus
Rajasthan	Rapeseed-mustard
Madhhya Pradesh	Rapeseed-mustard, coriander, berseem, citrus
Uttarakhand	Rapeseed-mustard, berseem, sunflower, eucalyptus, litchi, shishum
Uttar Pradesh	Rapeseed-mustard, maize, tur, eucalyptus, shishum, coriander
Bihar	Brassica, khesari, coriander, sunflower, drumstic, litchi, jamun
Jharkhand	Brassica, niger, karanj
West Bengal	Mustard, coriander, kalajeera, eucalyptus, mangroves, litchi
Odisha	Niger, eucalyptus, bombax, coffee, jamun, herda, amla
Maharashtra	Tur, sunflower, sorghum, jamun, herda, gela,
Andhra Pradesh	Mustard, pulses, sesamum, sunflower, cucurbits, citrus
Karnataka	Tur, sunflower, coffee, <i>Schefflera</i> , <i>Lagerstroemia</i> , rubber, eucalyptus
Kerala	Rubber
Tamil Nadu	Sunflower, rubber, coffee, tamarind

Important organizations associated with beekeeping

- Khadi & Village Industry Commission, Govt. of India, Ministry of MSME provides training, subsidy, finance and marketing assistance. Its 15 State Beekeeping Extension centers (SBEC), 100 registered institutions, Cooperatives and State Khadi and V.I. Boards are undertaking training programs throughout the country.
- Central Bee Research and Training Institute, Khadi & Village Industries commission, Pune

- National Bee Board, Department of Agriculture & Cooperation, New Delhi
- Integrated Beekeeping Development Centre, Kurukshetra, Haryana
- State Bee Keeping & Extension Center
- Directorate of Forest Based Industry, Khadi & Village Industries Commission, Mumbai
- All India Coordinated Research Project on Honey Bees and Pollinators, Division of Entomology, ICAR-Indian Agricultural Research Institute, New Delhi.

World Bee Day for promotion of beekeeping

20th May is designated as World Bee Day by United Nations in order to create awareness about pollinators, the threats to them and their contribution to ecosystem. It also marks the birth anniversary of Anton Janson, the founder of beekeeping. The first World Bee Day was celebrated on Sunday, 20 May 2018. In 2021 the theme for Bee day was “Bee engaged: Build Back Better for Bees” (<https://www.un.org/en/observances/bee-day>).

Way forward

Per capita honey consumption in India is very poor (20g/year) compared to highest consumption of 2.02kg/year in New Zealand (FAOSTAT, 2013). So, considering the health benefits of consuming honey, honey and bee pollen shall be included in mid day meals and nutrition programmes of child, sportspersons and defence personnel. There is a need to promote it as healthy nutritional food through mass media. Further it is necessary to encourage the cultivation of bee friendly crops such as mustard, sunflower, oilseeds, pulses, vegetables, forest trees, plantation crops to increase the honey production through increasing the number of bee hives. The awareness about the bee products such as royal jelly, beeswax, bee pollen, propolis bee venom must be promoted through awareness programmes and capacity building. To protect the bees and other pollinators from poisonous pesticides, bee friendly farm practices shall be encouraged. Honey bees and organized pollination shall be recognized as an input in agriculture to ensure high level of crop productivity, food security and prevent pollinator decline. However, this is need of the hour to promote beekeeping industry so that “Sweet/Golden Revolution” in the country could be achieved and crop yield can be enhanced.



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