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# Productivity and Management of Honey Bees in Bihar: A Critical Analysis

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**ABSTRACT:** In India beekeeping is practiced in agricultural lands and mangrove forests etc. The technique involved in beekeeping vary from region to region. The main harvest is from *Apis dorsata*, *Apis cerana*, and *Apis mellifera*. Beekeeping with *Apis cerana* has been a growing industry in Samastipur, Bihar. The Thai Sac brood disease wiped off *cerana* beekeeping in India.. The critical surveys of natural bee populations and stock multiplication from disease resistance colonies, supply of disease resistance breed facilitated to revitalize *cerana* beekeeping especially in Bihar. *Apis mellifera* was successfully introduced in Bihar. The threat of Thai sac brood disease of *Apis cerana* forced the beekeepers to introduce *Apis mellifera* in Bihar also. Management technologies schedules have been evolved for specific locations in the country. Today, beekeeping is an important, sustainable, integral agricultural activity under the rural development programme in India. since it provides nutritional, economic, and ecological security and balance. The routine management practices and special management for quality honey production with fresh drawn out combs, large-scale queen production with mass selection are among them. The millennium hive is an asset to *mellifera* beekeeping as it maintains populous colony in spite of temperature fluctuation and, enhances honey, queen and royal jelly production in all seasons. Time has come to generate more income to the beekeepers, and attention is to be persistently diverted to produce royal jelly, propolis, bee venom by exploiting *Apis mellifera* beekeeping.

**KEYWORDS:** Beekeeping, *Apis mellifera*, Honey, Queen and Royal.

## I. INTRODUCTION

In India beekeeping is practiced in agricultural lands and mangrove forests etc. The technique involved in beekeeping vary from region to region. The main harvest is from *Apis dorsata*, *Apis cerana*, and *Apis mellifera*. Beekeeping with *Apis cerana* has been a growing industry in Samastipur, Bihar. The Thai Sac brood disease wiped off *cerana* beekeeping in India.. The critical surveys of natural bee populations and stock multiplication from disease resistance colonies, supply of disease resistance breed facilitated to revitalize *cerana* beekeeping especially in Bihar. *Apis mellifera* was successfully introduced in Bihar. The threat of Thai sac brood disease of *Apis cerana* forced the beekeepers to introduce *Apis mellifera* in Bihar also. Management technologies schedules have been evolved for specific locations in the country. Emphasis is given in the context of changing conditions of vegetation and climate. Beside the seasonal management for each agro climatic region, suitable management technologies have been adopted to improve colony productivity and for production of honey, bees wax, pollen, royal jelly etc. Today, beekeeping is an important, sustainable, integral agricultural activity under the rural development programme in India. Since it provides nutritional, economic, and ecological security and balance. The knowledge of agroclimatic conditions, the diversified flora, changing agri / horticultural pattern of the crop, the types of bees, the management practices etc. play a pivotal role in transforming the beekeeping industry in the country.

### Pattern and beekeeping potential:

India is a vast country with varied climates and ecological conditions. The major geographical regions facilitating beekeeping development in Bihar is classified into Indo-Gangetic plains and south region. The extensive area of forest and millions of acres of cultivated land sustains a large proportion of insects and honeybees. Realizing the viability of beekeeping, the Khadi and Village Industries Commission took up beekeeping as a village industry and extensively organized beekeeping programme throughout India and now there is more than a million bee colonies are reared by lakhs of beekeepers. Bihar has number of unique plants, which are major unifloral sources of honey bees. Litchi and Karanj in Bihar. In monsoon and post monsoon ground flora, maize and khesari cultivation has a major role for survival and development of the colony. *Apis cerana* is available in all pockets of the country. The *Apis cerana* in India has several ecotypes with wide range of morphological characters like body size, cubital index, tongue reach etc. and genetical characters like absconding, swarming, higher honey yield, temper etc varying from south to North. Hence the selective breeding of desired characters is possible with *Apis cerana* which can increase productivity. In Bihar mostly labour type people are taken up *cerana* beekeeping.

## II. REVIEW OF LITERATURE

Review of related literature makes the investigator fully aware with the previous work that has been done. It also provides an opportunity of gaining insight into the method, measures, subject and approaches employed.

**Gupta, R.K (2014).** Taxonomy and distribution of different honeybee species Of all these species of honeybees, only *Apis mellifera* is non-native to Asia, although there have been suggestions of a possible Asian origin of the early lineage of honeybees that gave rise to the present day European honeybee *A.mellifera* .

**Michener, C.D (2007).** The Bees of the World (2nd Edition, The group consisting of the small *Apis* bees, *A. florea* Fabricius and *A. andreniformes* Smith, constitute the basal branch of the phylogenetic tree. The large species *A. dorsata* Fabricius, *A. laboriosa* Smith, *A. binghami* Cockerell and *A. breviligula* Maa, constitute the group of giant *Apis* bees which are the next branch in the phylogenetic tree, although the last two species in this group are regarded as allopatric species of *A.dorsata*, and not true species.

**Alexander, B.A (1991).** Phylogenetic analysis of the genus *Apis*.Following the naming of the genus by Linnaeus in 1758, several species and subspecies of this genus have been described by different authors from all over the world, and at present at least nine different species are recognized under this one genus *Apis* which have been informally classified into three groups on the basis of their phylogeny .

## III. METHODOLOGY

The method used in this paper is descriptive-evaluative method. The study is mainly review based. It is purely supported by secondary source of data, i.e. books, journals, papers and articles and internet.

## IV. RESULT AND DISCUSSION

### **Apis mellifera beekeeping:**

*Apis mellifera* has been imported initially to Punjab and has become popular among commercial beekeepers because of its higher honey yield. The mellifera gradually spread to Himachal, Bihar, Uttar Pradesh, West Bengal and recently in Kerala, Karnataka and Maharashtra. Since *Apis mellifera* beekeeping need sound financial support it is difficult for the poor farmers to afford *Apis mellifera* was successfully introduced during 1960's in foothills of Himachal Pradesh and agricultural plains of Punjab. The basic stock of 10 to 15 colonies and few queens are multiplied in lakhs and mellifera beekeeping is popular in all northern states and recently in southern states. The special traits of *Apis mellifera* to produce propolis, royal jelly, pollen etc add great importance to this bee. The European honeybee was a native to Africa, most of Europe and the Middle East, and was subsequently introduced by man to the Americas, Australasia and much of the rest of the world. Besides being managed extensively for commercial beekeeping in India, escaped colonies of this introduced bee has populated the wilds and co-exists with its Asian counterpart *A.cerana*. *A. mellifera* is bigger than *A. cerana*, but its habits in the wild are same as the latter species.

The yield of honey (25-40 kg per colony per year) is higher than the Asian bee and they are much more docile and less prone to absconding than *A. cerana*. The different species of *Apis* bees occurring sympatrically have been shown to display a myriad of interactions including competition, interference, parasitism, avoidance etc. among each other (Koeniger 1982). A brief summary of the recorded interactions between the different species of honeybees native and introduced to Asia, including India. The management practices are the base for the success of mellifera beekeeping In general, a cycle of management practices is done for mellifera beekeeping. i.e. dearth management, winter management, comb management, queen management, honey flow management, pest and predator management etc.. Due to climatic and floral conditions in Bihar, beekeeping generally starts with build- up period in September to November due to rabi crops like lahi and other oil seeds. Weak colonies build up and strong colonies store honey. Commercial beekeeping using the docile and manageable strains of the European honeybee *Apis mellifera* has seen a steady rise in Asia, including India. Following its introduction in Himachal Pradesh in the 1960s, the rearing of this bee has increased manifold across several states of the country, and at present in India, commercial migratory bee keeping relies heavily on this introduced bee species (Rao and Rao 2011), much like the rest of the world. Since this bee is the European counterpart of the Asian honeybee *Apis cerana*, much of its behaviour and requirements are same as the latter species, resulting in direct competition between the two species, usually for food, in nature.

Under experimental conditions, also, *Apis mellifera* have been shown to prevent *Apis cerana* from accessing food from artificial feeding stations (Dhaliwal and Atwal 1970). *Apis mellifera* have been shown to be aggressive robbers of food stores from *Apis cerana* colonies (Yang 2001) and because of a supposed absence of pre-mating barriers between these two species (Ruttner 1988) and similar queen pheromones, frequent copulation attempts by *A. mellifera* drones is made on *A. cerana* queens, outcompeting the *A. cerana* drones (Muzaffar and Ahmed 1990), and with a noxious effect on the queen (Yang 2009). These negative interactions between the two species lead to the speculation of whether the European honeybee *Apis mellifera* shall emerge as a potential invasive threat to India's

indigenous honeybee species, *A. cerana*. *Apis cerana* populations have been reported to have declined steadily following introduction of *Apis mellifera* bees, in India (Atwal and Sharma 1971; Verma 1993), as well as in other Asian countries (Japan: Sakagami 1959; China: Yang 2005; Nepal: Partap 1998). An increased interest in beekeeping with the European honeybees, due to their large yield of honey, beeswax and propolis, has further resulted in a decline in conservation and management practices involving the Asian honeybee species. Although, not yet threatened with extirpation, unless proactive conservation measures are adopted, India may see a severe dwindling in the population of its indigenous honeybee species, with increasing importance given to commercially viable colonies of imported and introduced European honeybee races. At present, several behavioural and physiological differences between the indigenous *Apis cerana* and the introduced *Apis mellifera* are serving as checks against replacement of the former species by the latter, by creating enough niche separation between the two bee species. For instance, *A. cerana* have been found to forage earlier in the day and also tolerate lower temperatures than *A. mellifera* (Partap, Shukla and Verma 2000). *Apis cerana* also have been reported to be efficient pollen collectors from heterogenous flower patches, spending less time per flower, while *Apis mellifera* preferred relatively homogenous big flower patches and had greater flower processing times (Partap *et al.* 2000). These differences in timing and flower patch preferences may be enough to avoid competitive exclusion of *Apis cerana* by *Apis mellifera*. Besides, *A. mellifera* are more susceptible to *Varroa* mite infestation, which is a natural parasite of *A. cerana* and causes the latter species much less harm.

However, increasing air temperatures, widespread use of pesticides and acaricides to control *Varroa* mites, and monoculture of entomophilous crops may turn the tables and break these barriers stopping the introduced *Apis mellifera* from becoming invasive with the elimination of its Asian counterpart *Apis cerana*. Commercial beekeepers migrate colonies from the hills to the agricultural plains of Punjab, Haryana, Uttar Pradesh to avail Brassica, Eucalyptus, Trifolium, Helianthus etc. and also to litchi orchards upto April. During dearth, sugar and pollen supplement feed to compensate the nectar and pollen dearth, during winter, the colonies dwindle due to the temperature fluctuations hence winter packing and sufficient food stores is a prerequisite. During the build-up period with the development of colonies C.F. sheet for drawn out combs, during honey flow, super combs to provide enough space to store nectar, queen excluder in quality honey production and higher honey yield are the other requisites. Several mites and pest infestations and microbial, bacterial and viral infections cause severe loss to the colonies Sulphur dusting, formic acid fumigation etc. is effective against mites. Central Bee Research and Training Institute, with its network of field stations throughout the country developed a more effective and economic way of beekeeping.

#### IMPROVED TECHNOLOGY:

The local inhabitants are ruthlessly hunting these colonies by the traditional crude and destructive methods and earning their seasonal livelihood. The squeezing of combs makes honey turbid due to the crushing of larval juice and pollen grains, and fetch low market prize. Moreover due to the destructive method of honey hunting, every year 40 to 50% of the rock bee colonies are losing their life and in turn failed to complete their respective breeding cycles. Their decline in strength is a threat to the ecosystem. At the same time, beekeeping have to be encouraged for the economic upliftment of the rural populations in the remote areas. It helps in conservation of the resources, and also improves the health, nutritional and economic status of the people in these areas. Considering all these facts, appropriate and eco friendly management practices are developed and disseminated through extensive training programmes. There is no chemical treatment for the viral disease, hence development of tolerant strains were undertaken to revive cerana beekeeping. It was observed that colonies affected with disease for less than two months in a year showed normal growth and honey yield. The colonies that are completely free from disease throughout the year showed better and had more resistance to disease. Such colonies were isolated and further multiplication was undertaken by grafting method. Large number of queens was produced and colonies were requeened frequently. During this process resistance is passed on to generations within a short period. Such colonies were distributed to progressive beekeepers under the revival programme.

#### V. CONCLUSION

The introduction of the European honeybee species *Apis mellifera* has boosted beekeeping and added to the rural economy of Bihar. Its contribution in migratory beekeeping is undeniable. However, because of its active interference with foraging and mating habits of the Asian honeybee *Apis cerana*, the introduced European honeybee faces the risk of being tagged an invasive threat to the indigenous species of honeybees in Bihar. Timely corrective actions, however could mitigate the problems and ensure co-existence of the two species. Through careful conservation practices, including preservation of wild flora and suitable nesting places, and controlled use of agrochemicals and biocides, the populations of India's indigenous honeybees may be protected. The European bee species, because of its high economic viability, both as a producer of a marketable product and as an important ecosystem service provider, at present in Bihar may be monitored and managed closely so that its impact on the indigenous apifauna is maintained at a minimum. The productive efficiency of the bees is the cumulative effect of bee management, bee forage and bee breed.

Bee management is successful only when the record of the colonies and planning is done properly. Due to diversity in flora, topography and activities of people, beekeeping and management is diverse. Beekeeping in Bihar has been adapted to various ecosystems, socioeconomic profiles and habitat preferences. The *Apis dorsata* which is economically important as it is a producer of honey and bees wax, a good pollinator especially in forests, is a source of income to bee hunters. The routine management practices and special management for quality honey production with fresh drawn out combs, large-scale queen production with mass selection are among them. The millennium hive is an asset to mellifera beekeeping as it maintains populous colony in spite of temperature fluctuation and, enhances honey, queen and royal jelly production in all seasons. Time has come to generate more income to the beekeepers, and attention is to be persistently diverted to produce royal jelly, propolis, bee venom by exploiting *Apis mellifera* beekeeping.

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