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## Survey studies on beekeeping with *Apis mellifera* in Himachal Pradesh: Beekeeper's prospective

**Neha Negi, Meena Thakur, Harish Kumar Sharma and Kiran Rana**

### Abstract

Survey studies were conducted in three districts of Himachal Pradesh viz., Kangra, Kinnaur and Solan during the period 2016-17. Information on various parameters and practices followed for *Apis mellifera* rearing viz., brood diseases, awareness, and management practices adopted by beekeepers for maintenance of bee colonies, honey storage practices and migratory route followed by the beekeepers was gathered in questionnaires from randomly selected beekeepers in the districts and compiled. Ectoparasitic mites, European foulbrood, sacbrood, Nosema diseases and attack of wasps, birds and bear, though low, was prevalent in the beekeepers apiaries and sulphur dusting, fumigation of formic acid for diseases and hand killing for wasps were the commonly followed management practices. Winter packaging, regular checking of apiary and artificial feeding was done by the beekeepers, Stainless steel containers were commonly used for storage of honey.

**Keywords:** *Apis mellifera*, bee diseases, honey bee management

### Introduction

Beekeeping with European honey bee, *Apis mellifera* is practiced in Himachal Pradesh as migratory beekeeping. At present, there are more than 1500 beekeepers having about 1 lakh bee colonies and producing 1700 MT honey in low to high hills of the state (Anonymous, 2013) [2]. To overcome harsh conditions of the state, the beekeepers keep their colonies from April to October in Himachal Pradesh and migrate to plain areas of Haryana, Punjab, Rajasthan and Uttar Pradesh during the rest period of the year. Sharma (2001) reported in a survey of 60 beekeepers in district Kangra, Himachal Pradesh that migratory bee keeping resulted in higher honey yield (41.60 kg/colony) as compared to stationary beekeeping (15.66 kg/colony), the cost structure of the two was not statistically significant. The net returns were higher in former as compared to the later.

In 2003, sac brood virus was detected at two locations in Himachal Pradesh. At Nauni (district Solan), it was detected in colonies during spring and summer (March- May) affecting 0.39 per cent to 5.20 per cent of the brood where as at Jachh (district Kangra), the disease was also detected during March to June infecting 0.23per cent to 2.10 per cent of brood (Rana and Rana, 2015) [7]. Abrol and Ball (2006) [1] surveyed different apiaries of Jammu during 2003-2004 and reported that 10-15 per cent colonies were suffering from European foulbrood disease. The symptoms of the disease included sudden weakening of the colonies. The disease was noticed during dearth period and high infestation was noticed when the larvae were less than 48 hours old and usually died in coiled state.

Presence of various diseases, predators and pests which impair the health and normal working of *A. mellifera* is one of the major problems for beekeepers of the state. The seasonal incidence of various diseases and enemies of *A. mellifera* is influenced by various weather parameters. Further, the prospective beekeepers should be aware of various limiting factors to protect honey bee colonies to get maximum benefit from beekeeping venture.

### Materials and Methods

The study was conducted during April, 2017 to March, 2018. Survey studies were conducted in three districts of Himachal Pradesh viz., Kangra, Kinnaur and Solan. Information on various parameters and practices followed for *Apis mellifera* rearing viz., brood diseases, awareness, and management practices adopted by beekeepers for maintenance of bee colonies, honey storage practices and migratory route followed by the beekeepers was gathered in questionnaires from randomly selected beekeepers in the districts and compiled.

Questionnaires were prepared and data was collected from randomly selected beekeepers in different districts of the state. Data about brood diseases, mites, awareness, and management practices adopted by beekeepers for maintenance of bee colonies, honey storage practices and migratory route followed by the beekeepers was gathered.

## Results

The beekeepers of Himachal Pradesh are maintaining 35- 250 colonies of *A. mellifera* as migratory beekeeping by shifting colonies to other adjoining states viz., Haryana, Punjab and Rajasthan. The *A. mellifera* colonies are rented for apple pollination in apple growing districts of Himachal Pradesh on payment basis.

## A. Migratory cycle of *A. mellifera*

According to the survey studies, the beekeepers of Himachal are following different migratory cycles for *A. mellifera*: 1) District Kangra: 3 migratory cycles (a) from September to November to neighbouring states i.e. Punjab, Rajasthan to avail the mustard flora, (b) from December to January to Haryana for eucalyptus and (c) March to April back to Himachal Pradesh for apple pollination (2); District Kinnaur: 2 migratory cycles a) migration to Punjab and Haryana in the months of October- February for mustard and eucalyptus (b) back to Himachal Pradesh in the months of March- April for apple pollination; (3) District Solan: 2 migratory cycles a) from November to December to Punjab and Rajasthan for mustard and b) January to February to Haryana for Eucalyptus (Table1).

**Table 1:** Migratory cycle of *A. mellifera* adopted by beekeepers in Himachal Pradesh

District	Period	State	Major honey source
Kangra	September-November	Punjab, Rajasthan	Mustard
	December- February	Haryana	Eucalyptus
	March- April	Himachal Pradesh	Apple
Kinnaur	October- February	Punjab, Haryana	Mustard, Eucalyptus
	March- April	Himachal Pradesh	Apple
Solan	November-December	Punjab, Rajasthan	Mustard
	January- February	Haryana	Eucalyptus

## B. Incidence of diseases and management practices in *A. mellifera*

The information collected on the incidence of diseases, months of disease prevalence, annual colony losses and management practices adopted by beekeepers of respective districts is present in Table 2. Ectoparasitic mites were

prevalent in all the apiaries 12-20 per cent incidence was observed for Solan district in the month of November, 10-12 per cent for Kangra district in the month of December- March and 8- 15 per cent incidence for Kinnaur during April- May, 2017. Fumigation of formic acid and dusting of sulphur were the common management practices.

**Table 2:** Status of disease and management practices in *A. mellifera*

Districts	Bee disease	Months of prevalence	Annual colony losses (%)	Management by beekeepers
Kangra	Ectoparasitic mite	Dec- March	10-12	Fumigation of formic acid
	Nosema	July -August	4-5	Dusting of sulphur
				Keep colonies in sunlight
	Sacbrood	April- June	2-3	Use of boiled water for feeding
Cleanliness in apiary				
Kinnaur	EFB	May- July	10-15	Regular check on colonies
	Ectoparasitic mite	April- May	8-15	Fumigation of formic acid
				Dusting of sulphur
	EFB	March- August	12- 20	Use of formic acid
Sacbrood	May- July	1-2	Cleanliness in apiary	
Solan	Ectoparasitic mite	November	10-20	Fumigation of formic acid
				Dusting of sulphur
	Sacbrood	March	2-3	Cleanliness in apiary
				Regular check on colonies
EFB	February	10-12	Use of chemicals like oxytetracyclin	
			Use of formic acid	

The incidence of the fungal disease Nosema was reported only in district Kangra in the months of July to August, where, 4-5 per cent annual losses to the apiary were observed (Table 2). The incidence of sacbrood was 1-2per cent for Kinnaur and 2-3 per cent both for Solan and Kangra, proper hygiene and regular check of colonies for the occurrence of the disease is being practiced.

According to the survey information the period of incidence of European foulbrood was different i.e. May- July in Kangra (10-15%), March- August in Kinnaur (12-20%) and February in Solan (10-12%). Use of formic acid and oxytetracyclin was

the common management practice adopted by beekeepers for European foulbrood.

## C. Incidence of enemies and management practices in *A. mellifera*

Wasps were the major bee pests causing 15-18 per cent (July-October 2017, Solan), 12-15 per cent (June- October 2017, Kangra) and 8-10 per cent (June- August, Kinnaur) damage to *A. mellifera* colonies. Hand killing of wasps by flapping and burning wasp nests were the management practices adopted by beekeepers.

**Table 3:** Status of enemies and management practices in *A. mellifera* adopted by beekeepers

Bee enemy	District	Months of prevalence	Annual colony losses (%)	Management by beekeepers
Wasps	Kangra	June- October	12-15	Hand killing, burning of their nest
	Kinnaur	June- August	8-10	Hand killing
	Solan	July- October	15-18	Hand killing
Birds	Kangra	Throughout year	2-4	Manually
	Kinnaur	-	-	-
	Solan	Throughout year	2-3	Manually
Bear	Kangra			
	Kinnaur	May- June	15	Wire fencing
	Solan	-	-	

Birds were also observed by beekeepers to attack *A. mellifera* colonies throughout the year in Kangra and Solan districts causing 2-4 and 2-3 per cent of colony damage, respectively. Whereas, no bird attack was reported from Kinnaur district (Table 3). Attack of bear in bee apiaries was a serious problem in district Kinnaur causing upto 15 per cent losses to the apiary. To save the apiary from this animal, the beekeepers were using wire fencing as management practice.

#### Seasonal management practices adopted by beekeepers for the *A. mellifera* apiary

Winter packaging to *A. mellifera* colonies to withstand harsh conditions of weather, keeping colonies in shady places and checking water needs during summer, honey extraction during summer months and keeping colonies at certain height or on hill to avoid water damage (Kangra) during monsoon is practiced (Table 4).

**Table 4:** Seasonal management practices for *A. mellifera* adopted by beekeepers

Season	District		
	Kangra	Kinnaur	Solan
Winter	Checking of queen, winter packaging	Winter packaging	Winter packaging, feeding is done
Summer	Colonies are kept in shady places and water needs are checked and water is provided, honey extraction	Colonies are kept in shade, honey extraction	Colonies are kept in shade, moisture is maintained in the apiary
Monsoon	Colonies are kept in dry places or kept at certain height	Keep colonies at dry places and disease incidence is checked	Colonies are kept at dry places
Spring	Unpacking of winter packaged colonies, checking of food sources.	Unpacking of winter packaged colonies	Artificial feeding is done. Unpacking of winter packaged colonies
Autumn	Checking of healthy queen and new queen is provided.	-	-

Unpacking of hives with increase in temperature during summer, artificial feeding to strengthen the colony after winter months, checking for healthy queen during autumn season and replacement of old new if required

#### Management practices adopted for honey storage by beekeepers of Himachal Pradesh

Beekeepers of the three districts are adopting different management practices for honey storage to get maximum benefits (Table 5). In district Kangra, honey is kept in dry and

shady places and the beekeepers use stainless container or glass bottles for storage and sell their honey in food grade plastic container, the period of storage is 5-6 months. In district Kinnaur extracted honey is kept at dry places and plastic or stainless steel containers are used for storage, storage period varies from 1-2 months up to 3 years. In Solan district period of storage is 5-6 months and stainless steel or glass bottles are used for storage and one year storage period is recorded.

**Table 5:** Honey storage practices adopted by beekeepers

Parameters	District		
	Kangra	Kinnaur	Solan
Storage Place	Kept in dry and shady place	Dry place	Shady and dry place
Honey Container	Stainless steel container, glass bottles, food grade plastic container	Plastic buckets, Stainless steel container	Stainless steel container, glass bottles
Period of storage	5- 6 months	1-2 months up to 3 years	One year

#### Discussion

The beekeepers of Himachal Pradesh are well aware of important bee diseases, enemies and their management practices. Brar *et al.* (2018) [4] conducted survey studies from six districts viz., Kullu, Kinnaur, Sirmaur, Solan, Shimla and Una of Himachal Pradesh during July 2015 to June 2016 to know the status of rearing of *A. mellifera* colonies both under stationary and migratory conditions. Seasonal incidence of brood diseases, ectoparasitic mites and enemies of *A. mellifera* under stationary and migratory conditions varied from location to location and place to place. Among enemies, bear and lizard were observed by beekeepers to attack *A. mellifera* colonies during different timings of year. Bear was

reported as a major problem in Kinnaur area (Telangi and Reckong Peo) during May to July. *A. mellifera* colonies migrated to Kinnaur were also attacked by lizard in May-June months. For the management of *Varroa* mite beekeepers of Nalagarh, Kinnaur, Kullu and Lahaul and Spiti are using sulphur. Beekeepers of Nalagarh and Kinnaur are using Thymol and beekeepers of Bajaura are using Formic acid in *A. mellifera* colonies Brar *et al.* (2018) [4].

Abrol and Ball (2006) [1] conducted a survey in different apiaries of Jammu during 2003-2004 and reported that 10-15 per cent colonies suffered from European foulbrood disease. The symptoms of the disease included sudden weakening of the colonies. The disease was noticed during dearth period

and high infestation was noticed.

Birds are also very important threat to bee colonies (Brar 2016) <sup>[5]</sup>. Blue bee-eater (*Nyctyornis athertoni*) can eat average 270 bees per 13.5 minute, and incidence of bird was reported in February month in Nauni, Solan.

Damage by bears has been reported in autumn and winter in hilly (Gulati and Kaushik, 2004) <sup>[6]</sup> areas cheap wall enclosures or keeping hives in the walls of dwelling houses or suspending hives from the horizontal branches of trees were the effective control measures against bear attack adopted by beekeepers.

These studies suggested that though beekeepers of the state are adopting safe methods for management of diseases and enemies and are well aware of beekeeping practices but still there is need of scientific knowledge for maximizing profits of beekeeping.

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