

## Wax moth infestation levels in Indian honey bee hives at Dharwad

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**Abstract:** A study was conducted to assess the wax moth infestation under different levels of frames in Indian bee hives, from December 2023 to June 2024 at Biodiversity Park, College of Agriculture, Dharwad. Indian honey bee colonies in 8-frame hives showed a higher infestation of wax moths, while those in 6-frame hives experienced significantly lower infestation. Additionally, both 6-frame and 8-frame hive colonies had notably higher wax moth incidences during the honey bee dearth period compared to other times of the year at Dharwad location.

**Key words:** 6 Frame hive, 8 Frame hive, Indian honey bee, Wax moth

### Introduction

Honey bees play a key role in the pollination of crops, besides providing honey, beeswax, bee pollen royal jelly, propolis, etc. However, honey bees are subject to stress from different factors. Even though not as serious as other stresses, the wax moth *Galleria mellonella* Linnaeus (Lepidoptera: Pyralidae) attack often causes concern because of poor management practices, leading to absconding (Ebadi *et al.*, 1980) and economic loss to the beekeeping industry all over the world. Greater wax moths are attracted not only to weak colonies but also to strong colonies, reducing the comb to a mass of web and debris, with severe infestation leading to suspension in brood rearing and foraging, ultimately absconding (Gulati and Kaushik, 2004), a very common behaviour in *Apis cerana*, including natural swarming (Pokhrel *et al.*, 2006). Often beekeepers neglect wax moth infestation which follows unidentified stress in bees, according to them. Thus, there is a need to control wax moths by providing a structural improvement to the hives as the floorboard debris first invites the wax moths when the colony gets weaker and the combs are not renewed. The frame level is not universal and varies with the region. With no information available on comparing the wax moth infestation levels in 6 and 8 frame hives of Indian honey bee, *Apis cerana indica* F., this study was undertaken to compare wax moth infestation levels in 6 and 8 frame Indian bee hives at Dharwad location.

### Material and methods

The study was carried out at the Biodiversity Park, College of Agriculture, Dharwad, Karnataka from December 2023 to May 2024. Dharwad is situated at 15.4589° N latitude and 75.007° E longitude with an elevation of 750 meters above mean sea level. The region has a tropical wet and dry climate and falling within the transitional zone (zone 8) and characterized predominantly by red and black soils. Dharwad experiences an average rainfall of 787 mm, with temperatures ranging from 12°C to 43°C and relative humidity varying between 40 and 88 per cent. Ten colonies of Indian honey bee, *Apis cerana indica* (local strain/morph) were procured from a local beekeeper and by natural hiving in Dharwad. The colonies were successfully established

in Biodiversity Park. Out of the total ten colonies, five were established in 6 frame hives and another five were established in 8 frame hives, ensuring equal replication for both types of boxes. The colonies were set up at a distance of 50 meters between the boxes. All the 6 frame and 8 frame hive colonies, possessed strength of three frames per box and were brought in the month of November 2023. Grease was applied to the supporting stand of all the colonies to prevent attack from ants, lizards and cockroaches.

All the colonies were examined for the occurrence of wax moth infestation, by observing the number of wax moth larvae in each colony and presence of webbing and tunnels. Wax moth larvae found during cleaning of bottom boards and number of larvae found on frames was recorded at fortnightly interval in 6 and 8 frame bee hive colonies. Wax moth infestation was observed till June 2024. The data obtained from five replications were further subjected to statistical analysis by following two sample t-test to compare the treatments.

### Results and discussion

During the study period, wax moth larvae were found in all the 6 and 8 frame hives during cleaning of bottom boards and number of larvae found on frames was recorded. Initially, during winter season number of wax moth larvae found was very less. Among the 6 frame hive colonies, the highest number of wax moth larvae was found in the first fortnight of July with 15 larvae per 6 frame colonies. In 8 frame hive colonies, the highest number of wax moth larvae was found in first fortnight of July with 30 larvae per 8 frame hive colonies. From the table it is observed that wax moth infestation was higher from February to July compared to the period from December to January. Total mean number of wax moth larvae recorded in 8 frame hive colonies was 7.20 and lesser mean number of wax moth larvae of 2.87 was observed in 6 frame hive colonies.

Number of wax moth larvae recorded was subjected to two sample t-test analysis and obtained the calculated t value of 3.10, which is higher than the t-table (0.05) value of 2.05.

Table 1. Wax moth infestations in 6 and 8 frame hives

| Period of observation         | No. of wax moth larvae/ box  |              |
|-------------------------------|------------------------------|--------------|
|                               | 6 Frame hive                 | 8 Frame hive |
| I fortnight of December 2023  | 0                            | 0            |
| II fortnight of December 2023 | 0                            | 0            |
| I fortnight of January 2024   | 0                            | 0            |
| II fortnight of January 2024  | 3                            | 9            |
| I fortnight of February 2024  | 0                            | 8            |
| II fortnight of February 2024 | 3                            | 0            |
| I fortnight of March 2024     | 4                            | 9            |
| II fortnight of March 2024    | 0                            | 0            |
| I fortnight of April 2024     | 3                            | 5            |
| II fortnight of April 2024    | 1                            | 4            |
| I fortnight of May 2024       | 1                            | 3            |
| II fortnight of May 2024      | 2                            | 5            |
| I fortnight of June 2024      | 1                            | 15           |
| II fortnight of June 2024     | 10                           | 20           |
| I fortnight of July 2024      | 15                           | 30           |
| Mean ± S. D.                  | 2.87 ± 4.24                  | 7.20 ± 8.65  |
| t - Statistic value           | 3.10**                       |              |
| t - Table value (0.05) - 2.05 | t- Table value (0.01) - 2.76 |              |
| ** - Significant at 0.01      | Average of 5 hives           |              |

Therefore, it was found that the samples were significantly differed at 5 percent level of significance, indicating that significantly higher number of wax moth larvae was found in 8 frame hive colonies than in 6 frame hive colonies of Indian honey bee (Table1).

During the summer and rainy season, a peak number of wax moth larvae were observed compared to the winter season might be due to favorable conditions for breeding and egg laying in the warmer temperatures and increased relative humidity. Wax moths exhibited greater activity during warm month of the year. The combination of higher temperatures and humidity likely stimulated increased egg laying by wax moths, and the shorter incubation period in warm conditions facilitated faster larval development.

Throughout the study period the larval stage of wax moths was observed to significantly damage combs whenever infestations occurred, a phenomenon also noticed during colony cleaning. The number of wax moth larvae was higher in 8 frame hives, potentially because the 8 frame hives provides lesser compact space. This larger internal space in boxes with the available worker strength the defense against wax moth infestation might be inefficient and contributed to the greater wax moth infestation in 8 frame hives.

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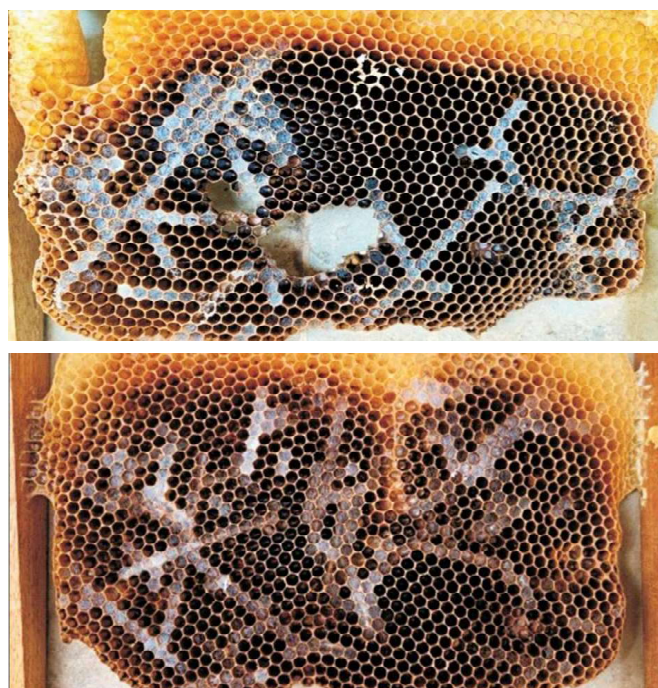


Fig1. Wax moth infested comb

The current research results are in concert with Singha *et al.* (2023) who reported maximum incidence of greater wax moths during June to August with peak incidence in the month of July ( $13.83 \pm 0.68$  no. of individuals/hive). Maximum percentage of hives with moth infested combs also recorded during July.

From the current study, the peak number of wax moth larvae was recorded from June to August. Similarly, Yadav and Kumar (2023) also reported the occurrence of *Galleria mellonella* (larval, pupal as well as adult)/ colony increased from the first fortnight of August till the second fortnight of September 2019 in *Apis mellifera* colonies.

## Conclusion

The study results emphasize the comparative performance of Indian honey bee concerning with wax moth infestation levels in 6 and 8 frame hives. Indian honey bee colonies in 8-frame hives showed a higher infestation of wax moths, while those in 6-frame hives experienced significantly lower infestation. Additionally, both 6-frame and 8-frame hive colonies had notably higher wax moth incidences during the honey bee dearth period compared to other times of the year at Dharwad location.

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