
Prevalence of Wax Moth in Modern Hive with Colonies in Kafta Humera

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Abstract: A cross-sectional study was carried out from April 28 to May 30, 2009 in four village of Kafta Humera to determine the prevalence of wax moth in modern hive with colonies. A total of 307 modern bee hives with colonies were inspected during the study period. Physical inspection and observation were the methods of the study used. According to the study the overall prevalence of wax moth in modern bee hive was found to be 27.4%. During the study period larval stage of wax-moth was only detected. The nature of severity was differentiated and categorized in to three groups as 35(11.4%), 47(15.3%) and 2(0.65%) as light, moderate and severely affected respectively. Infestation rate of wax moth based on supering was found to have statistically significant difference as determined as 8(16%), 65(27.7%) and 11(47.7%) in base only, base plus one box and base plus two boxes. To combat the problem, awareness creation should be done on proper management of bee keeping in the area.

Keywords: Bee, Kafta Humera, Modern Hive, Wax Moth

1. Introduction

The contrasting geomorphic land scopes of Ethiopia create favorable environment for the existence of a large and unique biodiversity both in plants and animals including honey bee sub species. The ideal climate conditions and diversity of floral resources allow the country to sustain around 10 million honey bee colonies of which 7.5 million are kept in local bee hives around 30 thousand in top bar hives by farmers and the remaining exist in the forest as wild colonies. This makes the country to have the highest bee density in Africa [1,2,3]. Beekeeping preserves nature, agriculture, sustains livelihoods, and provides food security [4]. Beekeeping in Tigray is most traditional and has long years of experience which is parallel to the history of agriculture, but still a recent time, Beekeeping and honey production for that matter has been in state of stagnation.

The honey bee could be affected by many infectious diseases which are parasites, bacteria, virus, protozoa, fungus, pests, and poisons and attacked by predators. Transmission of bee diseases from one colony to another can be by adult bee, reuse of contaminated comb, bee keepers, beekeeping equipment, feeding of infected honey and pollen [5,6]

Wax moths are potentially very troublesome to bee keepers all over the world. These are of two species of wax moth namely *Galleria mellonella* and *Achroia grisella*. All occur naturally or have been introduced by man in almost all regions of the world. Wax moth is a serious destructive pest cause considerable damage to both normal and abandoned combs of bee and brings considerable loss to beekeeping industry [7]. The weak colonies or abandoned combs are easily attacked more often by wax moth [8,9]. Throughout the world today they are an ever present cause of economic loss to bee keepers who have capital invested in framed combs built on comb foundation.

Wax moth emerge as adults in the hive and the female may live a few days or a few weeks after dark she flies out to a tree and mates, she then re-enters to hive and lays about 500 eggs. The newly hatched larvae can run very fast and thus distribute themselves around the hive, they then burrow in to comb, damaging it in a characteristics way by constructing a feeding tunnel of silk through it [10]. Damage may be done to combs containing honey to freshly extracted combs, and to stored combs. The market demand for beeswax both in the domestic and international trade is very high. Beeswax from Ethiopia has higher demand and also earns higher price in

EU[11]. The wax moth is also the major problem in the whole country and regions which causes damages and losses. Other than its presence the magnitude, type and amount of loss are not well studied in depth. Therefore the objective of this paper was to assess wax moth infection rate in modern bee hives in Kaft Humera district of Tigray.

2. Materials and Methods

2.1. Study Area

The study was conducted in Kafta Humera district, Tigray regional state of Ethiopia. The study was conducted on four selected 'kebeles'/local administrative region / of the Kafta Humera district namely, Baeker, Adhrdi, Mayweyni and Adi-goshu. The geographical location of the research site is 130 42' to 140 28' North latitude and 360 23' to 370 31' East longitude and its elevation is 550-2800 m.a.s.l. The mean monthly maximum temperature remains high throughout the year ranging from 30°C in August to 40°C in March and May in Humera.

2.2. Study Design

Across sectional epidemiological study was conducted from April 28 to June 30, 2009. During the study period data was collected through gross hive inspection of each hive. The data collected from the study area were summarized and

analyzed by the possible categories and variables. The nature of severity was differentiated and categorized in to three groups as light, moderate and severe infestation based on the criteria of [12].

A total of 307 modern hives with colonies have been randomly sampled for wax moth infestation. Sample size taken for each study sites includes, Adhrdi from total 114 modern hives 50 were sampled; Baeker from 80 modern hives 36 were sampled; Adigoshu from 373 modern hives 163 were sampled and in Mayweyni from 130 modern hives 58 were randomly inspected (44-45% of the total modern hives with colony in the selected village were included in the study).

3. Results

3.1. Degree of Wax Moth Infection

The total numbers of 307 modern bee hives with colonies were inspected during the study period. The routine internal inspection revealed that 27.4%(84) of the modern hives with colonies had visible larval stage of wax moth. Degree of severity based on Burges criteria was differentiated and categorized in to three groups as 35(11.4%), 47(15.3%) and 2(0.65%) light, moderate and severely affected respectively (Table 1).

Table 1. Categorical degree of wax moth infection in Modern hive.

S.No.	Village	No of modern bee live inspected	Degree of			Total(%)
			Light(%)	Moderate(%)	Severe(%)	
1	Adhrdi	50	5	16	2	23
2	Baeker	36	2	14	-	16
3	Adigoshu	163	22	10	-	32
4	Mayweyni	58	6	7	-	13
Total		307	35(11.4%)	47(15.3%)	2(0.65%)	84(27.4%)

During the study period egg and adult stage of wax moth were not detected.

3.2. Comparison Based on Hive Positioning

Out of 307 modern hives inspected 50(16.3%), 234(76.2%) and 23(7.5%) were base only, base plus one box and base plus two boxes respectively. The infection rate of wax moth

based on their supering was determined as 8(16%), 65(27.7%) and 11(47.8%) in base only, base plus one box and base plus two boxes respectively (Table-2)

Table 2. Comparison between positioning of hives in wax moth infestation each study sites.

No	Sires	Inspection of wax moth in each category					
		Base only		Base plus one box		Base plus two boxes	
		No of hive Inspected	+ve	No of hive Inspected	+ve	No of hive Inspected	+ve
1	Adhrdi	5	1	35	18	10	4
2	Adigoshu	21	2	138	28	4	2
3	Baeker	10	2	20	11	6	3
4	Maywyni	14	3	41	8	3	2
Total		50	8(16%)	234	65(27.7%)	23	11(47.8%)

$\chi^2 = 8.114$; $p = 0.017$

4. Discussion

An overall prevalence of wax moth in modern bee hive in the study area was found to be 27.4%. The nature of severity

was differentiated in to three categorized as light, moderate and severely affected. The larvae of wax moth silken tunnels throughout the comb and when hives are heavily infested the combs are completely consumed and only the larval silk, droppings and cocoons remain in the hive [10]. Based on

Burges criteria only 2(0.65%) from the total affected modern hives were severely affected. Based on positioning of hives the infection rate was determined in base only, base plus one box and base plus two boxes. The infection rate was statistically significant increasing as supering of hive increases and this current result is agreed with the idea of [11] as bee colonies become weak the chance of getting infection by wax moth is high and the combs are vulnerable to wax moth when in store, as well as inner parts of hives not occupied by bees. Supers of empty combs are sometimes left above the brood box for storage, but they are safe from wax moths only where the colony can be kept strong enough throughout the year [12].

The current result was indicating that infestation of wax moth in the study area was high. This may be due to the fact that lack of proper management in the study site. This can be due to lack of extension services in the district and lack of training to the farmers to create awareness about proper management. There is no method for killing of wax moth can take the place of management that prevents infestation in the hive [13,14]. The apiaries are to ensure that all colonies are strong and healthy. During the study period it was observed that larval stage of wax moth was responsible for destroying the combs. There for wax moth is mainly responsible for damaging the combs and feeds completely, and cause for the colony to be absconding. This is congruent to the idea of Crane [13] that combs are vulnerable to wax moth when in store as well as in parts of hives not occupied by bees. Estimated the annual loss in the USA as \$500,000 and the damage is likely to be relatively more in other parts of the world. The other important contribution for this higher wax moth infestation recorded in the area may be due to lack of food resources in the season and poor site selection. Weak colonies are easily susceptible to wax moth infestation. Burges[11] indicates that as adult wax moth emerge in the hive and the female may live a few days, in the hive a few weeks later she flies out to a tree and mates she then re-enters to hive and lays about 500 eggs in dark time in a weak colony.

5. Conclusion and Recommendations

The infestations of honey comb by wax moth are potentially very troublesome to bee keepers all over the world and the studied area. During the study period observation and inspection the combs were vulnerable to wax moth as in parts of hives not occupied by bees. The fast moving larval stage of wax moth was responsible in destroying the comb and its contents. It is must to keep colony of hive to be strong and healthy to avoid infestation of wax moth. In general we can conclude that poor management of bee keeping is the main reason for wax moth to invade modern bee hive. In light of the above facts the following recommendations can be made with respect to the status of the infestation of wax moth and then possible measures to be taken at the study area.

- awareness should be created to wards management of bees.

- Apiary inspectors, beekeepers and researchers must be able to recognize possible intervention, option that could improve on the control of wax moth.
- Site selection should be assisted by experts
- Flowering plants should be planted to increases bee forage

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