

**Prevalence of Bee Lice *Braula coeca*
(Diptera: Braulidae) and Other Perceived Constraints
to Honey Bee Production in Wukro Woreda, Tigray Region, Ethiopia**

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Abstract: A cross sectional study was conducted from November 2008 to March 2009 in Wukro Woreda to determine the prevalence of bee lice and other constraints to honey bee production in the area. The result revealed an overall *Braula coeca* (bee louse) prevalence of 4% in the brood and 5.5% in the adult honey bees, respectively. The prevalence of louse infestation recorded in brood and adult bee of the three peasant associations of Wukro Woreda were, 3.3%, 5% in Genfel, 4.9%, 6% in Adikisandid and 3%, 5%, Aynalem, respectively. There was no statistically significant variation in overall prevalence rates of lice infestation between brood and adult bees and locations ($P > 0.05$). Factors perceived as major constraints to honeybee production by 51 interviewed farmers were frequent occurrence of drought, lack of bee forage, existence of pests and predators and pesticide poisoning in decreasing order of importance. The beekeepers also listed pests and predators that they considered important to be honey badgers, ant like insects, wax moth, birds, spiders, monkeys, snakes and lizards. According to the response of beekeepers, honey badger attack was a serious problem in the Woreda. This study revealed the presence of real threat to beekeeping and honey production from louse infestation, predators, chemical pollution and drought. The effects of drought, pests and predators on beekeeping practice in the study area need to be minimized with appropriate management practices.

Key words: Prevalence • Constraints • Honey Bee Production • *Braula coeca* • Pests • Predators

INTRODUCTION

Ethiopia is home to some of the most diverse flora and fauna in Africa. Its forests and woodlands contained diverse plant species that provide surplus nectar and pollen to foraging bees [1]. The country is the largest honey producer in Africa and 10th largest honey producer in the world [2]. Although thousands of tones of honey were produced every year, the products obtained from the subsector were still low as compared to the potential of the country [3].

Like all living animals, honey bees were infected with disease and attacked by parasites and pests endangering their health and life [4, 5]. These diseases of honey bees impose serious problem on honey bee production and productivity. Bee-lice are usually considered to be harmless in honey bee colonies, but they may become pests in some areas as their larvae make tunnel and

despoil comb and both larvae and adults steal food from bees [4]. An experimental study had shown bee lice to be an evident cause of reduction in the number of worker bees and honey production where treated colonies with tobacco smoking against *Braula* had produced an average of 18 kg of more honey as compared to the untreated ones [5]. *Braula coeca* is listed as a notifiable emergency animal disease in Australia, where reporting is mandatory if there is a suspected case or when confirmed by a positive laboratory result [6].

Beekeeping has a long-standing tradition in the Tigray Region, dating back to ancient times during the kingdom of Abyssinia. It currently has strong growing end markets making it viable enterprise for Women and Landless Youth [7]. To fully exploit opportunities in this sector, interventions to address constraints and detecting the occurrence of harmful diseases, parasites and other pests of honey bee colonies is key step to prevent their

harmful effects as early as possible. However, despite the probability for the presence of honey bee parasites and other problems, the study so far conducted on such problems in Ethiopia were very few and the infestation of bee colonies with *Braula spp* louse is not known. Therefore, the present study was conducted to determine the prevalence of louse infestation in bee colonies and assess the importance of pests and predators in Wukro Woreda.

MATERIALS AND METHODS

Study Area: The study was conducted at three peasant associations found in Wukro Woreda of Eastern Zone of Tigray Regional State: Genfel, Aynalem and Adikisandid. The peasant associations were selected based on accessibility and practicing bee keeping. Wukro Woreda also known as Kilte Awlaelo is one of the 36 Woredas in Tigray Region of Ethiopia. Wukro, the Woreda town, is located at a distance of 825 km North of Addis Ababa and 45 km far from the regional city. The Woreda is located in the area stretching from 13°33'-13°58' North latitude and 39°18'-39°41' East longitude with elevation ranging from 1760 to 2720 meters above sea level. The Woreda has two main rainfall seasons: The short rains from April to May and the main rains from June to Mid September. The average rainfall over the past 14 years is 450 mm per annum with a range of 217.3 to 638.4 mm per year. The mean annual temperature ranges from 17 to 23 degree centigrade. The Woreda is made up of 17 Peasant Associations (Tabias) [7].

Study Population and Design: Across sectional study was conducted from November 2008 to March 2009 in Wukro Woreda to determine the prevalence of bee lice and other constraints to honey bee production in the area. From 17 peasant associations, three peasant associations containing 51 households and owning about 805 honeybee colonies were selected purposively. Proportional sampling method was used to fix sample size for each peasant association and the study was conducted on 384 randomly drawn honey bee colonies. Fifty to hundred adult honey bees from each hive (bee colonies) were collected by brushing the bees off the comb through a large mouthed funnel or directly in universal bottle and brought to Mekelle Regional Laboratory, Parasitology Department. Brood examinations were done by random opening of 50 to 100 brood cells. The brood was removed from the cell with a fine forceps and the cell was inspected for the presence of lice using

hand lenses or by naked eye. Finally the lice were examined under a microscope at lower magnification setting to differentiate lice from mite. Bee louse (*Braula coeca*) resembles *Varroa destructor* in size and color; however, being an insect, *Braula* has six legs that extend to the side.

Structured questionnaire were also used to collect various information related to honey production and its constraint due to pests and predators of honeybees. A questionnaire and record sheets were developed and used for recording data and information generated from the formal interview of 51 farmers engaged in honey production. For easy and smooth discussion with farmers, the development agents of respective peasant association were used as data collectors. Data on various aspects of beekeeping, production, pests, predators and other chemical application affecting honey bees were gathered.

Data Analysis: Collected data were analyzed using descriptive statistics and chi square test by SPSS software.

RESULT

Prevalence of *Braula coeca*: The study conducted to determine the prevalence of louse infestation of brood and adult bee in the three peasant association of Wukro Woreda revealed an overall prevalence of 4% in the brood and 5.5% in the adult honey bees, respectively. The prevalence of louse infestation recorded in brood and adult bee of the three peasant associations of Wukro Woreda were, 3.3%, 5% in Genfel, 4.9%, 6% in Adikisandid and 3%, 5%, Aynalem, respectively. The louse species identified were *Braula coeca*. There was no statistically significant variation in overall prevalence rates of lice infestation between brood and adult bees and locations ($P > 0.05$).

Major Constraints to Honeybee Production: Factors perceived as major constraints to honeybee production by the 51 interviewed farmers were frequent occurrence of drought, lack of bee forage, existence of pests and predators and pesticide poisoning in decreasing order of importance (Table 3). The beekeepers also listed pests and predators that they considered important to be honey badgers, ant like insects, wax moth, birds, spiders, monkeys, snakes and lizards. According to the response of beekeepers, honey badger attack was a serious problem in the Woreda. They reported that an attack by this predators resulted in loss of honey production and

Table 1: Prevalence of louse (*Braula coeca*) infestation on brood and adult honey bee in Wukro Woreda during November 2008 to March 2009

Types of bees	Total number of hives examined	Positive number (%)
Brood	384	15 (4.0)
Adult	384	21 (5.5)

Table 2: Prevalence of louse (*Braula coeca*) infestation on brood and adult bee in each peasant association of the study area during November 2008 to March 2009

Study site	Total number of inspected hives	Positive number (%)
Genfel	Brood = 120	4 (3.3)
	Adult = 120	6 (5.0)
Adikisandid	Brood = 164	8 (4.9)
	Adult = 164	10 (6.0)
Aynalem	Brood = 100	3 (3.0)
	Adult = 100	5 (5.0)



Fig. 1: *Braula Coeca* isolated from honey bees of Wukro Woreda

absconding. Seventy percent of beekeepers reported that they protect some of bee enemies by wrapping smooth iron sheet and spine around trees on which hives were mounted. Some farmers tried to protect honey badger by using rope around entrance of hive that can hang the predators' neck and by hanging hives on a branch of tree using stick which had branch from both ends. Other pests and predators were presented by frequent cleaning of hives of the apiaries around tree, using ash and by killing the enemies.

DISCUSSION

Though, there was no laboratory based investigation on the prevalence of louse infestation in brood and adult honey bees in Ethiopia, in a questioner survey, bee lice was ranked third important problem next to ants and wax moth by bee keepers of Burie District [8]. A study conducted in Jordan revealed that bee louse, *Braula orientalis*, is quite common found in 64.3% of inspected apiaries and diagnosed in 45.4% of the hives [9]. The low

prevalence of *Braula* infestation in this study might be associated with the study period (November 2008 to March 2009). A decrease in infestation rate was reported after December and during spring, reaching its lowest level in April, though bee lice were found inside the bee colonies throughout the year [5]. Another study showed rapid increase in the infestation rate of *B. coeca* to begin in May [10]. Sanford [11] indicated the recent identification of *B. coeca* in Florida, its presence in colonies along the eastern shore of Maryland, USA for some time and the large infestations reports from Spain. Though no detrimental effects have been attributed to the presence of *B. coeca* on the honey bees in some earlier reports [12], a recent experimental study had shown bee lice to be an evident cause of reduction in the number of worker bees and honey production [5].

According to the result of the survey, the major challenges to sustainable beekeeping development in the study areas were frequent occurrence of drought, lack of bee forage, existence of pests, predators and pesticide poisoning. In this survey, most beekeepers ranked drought as the major problem. Even though it was beyond the beekeeper control, it might be aggravated by human activities and interference. Lack of bee forage associated with drought and deforestation was also important problem. The elimination of good nectar and pollen producing tree species in many areas made it difficult to maintain bee colonies. Yirga and Teferi, [13] also attributed limited flora due to land degradation and deforestation as the main constraints limiting the expansion of beekeeping in Tigray Region).

The existence of pests and predators were additional nuisances to the honeybees and beekeepers. Different types of pests and predators were reported by the farmers in the study area. As Ethiopia is one of the sub-tropical countries, the land is not only favorable to bees, but also for different kinds of honeybee pests and predators that were interfering with the life of honey bees [14]. Pests and predators that cause devastating damage on honeybee colonies and ranked in order of to decreasing importance were honey badger, ants, wax moth, bee-eater birds, lizard, snake and spiders. Yirga and Teferi, [13] also listed ants (both black and red) and ant like insects, birds, spiders and lizards. Pesticide poisoning was also the main problem. The use of chemicals and pesticides for crop pest, weeds, tsetse fly and malaria and house pest control in the study areas is real threat to honey bee colonies and contamination of hive products. Similar threats were reported from Burie District of Amhara Region where ants, wax moth (*Galleria mellonella*), bee-eater birds, spider,

Table 3: Factors perceived as major constraints to honeybee production by farmers of the three peasant associations of Wukro Woreda during November 2008 to March 2009

Types of constraints mentioned	Beekeepers that considered the constraint important (%)
Drought (due to lack of rain fall)	75
Lack of bee forage associated with deforestation	70
Pests and predators	60
Application of agrochemical (pesticide and insecticide)	50

Table 4: Major pests and predators considered important by farmers of the three peasant associations of Wukro Woreda and local control methods employed during November 2008 to March 2009

Pests and predators	Bee keepers who consider the predator important (%)	Control
Honey badger	85	Using rope around the entrance of hive that could hang the predators
Ants	75	Hive stands in tin or plastic container filled with water or oil and ash
Wax moth	70	Remove old comb and frequent inspection of hive
Birds	55	Killed hunter birds, kept hives at morning and evening
Spider	25	Frequent cleaning of the hives and apiaries
Snake	20	Frequent cleaning of the hives
Lizard	18	Cleaning of the nest

bee lice (*B. coeca*), honey badger (*Mellivora capensis*), termite, small hive beetles (*Aethina tumida*) and snake were the most harmful pests in order of decreasing importance [8].

This study revealed the presence of real threat to beekeeping and honey production from louse infestation, predators, chemical pollution and drought. The effects of louse infestation, drought, pests and predators on beekeeping practice in the study area need to be minimized with appropriate management practices.

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