



**Full Length Article**

# Distribution and Impact of Honeybee Pests on Colony Development in Kwara State, Nigeria

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## ABSTRACT

The impact of bee pests on bee colony establishment in Kwara State, Nigeria and the distribution/spread in the various Local Government Areas were studied at the peak of production i.e., April/May 2006. Bee colony establishment rate were below 15% in Oyun, Asa, Irepodun and Ilorin west LGAs. In Ifelodun and Moro LGAs, 73.33% and 65.85% of the 60 and 41 bee hives mounted, respectively established bee colonies. The animals encountered in the hives within the state include ants, *Campanotus pennsylvanicus* Degeer (Hymenoptera: Formicidae); small bee beetle, *Achina tumida* Murray (Coleoptera: Nitidulidae); large bee beetle, *Hoplostomus fuliginosus* Oliv. (Coleoptera: Dynastinae); greater wax moth, *Galleria mellonella* Linn. (Lepidoptera: Pyralidae); lesser wax moth, *Achroia grisella* Fab. (Lepidoptera: Pyralidae); spider, *Latrodectus mactan* Fab. (Arachnid: Aranae); Termite, *Macrotermis militaris* Fuller (Isoptera: Termitidae) and Wasp, *Polistes fuscatus* Saussure (Hymenoptera: Vespidae). A description of each of these animals, their mean density per hive, interaction with the bee population as well as their distribution per LGA was highlighted. Correlation between absconding and the occurrence of each of pest at P=1 showed *A. tumida*, *C. pennsylvanicus* and *G. mellonella* informed absconding of bee colonies within the state.

**Key Words:** Beekeeping; Bee pest; Bee colony establishment; Kwara State

## INTRODUCTION

Apiculture is the art of rearing, breeding and managing honeybee colonies in artificial hives for economic gains (Ikediobi *et. al.*, 1985; Morse, 1989) probably; as old as mankind (6000-8000 years old). Honey and other products such as beeswax, pollen (bee bread), propolis, royal jelly, bee venom and apilamil (Ojeleye, 1999). Bees are known to be directly responsible for 80% of insect pollinating activities in plants (Ojeleye, 1999; Olagunju, 2000), they invariably enhance food production capacity of the ecosystem through their pollination activities.

The success of apicultural activity depends on the biotic and environmental factors proffered by the ecosystem (ERLS, 1995; Ojeleye, 1999). Honeybee pests have been identified as one of the major biotic factors standing in way of successful beekeeping practice in Nigeria (ERLS, 1995). Kwara state, which enjoys a tropical climate with an annual rainfall of between 1000 mm and 1500 mm and a maximum average temperature range of between 30°C and 35°C (Elias, 2000), presents a favourable climatic and environmental conditions for beekeeping (Olagunju, 2000). Unfortunately the beekeeping potential within the State is yet to be realized. Modern beekeeping practice was documented in nine out of the sixteen Local Government Areas of the State with less than 2000 installed bee hives

and only 15.01% of these had established bee colonies (Oyerinde & Ande, 2006). This rather low ebb is due to some biotic factors militating against the bees in the State. A dearth of knowledge with respect to the honeybee pests available in Kwara state and their impact on bee colonies within the state has been identified. This study therefore attempts to, for the first time, document the types, distribution and impact of bee pests on bee colony establishment in Kwara state, Nigeria.

## MATERIALS AND METHODS

One thousand eight hundred and eighty six bee hives from various farms across Kwara state were examined spontaneously at the peak of hive production i.e., April/May of 2006. The location of each hive and its status with respect to colony establishment and absconding were noted. Rate of successful bee colony establishment were subsequently determined per Local Government Area (LGA) as a proportion of total number of hives examined in percentage. Absconding rate was also determined as proportion of inactive hives showing evidence of earlier colonization of the total number of hives with bee activity in percentage.

Each hive was carefully examined for the occurrence of animal species other than *Apis mellifera* and their location and activity within the hive noted. Samples of all

animals encountered were collected and fixed in 70% alcohol or 10% formalin and labeled to reflect hive source and LGA. Where immature developmental stages were encountered these were reared to adult stage and all stages fixed. All fixed samples were identified at the Crop Protection Department, Ahmadu Bello University, Zaria, Nigeria. The frequency of occurrence of each pest type per LGA was calculated in percentage and an attempt was made to estimate the density of each pest in the hive, where they were noticed. The correlation coefficients of frequency of occurrence of the various pests with the bee colony establishment and absconding rates were also noted.

## RESULTS

The beehive distribution and their beehive colony establishment status in the various local Government Areas of Kwara state are as shown in Table I. Oyun, Asa, Irepodun and Ilorin west LGAs presented encouraging number of beehives but bee colony establishment rate were below 15% in all cases. The worse hit LGA was Oyun where only 3.71% of the 620 hives mounted were colonized by bees. In Ifelodun and Moro LGAs, where 60 and 41 bee hives were mounted, 73.33% and 65.85% of the hives established bee colonies, respectively. Although very glaring discrepancies were noticeable in the bee colony establishment rate, the actual numbers of hives colonized per LGA were comparable in most cases, as they fell within a range of 14 to 46 per LGA. The LGAs and the number of bee colonies show Ilorin south (46), Ifelodun (44) and Asa (41) topping the list, while Offa (14), Oyun (23) and Ilorin West(24) were the least. Absconding rates were relatively higher in the LGAs with less than 27 established hives except Oyun LGA.

Table II shows the frequency of occurrence and density distribution of the various animal types noticed within the hives in different LGAs in Kwara State. These animals include ants, *Campanotus pennsylvanicus* (Hymenoptera: Formicidae); small bee beetle, *Achina tumida* (Coleoptera: Nitidulidae); large bee beetle, *Hyplostonia fuliginus* (Coleoptera: Dynastinae); greater wax moth, *Gelloria mellonella* (Lepidoptera: Pyralidae); lesser wax moth, *Achroia grisella* (Lepidoptera: Pyralidae); spider, *Latrodectus mactan* (Arachnid: Arannae); Termite, *Macrotermis militaris* (Isoptera: Termitidae) and Wasp, *Polistes fuscatus* (Hymenoptera: Vespidae).

*C. pennsylvanicus* are small (0.5 cm to 2 cm long) black ants that crawl on the top bars and in the brooding chamber. They consume honey and the brood. The estimated average density of *C. pennsylvanicus* population in Kwara State was above 100 individuals per hive in 54.06% of the hives. They are sometimes seen dragging a dead brood across the hive collectively. The ants occurred in all the LGAs but were particularly more frequently encountered in Offa (100.00%), Oyun (91.30%), Moro (62.96%), Ilorin south (56.52%), Asa (61.98%) and Ekiti (55.56%) LGAs. A correlation coefficient of 0.802 was

**Table I. Bee hives colony establishment and absconding rates in the various Local Government Areas of Kwara State**

Local Government Areas (LGA)	No of Hives/ LGA	Colonization rate (%) / number	Absconding rate (%)
Asa	328	12.50(41)	15.85
Baruten	0	0.00	0.00
Edu	0	0.00	0.00
Ekiti	150	18.00(27)	28.00
Ifelodun	60	73.33(44)	13.33
Ilorin East	0	0.00	0.00
Ilorin South	97	47.42(46)	12.37
Ilorin West	250	9.60(24)	16.80
Irepodun	250	14.80(37)	12.06
Isin	0	0.00	0.00
Kaiama	0	0.00	0.00
Moro	41	65.85(27)	26.83
Offa	90	15.56(14)	25.56
Oke ero	0	0.00	0.00
Oyun	620	3.71(23)	6.45
Patigi	0	0.00	0.00
Total	1886	15.01(283)	13.94

Values in parenthesis=no of colonized hive

recorded between the ant's frequency of occurrence and bee absconding rate within the State.

*A. tumida*, is a small beetle of about 0.5 cm long that occurred in most of the bee colonized hives examined with 87.53% frequency of occurrence and an average density of between 50 and 100 individuals per hive in the state. The larvae of *A. tumida* feed on pollen, as well as, stored honey. They are most often harvested along with honey thus constituting a problem in honey processing. It featured in all the LGAs at a least frequency of 67.57%. All the bee colonised hives in Offa and Ilorin west LGAs had *A. tumida* infestation. The average density per hive was about 100 individuals per hive. A near perfect significant correlation (0.991:  $P < 1$ ) occurred between *A. tumida* infestation and bee absconding rates recorded in the various Local Government Areas of Kwara State.

The Greater wax moth, *G. mellonella*, adults were noticed crawling on the top bars as soon as the hive lid was opened. They were less than 1cm long. The larval stage ate and destroyed the comb meant for honey storage thus constituting the most dangerous developmental stage. Only 31.81% of the beehive colonies in the state had *G. mellonella* infestation but the average density per hive was higher than 100 individuals. Moro, Ifelodun and Ilorin south LGAs that had relatively higher frequency of occurrence of this pest, however had a low average density of less than 50 individuals per hive. A significantly close to perfect correlation (0.937:  $P < 1$ ) was established between the *G. mellonella* frequency of occurrence and absconding rate within the State.

The Lesser wax moth, *A. grisella*, measured about 2.5 cm and were found lining the inner side of 58.53% the hive across the state. The larval stage destroys the comb by webbing and changing its colour to grey-black. Each time adult *A. grisella* was encountered its density was not more

**Table II. Frequency of occurrence and average density per hive of the bee pests in the various Local Government Areas of Kwara State**

Local Government Areas (LGA)	Frequency of occurrence (%) and Mean Density per hive							
	Ants	Small bee beetle	Greater wax moth	Lesser wax moth	Large bee beetle	Wasp	Spider	Termite
Asa	61.98 (+++)	90.24 (++)	37.20(+++)	82.93(++)	2.44 (+)	0.00	29.27(+)	32.54(++)
Ekiti	55.56 (++)	85.19 (++)	26.67(+++)	25.93(+)	0.00	18.67(+)	0.00	0.00
Ifelodun	25.00 (++)	79.55 (++)	86.67(+)	61.36(++)	0.00	0.00	0.00	0.00
Ilorin South	56.52 (+)	95.65 (++)	51.55(+)	36.96(+)	6.19 (+)	16.49(+)	0.00	24.74(++)
Ilorin West	41.67 (+)	100.00 (+++)	26.80(+++)	100.0(++)	0.00	0.00	24.40(+)	55.60(++)
Irepodun	37.84 (++)	67.57 (++)	26.00(+++)	59.46(+++)	0.00	0.00	0.00	0.00
Moro	62.96 (++)	92.59 (+++)	92.68(+)	51.85(++)	0.00	0.00	0.00	9.76 (++)
Offa	100.00(++)	100.00 (++)	50.00(+++)	64.29(++)	0.00	0.00	31.11(+)	84.44(++)
Oyun	91.30 (+++)	91.30 (++)	19.52(+++)	52.17(++)	0.00	0.00	17.58(+)	55.16(++)
State Mean	54.06 (++)	87.63 (++)	31.81(+++)	58.66(++)	0.74 (+)	2.33(+)	15.59(+)	36.69(++)
R	0.802	0.991	0.937	0.669	0.321	0.245	0.412	0.522

Values in parenthesis = average density per hive: (+) = <50 pest/hive, (++) = >51<100 pest/hive and (+++) = >100 pest/hive.

'R' = Correlation coefficient of frequency of occurrence with absconding rate

than 100 individuals per hive. Asa, Ifelodun and Offa LGAs had more than 60% frequency of occurrence, while all the hives in Ilorin west LGA were infested with *A. grisella*. The correlation of the frequency of occurrence with absconding rate however shows an insignificant influence (0.669,  $P > 1$ ).

The Large bee beetle, *H. fuligineus*, occurred in hives sited in three Local Government Areas i.e., Asa (2.44%), Ilorin South (6.19%) and Irepodun (0.80%). Less than ten (10) *H. fuligineus* individuals were observed per hive in the state. This pest chews off the capped comb cells and ate the bee larva and pupa and also culmed the stored honey in the affected combs. There was however no correlation between the occurrence and absconding rate.

The Wasp, *P. fuscatus*, an orange and black skinned insect occurred in bee hives in two Local Government Areas i.e., Ekiti and Ilorin south at low frequencies of 18.67% and 16.49%, respectively. They were found molesting bees entering or leaving the bee hives and also sometimes occupied un-colonized hives, thus, preventing establishment of colony in such hives.

Spider, *Latrodectus mactans* occurred in 15.59% of the colonized hives in Kwara state but this was restricted to four LGAs, i.e., Asa, Ilorin west, Offa and Oyun at a frequency of less than 35% each. No visible interaction was observed between the bee and the spiders and the frequency of occurrence and absconding were not correlated. Termites, *Macrotermes militaris*, hive infestation was higher across the state (36.69%) and the density per hive was higher. Offa, Oyun and Ilorin west recorded higher rates of more than 50%. No deleterious interaction was observed between the bee and the termites except the destruction they bring about on the wooden and grass woven hives.

## DISCUSSION

The beehive colony establishment rate in Kwara state was quite low (15.01%) despite the encouraging numbers of bee hives mounted in the various LGAs within the state. The relative constancy in the number i.e., of established hives per LGA, i.e., 14-46 hives per LGA, may, however,

be indicative of a realization of a full bee colonizing potential. The fact that abscondments were documented showed that some factor may have been responsible for the rather low bee colonizing record of the state; thus confirming the opinion that the success of apicultural practice is dependent on the impact of biotic factors (Segeren, 1997; Ojeleye, 1999).

The *C. pennsylvanicus* and *H. fuligeneus* had a direct negative impact on the bee, as they consumed the brood and so did the wasps, *P. fuscatus* that molested the adult bees. *A. tumida*, *G. mellonella* and *H. fuligeneus*, consumed the comb and honey, *A. tumida* competes with the brood for pollen, while *A. grisella*, spoils the comb by webbing, thereby inflicting an indirect damage on the bee. Although spiders and the termites are known to have the capability to inflict a direct and indirect damage respectively on the bees, these were however not noticed with *Latrodectus mactans* and *Macrotermes militaris*. The incidence of these arrays of pests in Kwara State no doubt has limited honeybee production in Nigeria and conforms to an observation by ERLS (1995). The absence of pests/predators such as the bee lice and meropods, however, contradicts Hussein's (2000) assertion that meropods and bee louse constitute the major problem of beekeeping in Nigeria. The non-incidence of bee diseases in Kwara state, as revealed in this study, agrees with earlier studies (Ojeleye, 1999; Hussein, 2000).

The order of preponderance of the various bee pest that occurred within Kwara state was *A. tumida* > *A. grisella*, > *C. pennsylvanicus* > *M. militaris* > *G. mellonella* > *L. mactans* > *P. fuscatus* > *H. fuligeneus*. The average density of *G. mellonella* was above 100 individuals per hive, while those of *A. tumida*, *A. grisella*, *M. militaris* and *C. pennsylvanicus* were between 50 and 100 per hive. Others were below 50 per hive each. Ekiti, Ilorin west, Offa, Moro and Asa LGAs, where relatively higher absconding rates were documented across the state, showed higher frequency of occurrences of *A. tumida*, *C. pennsylvanicus*, *A. grisella* and *G. mellonella*. The correlation coefficient in each case showed the same trend, but only those of *A. tumida*, *C. pennsylvanicus* and *G. mellonella* were significantly correlated. Thus these three

insect pests could be the major pests responsible for the high absconding rate of bees within the state. Further research into the biology, ecology, population dynamics and eco-friendly non-chemical control methods for these pests need be encouraged, as this will go along way to improve colony development rate and apicultural production in the state.

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