

Incidence of *Galleria Mellonella* Infestation on *Apis Dorsata* Colonies At Different Regions of South-Western Karnataka



Zoology

KEYWORDS : Seasonal incidence, *Apis dorsata*, *Galleria mellonella*, South - western Karnataka

K. S. RAGHUNANDAN

Apidology Laboratory, Department of studies in Zoology, University of Mysore, Manasagangotri, Mysore – 570 006

S. BASAVARAJAPPA

Apidology Laboratory, Department of studies in Zoology, University of Mysore, Manasagangotri, Mysore – 570 006

ABSTRACT

The *Apis dorsata* normal and abandoned colonies built on the eaves of trees and on human built structures are infested by the greater wax moth, *Galleria mellonella*. The normal colonies with weak population were more prone to *G. mellonella* infestation and it was more in semi-arid region during summer (30.8%) followed by rainy season (23.4%). However, the infestation was less 11.0 and 6.6% during summer and winter seasons respectively in malnad. Interestingly, *G. mellonella* infestation was comparatively less during different seasons at arid region. The prevalence of *G. mellonella* infestation is common, however, the intensity was depended on colony strength and prevailed ecological conditions during various seasons at different regions of south-western Karnataka. Furthermore, eco-friendly management practices to control the *G. mellonella* infestation during different seasons at different regions are discussed so as to restore the existing *A. dorsata* population at its natural abode.

INTRODUCTION

The Asian giant honeybee, *Apis dorsata* Fabricius (1793) is one of the major pollinators, pollinate several crops and wild plants throughout the tropical regions (Rattanawane et al., 2012). Besides its pollination and propagation service, it provides multifloral honey and beeswax to rural populace. India being a tropical country has an advantage to produce multifloral honey throughout the year by *A. dorsata* due to rich variety of bee forage and suitable climate (Swamy et al., 2005). Having perennial nesting habits, however, *A. dorsata* faces many problems from the pests, predators and enemies at its nesting niche (Basavarajappa and Raghunandan, 2013). The greater waxmoth, *Galleria mellonella* (Lepidoptera: Pyralidae) destroys natural colonies of *A. dorsata* and bring considerable loss to beekeeping industry. *G. mellonella* is a serious destructive pest cause considerable damage to both normal and abandoned combs of *A. dorsata* (Williams, 1976). The weak colonies or abandoned combs are easily attacked more often by *G. mellonella* (Kapil and Sihag, 1983 and Basavarajappa, 2011). It develops tunnels in the comb and finally larvae convert the comb into a mass of silken wells and debris (Swamy, 2005). Unfortunately, the cryptic infestation activity of *G. mellonella*, the ubiquitous and ferocious nature of *A. dorsata* has discouraged to study in depth (Otis, 1991; Abrol, 2003 and Tan, 2007). Despite this difficulty, several researchers (Ozer, 1962; Kapil and Sihag, 1983; Swamy, 2005; Viraktamath et al., 2005; Roversi et al., 2008 and Nagaraja and Rajagopal, 2009) have reported the *G. mellonella* infestation to *A. cerana* and *A. mellifera*. However, seasonal incidence of *G. mellonella* is limited, therefore, presented investigation was undertaken.

MATERIALS AND METHODS

The systematic field survey was conducted during different seasons at south-western Karnataka that lies between 11° 50' 48.24" N - 12° 28' 43.18" N longitude and 75° 44' 19.22" E - 77° 01' 00.78" E latitude at an elevation of 823 meters above msl. In each region five places were randomly selected by considering both trees and human built structures (HBS) to record the *G. mellonella* infestation to *A. dorsata* colonies. Infestation on solitary colony, colony aggregate, abandoned comb were considered and photographed with the aid of Canon-power Shot S21S, 8.0 Mega Pixels Digital Camera with 12X optical zoom. To calculate the per cent infestation, digital images were used and collected data was statistically analyzed using EXCEL and SPSS software (ver 14.0, Chicago Inc., USA).

RESULTS

Galleria mellonella infestation was more (427 colonies) at semi-arid region, followed by malnad (121 colonies) and arid regions (68 colonies). During summer infested normal colonies were high (294 colonies) followed by rainy (173 colonies) and winter (149 colonies) seasons. Altogether, 616 normal colonies were prone to *G. mellonella* infestation on trees with a mean of

205.3 ± 193.80 and there was no significant variation (F=0.438; P<0.05) existed between seasons. It clearly demonstrated the prevalence of *G. mellonella* infestation during all the seasons. However, there was a significant variation (F=11.47; P>0.01) existed between the regions (Table 1). Interestingly, the infestation to abandoned colonies was high at malnad region (262 colonies) followed by semi-arid (86 colonies) and arid (25 colonies) regions. Moreover, similar trend was recorded for seasonal incidence of *G. mellonella* in abandoned combs. Winter scored more (202 colonies) followed by summer (118 colonies) and rainy (53 colonies) season. Total 373 abandoned combs were infested with a mean 124.3 ± 123.10 and similar trend existed with respect to seasonal and regional variation (Table 1).

Galleria mellonella infestation to *A. dorsata* colonies on HBS during different seasons and regions is depicted in Table 2. Infestation was high at arid region (58 colonies) followed by malnad (12 colonies). Altogether, 75 normal colonies were prone to infestation. Even at HBS, the *G. mellonella* infestation was not significantly varied (F=0.34; P<0.05) between seasons. However, it did vary significantly (F=9.245; P>0.05) between regions (Table 2). Similarly, *G. mellonella* infestation in abandoned combs occurred on the eaves of HBS was high at arid region (28 colonies) followed by malnad (19 colonies). However, *G. mellonella* didn't create much problem to *A. dorsata* colonies at semi-arid region. Altogether, 48 *A. dorsata* abandoned combs on HBS were infested by *G. mellonella*. Obviously, there was no significant variation existed with respect to *G. mellonella* infestation at HBS between regions and seasons in south-western Karnataka. (Table 2). Further, per cent occurrence of *G. mellonella* infestation to *A. dorsata* normal colonies and abandoned combs in south-western Karnataka as shown in Figure 1. Comparatively, the infestation was high at semi-arid region in both normal colonies and abandoned combs during most of the seasons than that of arid and malnad regions. However, there was a considerable variation existed between the normal colonies and abandoned combs infested by *G. mellonella* at arid and malnad regions during rainy, winter and summer seasons (Table 1 & 2, Fig. 1).

DISCUSSION

Galleria mellonella is a trouble shooter to *A. dorsata* population, moth laid eggs in normal colonies develop into larvae and start feed on hive products such as honey, pollen, wax and brood (Nurullahoglu and Susurluk, 2001), burrow through the comb and reduces the fitness of comb by damaging hive materials (Farmnote, 2007). The infestation occurs during most of the seasons due to its overlapping generations in a year. Abandoned combs and weak colonies are constantly occurs at different regions of south-western Karnataka, they become important reservoir for the multiplication of *G. mellonella* population. It is active from March to October (Garg and Kashyap, 1998) and continued up to November (Ramachandran and Mahadevan, 1951; Brar et

al., 1985; Gupta 1987). In south India, maximum infestation was recorded during the dearth period (Viraktamath *et al.*, 2005) that is coincided with the weak population in the colony. Further, *G. mellonella* hibernates in larval (about 70%) and pupal stages (about 30%) in abandoned combs. As the population increases, accordingly the severity of infestation increases, the combs reduced to a mass of silken web and debris within a short time. When once the most precious combs are destroyed, worker bees have to reconstruct fresh hive that requires time and energy in building new combs thus resulting in the lower yield of multifloral honey (Swamy, 2008). Sometimes, egg laying capacity decreases in queen, and the workers can leave the combs. In severely infested combs, the broods get entangled in the silken webbing, unable to emerge and finally the colony deserts surrendering to the onslaught of the wax moth. It becomes major hurdle to tackle *G. mellonella* infestation under wild con-

dition. Therefore, irrespective of different regions, the *G. mellonella* infestation commonly prevailed during various seasons in south-western Karnataka. Perhaps, prevailed tropical climate might have favored to conduct overlapping generations during different seasons. Therefore, controlling moth without harming the bees and bee colony has great economic importance (Turker *et al.*, 1993). As wax moth becomes source of nutrition for many hymenopterans, in order to maintain the ecological balance, biological control preferred rather than chemical control. On this line, further research is required.

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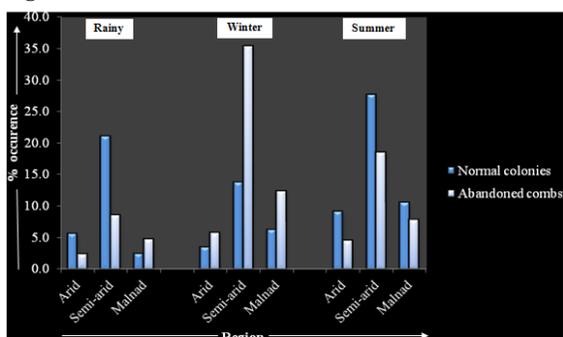
Table 1. Incidence of *G. mellonella* to *A. dorsata* colonies on trees during different seasons in south-western Karnataka

Sl. No.	Region	Infestation of <i>G. mellonella</i> to <i>A. dorsata</i> colonies on trees									
		Normal colonies					Abandoned colonies				
		Rainy	Winter	Summer	Total	'F' value	Rainy	Winter	Summer	Total	'F' value
1.	Arid	17	15	36	68	11.473	4	9	12	25	4.258
2.	Semi-arid	144	93	190	427		14	44	28	86	
3.	Malnad	12	41	68	121		35	149	78	262	
Total		173	149	294	616	-	53	202	118	373	-
Mean \pm SD		57.67 \pm 74.81	49.67 \pm 39.72	98.00 \pm 81.26	205.30 \pm 193.80	-	17.67 \pm 15.82	67.33 \pm 72.86	39.33 \pm 34.33	124.30 \pm 123.10	-
'F' value		0.438 NS					0.827				

Table 2. Incidence of *G. mellonella* to *A. dorsata* colonies on Human built structures during different seasons in south-western Karnataka

Sl. No.	Region	Infestation of <i>G. mellonella</i> to <i>A. dorsata</i> colonies on trees									
		Normal colonies					Abandoned colonies				
		Rainy	Winter	Summer	Total	'F' value	Rainy	Winter	Summer	Total	'F' value
1.	Arid	22	9	27	58	9.2455	6	15	7	28	0.701
2.	Semi-arid	2	2	1	5		1	0	0	1	
3.	Malnad	5	2	5	12		6	8	5	19	
Total		29	13	33	75	-	13	23	12	48	-
Mean \pm SD		9.67 \pm 10.79	4.33 \pm 4.04	11.00 \pm 14.00	25.00 \pm 28.70	-	4.33 \pm 2.89	7.67 \pm 7.51	4.00 \pm 3.61	16.00 \pm 13.70	-
'F' value		0.340 NS					0.4763				

Fig. 1. Per cent occurrence of *G. mellonella* infestation to *Apis dorsata* colonies at south-western Karnataka



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