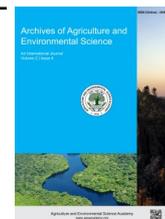




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ORIGINAL RESEARCH ARTICLE

Effect of European bee-eater (*Merops apiaster*) on honeybee colonies in Toshka region, Egypt

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ABSTRACT

The experiment was carried out in the apiary at Toshka region (Southwest of Egypt) during the period from the end of March to the first of October, 2015. To study the effect of European bee-eater on the areas of brood and stored pollen (inch²/colony) for two-hybrid of Carniolan honeybee and a hybrid of Italian honeybee races in Toshka region. Bee-eater was appeared in two periods the first time at the first of April to June and the second at the first of September to Mid-September. Positive correlations were found between the increase of bee-eaters number and the decrease of brood area and pollen stored in the two honeybee races. The highest average numbers of bee-eater was recorded in May (37.2) bird that caused less brood area for both worker brood in Italian honeybee race was (146.2 sq. inch./colony), and Carniolan honeybee race was (147.2 (sq. inch./colony), and the lowest average area of stored pollen was recorded in the period of bee-eater increasing that was (22.0 sq. inch./colony) for Italian race and (17.3 sq. inch./colony) for Carniolan race. In September, the second period of bee-eater appearance was effected to both of brood and stored pollen areas for the two races, due to the high temperatures after July and August. Thus, the effect of bee-eater in Toshka region on two periods at the beginning of April and the end of June and the second period at the beginning of September until the middle of September. Therefore, Toshka region which is in the far south of Egypt is the first warning line to enter the immigrant European bee-eater.

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INTRODUCTION

Honeybees affected by many diseases and pests that effect on activities of honey bees. Bee-eater is the most birds affecting on various activities of honey bees like foraging and pollen gathering also effect on mating queens (Murtadha, 2014). Cramp, 1985, reported that European bee-eater is a widely distributed species, although mainly locally abundant, in arid and semi-arid areas. Sihag, 1993 found was the green bee-eater, *M. orientalis*, to prey upon foraging honeybee's *A. mellifera* in India. Jones *et al.*, 1994 proposed that bee-eater is one of the few bird species with the ability to modify the habitat by digging long burrows

where it breeds, therefore fitting to the definition of the allogeneic engineer. Omar *et al.*, 1994, reported that the behavior of workers in foraging is influenced with the bee-eater appearance at the apiary area, in Sohag and the activity of workers, stopped early morning when the birds appeared. A negative correlation was noticed between a number of birds and honeybee foragers. The current area of the European Bee-eater expands from North Africa through the Iberian Peninsula, Southern Europe, the Carpathian Basin, Eastern Europe, Small- and Mid-Asia to Kashmir due to postglacial dispersal (Cramp 1998; Snow and Perrins 1998). El-Bassiouny, 2001 recorded that the highest population of bee-eaters were recorded during the period of

May 6-12 and from August 15-21 in the first and second active seasons, respectively. During the day, the maximum number of birds was observed during the period of 12.00 to 12.15 h and the population of this bird in the first active period (April-May) was denser than the second period (August-September). Omran et al. (2011) found that the maximum average number of bee-eater, 9 birds, or more than one-third of annual abundance were noticed during September, was significantly more than the other months. It was followed by April and May, or spring months, during 2005 and 2006. Valera et al. (2011) conclude that bee-eater mobility and migration may have played an important role in the transmission of the pathogen *N. ceranae*. Ali and Taha (2012) concluded that bee-eaters cause to losses of honeybee worker and affecting on queen rearing and should avoid queen mating at the periods of bee-eaters present. Dabessa Jatema and Belay Abebe (2015) found that the major pests facing the beekeeping activities, farmers were requested to rank them and the result indicated that bee-eater birds (67.46%), ants (66.67%), wax moth (39.68%), lizards (26.68), termites (18.25%) and hive beetles (13.49%) were the most harmful pests in order of decreasing importance. A number of researchers reported the pest of honey bees worldwide (Tan et al., 2012; Alqarni et al., 2014; Taha, 2015a, b, c; Taha, 2014; Taha et al., 2016; Al-Ghamdi et al., 2017; Taha and AL-Kahtani, 2017). Keeping in view, this study was undertaken to investigate the effect of European bee-eater (*Merops apiaster*) on honeybee colonies in Toshka region, Egypt.

MATERIALS AND METHODS

Experimental details

The experiment was carried out on honeybee colonies (*Apis mellifera*) during the end of March to the beginning of October 2015 in Toshka region. The study site was located in the Desert of Toshka, Aswan (Toshka, South-east Egypt, 22°46'N, 31°53'W).

Survey of bee-eater

To study the effect of European bee-eater on the areas of brood and stored pollen (inch²/colony) for two-hybrid of Carniolan honeybee and hybrid of Italian honeybee races. Weekly, monthly means, and percentages of the monthly abundance of bee-eater (*Merops spp.*) were calculated near the apiary was counted. Six counts were made weekly, over one day, at 2-hours intervals starting from 7 a.m. to 5 p.m. followed by standard technique (Omran et al., 2011).

Activities of honeybee colonies

Brood rearing and food stores: Workers unsealed and sealed brood areas (sq. inch.), and areas (sq. inch.) of food stores (honey and pollen or bee bread) were measured every twelve days, in honeybee colonies, using a standard frame, which divided into square inches. Average of brood rearing and food stores

(surplus sealed honey and pollen) was calculated.

Foraging and pollen gathering: Total numbers of outgoing workers, or foragers, and ingoing pollen collectors were counted each two weeks. Five readings, every of one minute, were carried out from 1 p.m. to 3 p.m., using a counter and stopwatch. Average two weeks and a monthly number of foragers and pollen collectors, was calculated. At the present to studying the effect of European bee-eater (*Merops apiaster*) on the activates of honeybee colonies in Toshka region.

RESULTS AND DISCUSSION

The results presented in Table 1 and Figure 1 showed the fluctuation of the brood area during the period of the bee-eater (*Merops spp.*) present to each of Italian and Carniolan races. In Figure 1, there was a high brood space before the appearance of bee-eaters in March and the first of April but in the month of May the mean of brood area (Inch²/colony) was the lower in hybrid of Carniolan and hybrid of Italian honeybee races were (147.2 and 146.2) when the mean of number of bee-eaters are 37.25 bird in the first period of the present of bee-eaters, and after the absents of bee-eaters the brood of each of the two races returned to up in June and July months. The second period for the activity of *Merops* was observed the end of September which affected on the brood area in October.

The results show that the maximum activity of *Merops spp.* was noticed at May and April and few mean a number of the birds in June and it appeared at the end of September and the first of October according to Moneim, 1992 Show bee-eater *Merops spp.* is considered one of the serious pests attacking honeybee colonies in Saudi Arabia during Spring and Autumn. The results show that the Carniolan race is the most effected than the Italian race.

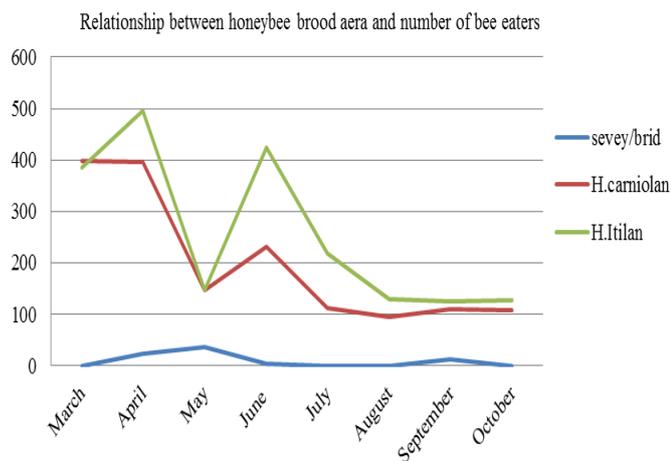
The data presented in Table 2 and Figure 2 indicated that the fluctuation of the stored pollen bee bread (Inch²/colony) during the period of the bee-eater (*Merops spp.*) present to each of Italian and Carniolan races. In May, the bee-eater recorded high activity is 37.25 birds the mean of stored pollen area (inch²/colony) was 17.3 for Carniolan hybrid and 22.0 for the Italian hybrid race. In June the bee-eater recorded a minimum number is 4.5 birds and the mean of stored pollen area (inch²/colony) was 34.4 for Carniolan hybrid and 56.53 for the Italian hybrid race. The second period for the return of the bee-eater in Autumn in the end of September and first of October the mean number of bee-eater recorded 11.75 birds and the mean of stored pollen area (inch²/colony) was 7.6 for Carniolan hybrid and 11.8 for the Italian hybrid race. The results according to Moneim, 1992 Show the bee-eater *Merops spp.* is the serious pests attacking honeybee colonies in Saudi Arabia during spring and autumn. The results show that the Carniolan race is the most affected than the Italian race. Thus, the effect of bee-eater in Toshka region on two periods at the beginning of April and the end of June and the second period at the beginning of September until the first of October.

Table 1. Effect of European bee-eater (*M. apiaster*) on worker brood area in two honeybee races in Toshka region.

Month	Mean of number of bee-eaters	Mean of worker brood area (Inch ² /colony)		Mean of brood
		Hybrid of Carniolan	Hybrid of Italian	
March	0.00 e	398.20	384.80	393.3 ab
April	22.67 b	396.00	495.87	445.93 a
May	37.33 a	147.20	146.20	146.73 c
June	4.67 d	230.40	424.07	327.23 b
July	0.00 e	113.30	218.80	166.07 c
August	0.00 e	94.80	130.60	112.70 c
September	12.00 c	111.00	126.10	118.55 c
October	0.00 e	107.20	127.80	117.50 c

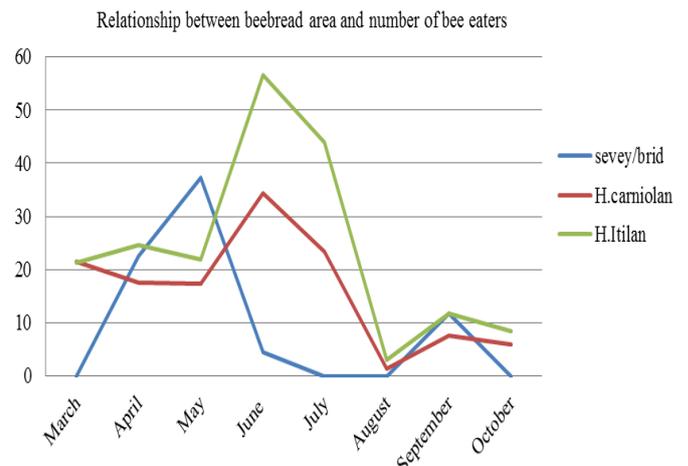
Table 2. Effect of European bee-eater (*M. apiaster*) on pollen stored area in two honeybee races in Toshka region.

Month	Mean of number of bee-eaters	Mean of stored pollen area (beebread) (Inch ² /colony)		Mean of stored pollen
		Hybrid of Carniolan	Hybrid of Italian	
March	0.00 e	21.60	21.40	21.50 c
April	22.67 b	17.60	24.53	21.067 c
May	37.33 a	17.30	22.00	19.65 c
June	4.67 d	34.40	56.53	45.46 a
July	0.00 e	23.30	44.00	33.65 b
August	0.00 e	1.33	3.07	2.20 e
September	12.00 c	7.60	11.80	9.70 d
October	0.00 e	6.00	8.40	7.20 d

**Figure 1.** Effect of European bee-eater (*M. apiaster*) on worker brood area in two honeybee races in Toshka region.

Conclusion

The present study concluded that there was a high brood space before the appearance of bee-eaters in March and the first of April but in the month of May the mean of brood area (Inch²/colony) was the lower in hybrid of Carniolan and hybrid of Italian honeybee races were (147.2 and 146.2) when the mean of number of bee-eaters are 37.25 bird in the first period of the present of bee-eaters, and after the absents of bee-eaters the brood of each of the two races returned to up in June and July months. The second period for the activity of *Merops* was observed the end of September which affected on the brood area in October. The maximum activity of *Merops spp.* was noticed at May and April and few mean a number of the birds in June and it appeared at the end of September and the first of October. So, Toshka region at the far south of Egypt is a warning

**Figure 2.** Effect of European bee-eater (*M. apiaster*) on pollen stored area in two honeybee races in Toshka region.

the first line to enter of the immigrant bee-eater to Egypt to putting the bee-eater traps and expulsion of the birds, and hunting its and during the presence of birds food should be provided if there is an imbalance between brood needs and available food.

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