FEEECT OF SOME CLIMATIC FACTORS ON THE SEASONAL ACTIVITY OF ORIENTAL WASP, *VESPA ORIENTALIS* L. ATTACKTING HONEYBEE COLONIES IN DAKAHLIA GOVERNORATE, EGYPT

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Abstract

The Seasonal abundance of oriental wasp (*Vespa orientalis* L.) populations attacking honeybee colonies was investigated based on the number of trapped adults in Dakahlia governorate, Egypt, during 2010/2011 for one year. A wire screen traps were used for *V. orientalis* controlling in the apiary, using fermented sugar syrup-solution or honey as bait. Results revealed that *V. orientalis* queens were started to appear as observed from January to May 2011, with a peak of activity during May. *V. orientalis* workers were collected from June 2010 to February 2011, with a peak in October then November, respectively. A gradual decrease in *V. orientalis* numbers was observed during December 2010 and January 2011 and no oriental wasp individual was observed during March 2011. An average of 28.75 queens and 156.25 workers were collected during May 2011 and October 2011, respectively. Correlation study revealed that there was significant positive correlation between the wasps' population and average temperature (r=0.137). Also, significant positive correlation between the wasps' population and average humidity (r=0.560) was observed. In addition, negative correlation was noticed between the wasps' population and average wind speed (r=0.549) during the experimental period. Its recommended using fermented sugar syrup or honey as bait for captured the oriental hornet queens and for captured the oriental hornet workers using bait consists of (fermented honey with little brower yeast and grape syrup).

Key words: Honeybees. Predators. *Vespa orientalis*. Seasonal abundance. Climatic factors.

INTRODUCTION

Honey bees face several predators and their ability to express collective defense behaviour is one of their major life traits that promote colony survival. Hornets (Hymenoptera, Vespidae) are particularly known to induce serious damage to apiaries by killing many individual honeybees or even by destroying entire colonies and occupying the beehive using its resources (honey, pollen, brood and adult honeybees) to feed their brood (Ken *et al*., 2005 and Papachristoforou *et al*., 2008). Honey bees defense against *V. orientalis* was studied and described by Papachristoforou *et al*., 2007 and Glaiim, 2009. Honey bees can produce a characteristic hissing sound of unexpectedly high frequency with a dominant

frequency around 6 kHz. And they can ball on the hornets and raising the ball temperature to 44 C° and affect the respiratory system by directly blocking abdominal pumping killing the hornets by asphyxia balling. Protecting honey bees from the hornets attack is the main goal for all of researchers and beekeepers. Srivastava *et al*., 1995 invent a new barrier device named ((Bee-Wasp protector)) effectively protect bees from wasp attack at the hive entrance. Moreover, Shoreit, 1998 used a wire screen trap with fermented sugar or honey as bait. In addition, Yousif-Khalil *et al*., 2001 evaluate the efficiency of a designed sticky trap for controlling the oriental wasps. They found that white colored sticky trap with east and south orients were the most attractant.

Selvarthinam and Baskaran, 2005 stated that the use of wood-glue trap in combination with fish as a bait was a reliable solution for controlling the wasps in apiaries. Also, the baits should be changed regularly every (1-2 days) because the decomposition reduces the total number of wasps capture. Some methods were recommended abroad to control the oriental hornet, *Vespa orientalis* L., attacking the honey bees colonies. One of these methods is covering the hive entrance with a piece of queen excluder to prevent the hornet from entering the hive, the position of the hive stand was reversed to deprive the hornet from using the flight board as a stage for waiting and creeping toward the defending bees. The second method was carried out by fixing a cardboard cone as a bee passage at the hive entrance to hinder the entry of the hornet into the hive and the use of vinegar traps (Glaiim, *et al*., 2008). A vast of researchers is dealing with the effect of metrological factors on the seasonal activity and abundance populations of oriental hornets. Ishay and Lior, 1990, Khater *et al*., 2001, Chhuneja *et al*., 2008 and Volynchik *et al*., 2008 mentioned that hornet activities outside the nest are coordinated with the metrological conditions. Monthly and seasonally activity of *Vespa orientalis* was discussed by Thakur and Bagga, 2000. The hornet wasp's activity differs greatly from place to place and from country to other.

The objective of this work is to investigate the effect of the climatic changes and metrological factors on the activity and abundance population of oriental wasp *Vespa orientalis* L. attacking honey bee colonies under environmental conditions of Mansoura region, Egypt.

MATERIALS AND METHODS

The present paper throws a light on the seasonal activity of oriental hornet *Vespa orientalis* L. in Al-Baydaa apiary, Mansoura region, Dakahlia Governorate, Egypt. This work was conducted during one successive year 2010 to study the abundance of oriental hornet *V. orientalis* L. The locations, sampling and used techniques were as the following: Four Abou EI-Enain modified traps (Abou EI-Enain, 1999) were placed in the apiary during the successive year (2010/2011). The traps

were checked weekly for the presence or absence of the hornets. The hornets were collected and spread over a white piece of paper for counting according to (Abou EI-Enain, 1999).

Meteorological Data:

Meteorological data were obtained from the Central Laboratory for Climate, Dokki, Giza, Egypt. Data were statistically analyzed by using (SPSS computer program V.10, 1999). For mean separations, least significant differences (L.S.D) were used.

RESULTS AND DISCUSSION

Data in table (1) showed that the highest numbers of captured oriental hornet was observed during October 2011 and November 2011 (625 and 547) with average temperature and relative humidity (24.4 C, 69.5 % and 17.3 C, 79.0 %), respectively. These results are in agreament with those obtained by Shoreit, 1998 mentioned that *Vespa orientalis* workers reached its peak in October. Data tabulated in table (1) and illustrated in fig (1) showed that there are three peaks for the populations of oriental hornets during the experimental periods from Dec. 2010 till Nov. 2011. The highest peak was in October with an average number of hornets (156.25).

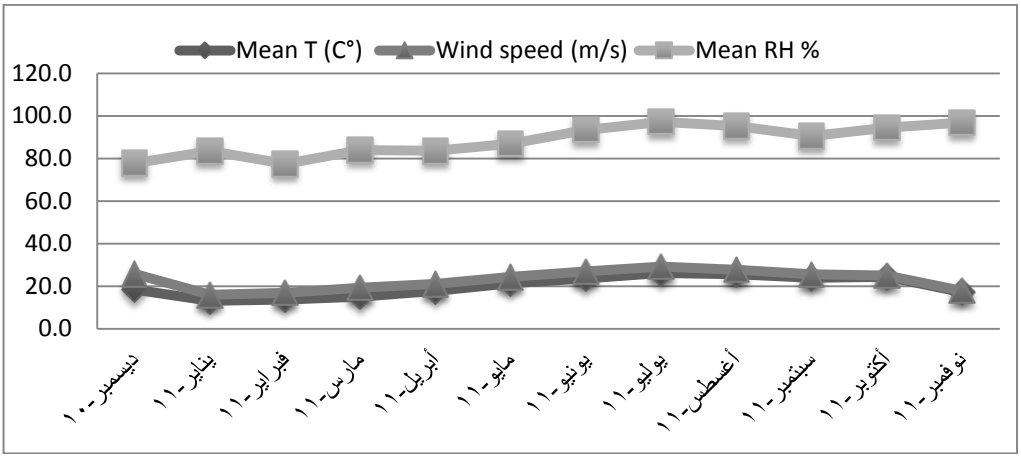
In November the second peak was takes place with an average number of worker hornets (136.75) Fig. (2). In addition, results indicated that the first appear of *Vespa orientalis* queens were at the last week of April and continuous till the mid of July. These results are not in agreement with Shoreit, (1998) who found that *V. orientalis* queens were observed from January to May, with a peak of activity during March. On the other hand, Khater *et al*. (2001) revealed that *V. orientalis* adults started to appear in the apiaries as early as the beginning of March, but in low numbers. Oriental wasp, *Vespa orientalis* is one of the most distributed pests which cause considerable damage for honey bee colonies all over the world (Al-Ghazawi *et al*., 2009).

The initial idea of controlling hornet wasp is to capture large numbers of hornets by using traps consider environmentally friendly as they don't include insecticides that might pollute the environment, or result in the total destruction of wasp colonies and/or the death of non target organisms, especially honey bees. Results indicated that using fermented sugar or honey as bait was more effective and attractant to the oriental hornet queens than the other tested bait. Meanwhile, bait consists of (fermented honey or sugar with little brower yeast and grape syrup) was more effectively attractant to the oriental hornet workers than the above mentioned bait. Diurnal trends of activity of this predator during summer and autumn seasons revealed that the activity was more in the morning and noon as compared to evening hours these results are in agreement with those obtained by (Thakur and Bagga, 2000).

Table 1. Mean of the population dynamics of *Vespa orientalis* attacking honeybee colonies in relation with the climatic factors during 2010/2011.

Season	Month	Hornet No.	Mean Hornet No.	Mean Temp. C°	Mean RH %	W.S. (m/s)	Mean ± S.D
Winter	Dec. 2010	106	26.50	18.45	52.0	7.3	12±13.17 b
	Jan. 2011	35	8.75	13.10	67.5	2.9	
	Feb. 2011	3.0	0.75	13.80	60.5	3.1	
Total		144	36.0	45.35	180.0	4.4	
Spring	Mar. 2011	0.00	0.00	15.2	64.5	4.2	9.58±15.95 b
	Apr. 2011	3.00	0.75	17.8	62.5	3.3	
	May 2011	112	28.0	21.4	62.5	3.0	
Total		115	28.75	54.40	189.5	3.5	
Summer	Jun. 2011	82	20.50	23.7	66.5	3.3	9.41±10.01 b
	Jul. 2011	4	1.00	26.2	68.0	3.1	
	Aug. 2011	27	6.75	25.7	67.5	2.1	
Total		113	28.25	75.60	202.0	2.8	
Autumn	Sep. 2011	47	11.75	23.9	65.0	1.6	101.58±78.40 a
	Oct. 2011	625	156.25	24.4	69.5	0.6	
	Nov. 2011	547	136.75	17.3	79.0	0.6	
Total		1219	304.75	65.60	240.5	0.9	
							LSD 5 %= 76.92

These results are in agreement with those obtained by Shoreit, 1998 who stated that *V. orientalis* workers were collected from June to December with a Peak in October. On Contrary, Khater *et al.*, 2001 mentioned that a gradual increase took place until mid June and then a more rapid increase with the maximum rate of occurrence during early September, followed by gradual decrease and disappearance at the end of December in El-Mullak region, Ismailia governorate. *V. orientalis* workers started to appear from the mid of July and the numbers increasing gradually till the first Peak in October then November. After that, a gradual decrease in *V. orientalis* workers were observed during December and January reaching the least number during February (3 individuals) with an average of temperature and relative humidity (13.8C° and 60.5%), respectively. In March there is no *V. orientalis* even queens or workers in Mansoura region. Meanwhile, *V. orientalis* queen were observed from the mid of April and reached its peak during May with individual number 112 per month with an average temperature and relative humidity (21.4°C and 62.5%), respectively. These results are in contrast with Shoreit, 1998 who mentioned that *V. orientalis* queens reached its peak during March. In conclusion, there are shifting in *V. orientalis* population activity and appearance than in the last two decades. Winter season is better meteorologically than the past periods as in December the average temperature was (18.45°C).



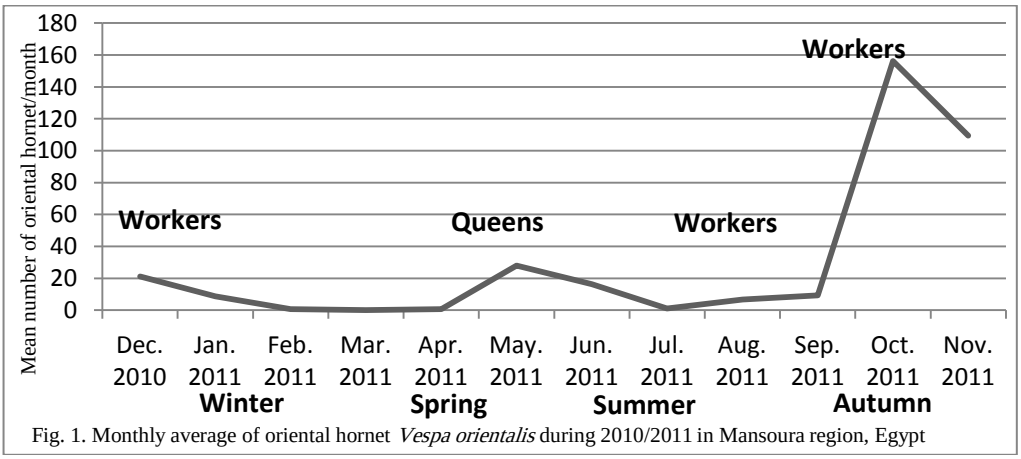


Fig. 1. Monthly average of oriental hornet *Vespa orientalis* during 2010/2011 in Mansoura region, Egypt

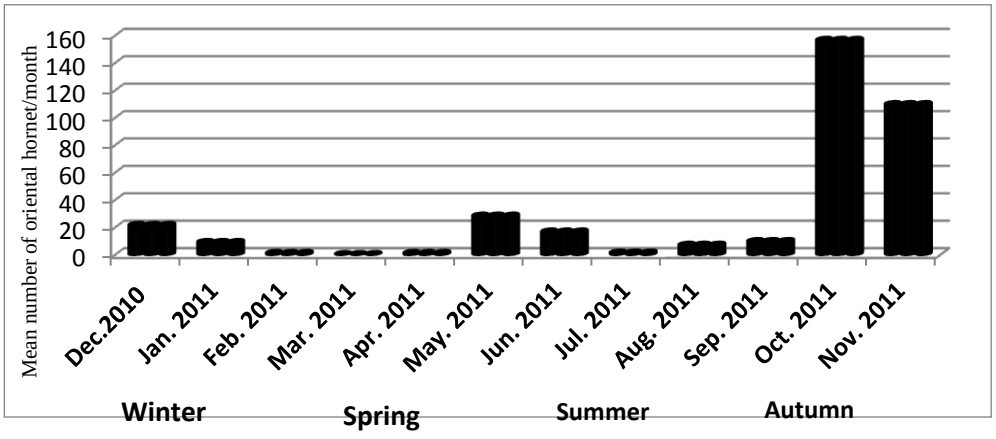


Fig 2. Monthly average of oriental hornet numbers attacking honeybee colonies during 2010/2011.

The *V. orientalis* queens started to appear from the last week of April reaching its peak in May. But in the previous searches it reached its peak in March (Shoreit, 1998 and Khater *et al*., 2001). The same trend was observed for *V. orientalis* workers as they started to appear from the first week of July and reached their peak in October. Meanwhile, in the past they reach their peak during October (Shoreit,

1998) and during early July (Khater *et al.*, 2001). Significant positive correlation was estimated for the relationship between the number of captured wasps and mean temperature. A significant positive correlation was found between daily activity and mean temperature during the daytime. On the other hand there was significant negative correlation for the relationship between the number of captured wasps and mean relative humidity.

Table 2. Simple correlation coefficient between changes of *Vespa orientalis* population and mean temperature, relative humidity and wind speed during 2010/2011 year in Mansoura region, Egypt.

Season	Temp.		R.H.		W.S.	
	r	p	r	p	r	p
Winter	0.909	0.273	-0.714	0.494	0.940	0.224
Spring	0.918	0.259	-0.520	0.652	-0.710	0.497
Summer	-0.995	0.064	-0.999	0.027*	0.379	0.753
Autumn	-0.330	0.786	0.659	0.542	-0.992	0.079
Over all year	0.137	0.671	0.560	0.058	-0.549	0.065

Table (2) showed that analysis of data in relation to meteorological factors revealed a positive effect of temperature and relative humidity with the average numbers of *Vespa orientalis* (r= 0.137 and r= 560), respectively. On the other hand, a negative correlation was observed between hornets populations and wind speed during the experimental period (r= - 549). These results are in agreement with El-Bassiouny, 2007. In addition, Indu *et al*., 2009 stated that there was significant positive correlation between the wasp populations and minimum temperature, maximum humidity and minimum humidity. Moreover, Chhuneja *et al*., 2008 found that there was significant positive correlation between the mean daily wasp population and mean minimum temperature, mean daily temperature and mean relative humidity.

Brief, The damage by orientalis wasps *V. orientalis* attack during October and November are very Hazards' because beekeepers try in this period to magnify their colonies population for the winter season. Second, to be ready for sale package bees swarms for Arab Gulf countries in matching with flowering season, the last reason to get strong colonies for collecting huge amounts of maize pollen grains. So, its disaster for beekeepers if there are declined in colonies populations. The results indicated that the activity of queen wasps was outstanding when average temperature, relative humidity and wind speed were (21.4 C°, 62.5 % and 3 m/s), respectively. Meanwhile, worker wasps were more active, spreading and hunting when temperature range was from (17.7 C° to 31.0 C°), relative humidity was from (52 % to 87 %) and wind speed was (0.6 m/s). Oriental hornet activities started to appearance from the first week of August reaching their peak on October and November 2011, respectively. These

results are in agreement with those obtained by Gommaa and Abdel- Wahab, 2006 and El-Hady, 2008 and not in agreement with Khater *et al*. (2001). A gradual decrease in *V. orientalis* numbers was observed during December 2010 and January 2011. It was observed that fermented sugar syrup or honey was more attractive to the oriental hornet queens than the other tested baits. A bait consists of (fermented honey with little brower yeast and grape syrup) was more attractive to the oriental hornet workers than the above mentioned bait. However, the characteristics of oriental wasp biology or behaviour suggest some hypotheses about oriental wasp pheromones as attractant that could be experimentally tested in future research.

RECOMMENDATION

- For captured the oriental hornet queens using fermented sugar syrup or honey as bait and for captured the oriental hornet workers using bait consists of (fermented honey with little brower yeast and grape syrup).

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تأثير بعض العوامل المناخية على النشاط الموسمى للدبور الشرقى المهاجم لطوائف نحل العسل فى محافظة الدقهلية– مصر

عمـــرو أحمـــد طـــــه

قسم بحوث النحل– معهد بحوث وقاية النباتات– مركز البحوث الزراعية– الدقى– الجيزة– مصر

أجرى هذا البحث بهدف دراسة تأثير التغيرات المناخية على النشاط الموسمى لتعداد الدبور الشرقى (دبور البلح الأحمر) الذى يهاجم طوائف نحل العسل بناءً على تعداد الأفراد داخل المصائد بمنطقة المنصورة بمحافظة الدقهلية، وذلك خلال عام ٢٠١٠/٢٠١١. تم إستخدام مصائد سلكية بهدف مكافحة الدبور فى المنحل مع وضع محلول سكرى أو عسل متخمر كجاذب. لوحظ أن نشاط ملكات دبور البلح الشرقى تبدأ فى الظهور من يناير ٢٠١١ إلى مايو ٢٠١١ مع ذروة نشاط فى شهر مايو ٢٠١١. بينما يبدأ نشاط شغالات الدبور الشرقى من يونيو إلى فبراير ٢٠١١ مع ذروة نشاط فى أكتوبر ثم نوفمبر2011 على التوالى. لوحظ إنخفاض تدريجى فى تعداد الدبور خلال ديسمبر ٢٠١٠ ويناير ٢٠١١ ولم تتواجد أفراد الدبور خلال شهر مارس ٢٠١١. فى المتوسط تم جمع عدد 28.57 ملكة و 156.25 شغالة خلال شهرى مايو و أكتوبر ٢٠١١ على التوالى. كما لوحظ إرتباط معنوى موجب بين تعداد الدبور و متوسط درجة الحرارة (r= 0.137)، كما لوحظ إرتباط معنوى موجب بين تعداد الدبور و متوسط الرطوبة النسبية (r= 0.560) فى حين كان هناك إرتباط سالب بين أعداد الدبور و سرعة الرياح (r= 0.549) خلال فترة التجربة. يوصى باستخدام محلول سكرى أو عسل متخمر كجاذب لصيد ملكات الدبور الشرقى. كما يوصى باستخدام جاذب أو طعم مكون من عسل متخمر، عصير عنب و قليل من الخميرة الجافة كجاذب لشغالات الدبور الشرقى.