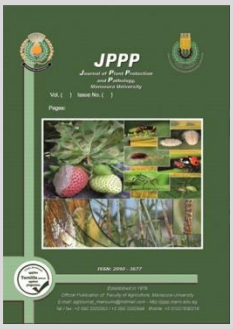
Journal of Plant Protection and Pathology

Journal homepage: www.jppp.mans.edu.eg
Available online at: www.jppp.journals.ekb.eg

Behavioral Study of The Dangerous Insect Predator (*Vespa orientalis*) on The Honeybee Colonies in Minia Region, Egypt

Fouad, M. S.; M. G. Darwish* and A. S. M. H. EL Roby

Plant Protection Dept., Faculty of Agriculture, Minia University, Egypt.



ABSTRACT

The seasonal abundance of oriental wasp (*vespa orientalis)* population attacking honeybee colonies was investigated based on the number of trapped workers in Minia region, during the two successive seasons of 2019 and 2020. Results revealed that *V. orientalis* workers were started to appear from July to December with a peak of activity during October. But a gradual decrease in *V. orientalis* numbers was observed during December of the studied seasons. On the other hand , the effect of this predator attack on the average no. of covered combs by bees was calculated. It is clear from the obtained results that the damaged colonies due to direct attack of this hornet were increased during active months to reach the maximum of destruction in October (5 and 4.5 in infested colonies as compared with 7.8 and 7 in un infested colonies). Mean while, a latent negative effect of this hornet was observed during December however, the average no. of covered combs by bees was 1.25 and 0 (as in infested colonies) as compared with 5.3 and 5 (un infested colonies).The two successive seasonal of 2019 & 2020, respectively. Moreover, the highest numbers of this orient horned was calculated at 6 pm during the mid of the two active months of September and October in the two seasons of 2019 & 2020 at Minia region.

Keywords: Honeybee ; Traps ; Oriental hornet ; *Vespa orientalis*; Wasps.

INTRODUCTION

The oriental hornet (*Vespa orientalis* L.) is the most important honeybee predator in the world (Papachristoforou et al. 2008). Also, it is considered recently the major pest and more dangerous for Egyptian beekeeping (Khodairy and Awad, 2013). However, this hornet (Hymenoptera, Vespidae) is particularly known to induce serious damage to apiaries by killing many individual honeybees or even by destroying entire colonies and occupying the bee hive using its resources (honey, pollen, brood and adult honeybees) to feed their brood (Ken et al. 2005)

On the other hand, the population dynamic of this hornet is seasonally fluctuated according to several environmental factors (Ahmed, 1999). In spite of there were many indications concerning the serious Injuries of hornets to honeybee colonies throughout numerous Loss of them, a little critical evidences were represented in the Literature about the number and percentage of the lost colonies by hornets during the direct attack or after spent It's active season (Donovan, 1992).

Therefore the objective of this work is to study the population fluctuation of this oriental hornet during the active season through trapping as an indicator or seasonal dynamic under environmental conditions of Minia region, Egypt. Also, the number of destroyed colonies due the direct and latent impact of horned during its active season. Moreover, a behavioral study of this predator was carried out by calculating the highest number of this predator during the day at the active months.

MATERIALS AND METHODS

The present paper throws a light on the seasonal activity of the oriental hornet *Vespa orientalis* L. at three apiaries in Minia region. This work was conducted during the two successive years of 2019 and 2020 to study the population density of oriental hornet during its activity season. However, a wire screened traps were used each trap was made on wooden and wire screen and put fermented sugar (Shoreit, 1998). Nine traps were placed outside the colonies on top of hives. These traps established and baited from July to December through the two years of study (2019&2020) due to the peak of activity of hornet. The hornet attacked and caught within the given traps were weekly collected and the counted (Taha, 2014)

Also, the number of damaged honeybee colonies during the period of study (July to December) was weekly recorded and calculated as the average no. of covered combs by bees due to direct attack by *V. orientalis* during the two seasons of study (2019&2020). Moreover, the number of this predator per minute from the time of 6 Am to 6 Pm during the highest active period at mid of September and October was recorded (every two hours during these two days).

Data Were statistically analysis by using Least significant range (Duncan range at 5%) Duncan, 1955.

RESULTS AND DISCUSSION

Data in Table (1) recorded the population density of the oriental hornet *V. orientalis* that caught by traps during the two seasons of 2019 and 2020 in Minia region. It is shown that the highest weekly average no. was obtained during the third week of October (7125.33 and 7914) during the two seasons of 2019 and 2020, respectively. While the least weekly average no. of the population density of this predator was occurred in the third and the fourth week of

* **Corresponding author.**
E-mail address: gomaamahmoud99@yahoo.com
DOI: 10.21608/jppp.2021.205739

December (0 &1) during the previous two seasons of 2019 and 2020, respectively. Moreover, there were significantly differences between the mean no. of the individuals of this predator in the different months during the two seasons of study (Table 1).

In the same time, the obtained results which illustrated in (Fig 1) indicated that the oriental hornet individuals started to clearly pear in the third and fourth week of July (2019 season) and during the first week of the same month during 2020 season. Then these numbers were increased throughout the followed weeks and attained its peak of abundance in October during the two seasons of study in Minia Region. These finding are confirmed by Sihag, 1992 ; Shoreit, 1998, El-Sherif, 2003 ; Ahmed, 1999 ; Gomaa & Abd El-wahab, 2006 ; Abd Al-Fattah & Ibrahim, 2009 and Taha, 2014.

Table 1. Weekly average no. of the population density of *V. orientalis* during the two seasons of 2019 and 2020.

Months	2019				
	First Week	Second week	Third week	Forth week	Mean
July	4	19	36	40	24.75 f
August	115.33	311	916.7	999.3	585.58 d
September	1502.7	2235.3	3089.7	4213.3	2760.25 b
October	4666	5812	7125.3	4830.7	5608.5 a
November	5234.7	1523.7	811.7	520.3	2022.58 c
December	112.3	6	0	0	29.58 e
L.S.R.			4062.07		
Months	2020				
	First Week	Second week	Third Week	Forth week	Mean
July	76.3	90.7	158	203.3	132.08 e
August	240	118.3	1510	1600.3	867.17 d
September	2283.3	3441	3401	4560.3	3421.42 b
October	5684.3	6351.7	7914	6213.7	6540.92 a
November	5631.7	2114.7	1455.7	1281.3	2620.83 c
December	745.7	121.7	3.3	1	217.92 e
L.S.R.			96.31		

Means followed by the same letters are not significantly different at 5% level of probability (Duncan multiple range test)
***L.S.R. Least significant range (Duncan range at 5%).**

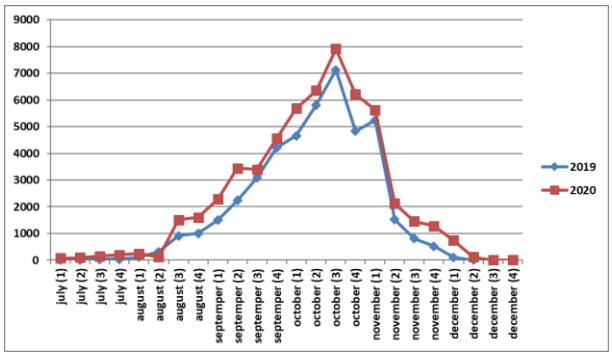


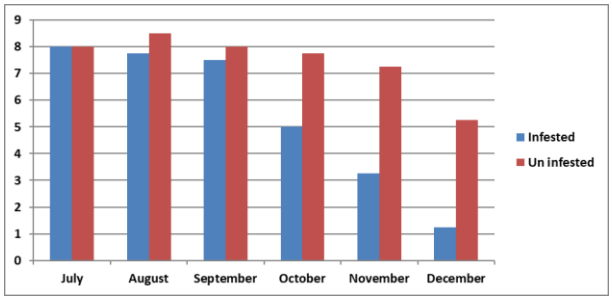
Figure 1. Weekly average no. of the population density of *V. orientalis* during the two seasons of 2019 and 2020.

On the other hand, the effect of *V. orientalis* attack on the average no. of covered combs by bees was observed. However, the average no. of covered combs by bees due to direct attack of the oriental hornet *V. orientalis* during the two studied seasons of 2019 & 2020 which expanded from July to December are presented in Table (2) and illustrated in Fig (2). It is clear from the obtained data that the damaged colonies due to the direct attack of hornet were increased during the highly active months of hornet to reach the maximum of destruction in October (5 and 4.5 during the two seasons 2019 & 2020 , respectively). While, the lowest average no. of destruction was occurred in July, August and September (8 , 8 & 7.7 , 7.7 and 7.5 , 7) during the two seasons of study 2019 & 2020 , respectively.

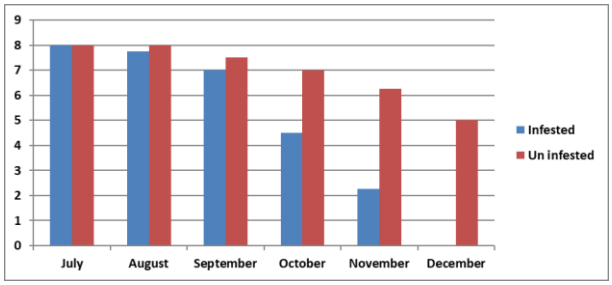
Moreover, the survived colonies after hornet active season were weak in November and December were (3.2 &2.2 and 1.2 & 0) covered combs as compared with (7.2 & 5.2 and 5.2 & 5) in un infested colonies, as alatent negative effect of hornet. This serious damage may be due to that the honey bee colonies to be the best food source for the oriental hornet where it can be find the combination of animal protein (bees and Immature stages and carbohydrate) Abd Al-Fattah & Ibrahim, 2009 ; Taha, 2014 and Nowar, 2016)

Table 2. Average no. of covered combs by bees due to direct attack by V. *orientalis* during the two seasons of 2019 and 2020.

Month	2019		2020	
	Infested colonies	Un infested colonies	Infested colonies	Un infested colonies
July	8	8	8	8
August	7.7	8.5	7.7	8
September	7.5	8	7	7.5
October	5	7.7	4.5	7
November	3.2	7.2	2.2	6.2
December	1.2	5.2	0	5
T- test (value)	0.0424		0.1798	



2019



2020

Figure 2. Average no. of covered combs by bees due to direct attack by *V. orientalis* during the two seasons of 2019 and 2020.

Moreover, the data in Table (3) and fig (3) cleared the number of *V. orientalis* per minute from 6 Am to 6 pm during the highly active months of this predator. It is shown that the highest numbers of this orient hornet was observed it at 6 pm time during the mid of the two months (196, 336, 298 and 411), followed by 8 am of these two months of September and October (89, 111, 135 and 199 during the two seasons of 2019 and 2020, respectively.

Table 3. Number of *V.orientalis* / minute from 6 Am to 6 Pm during mid of September and October of 2019 and 2020 seasons.

	2019		2020	
	15 Sept.	15 Oct.	15 Sept.	15 Oct.
6 am	4	35	26	48
8 am	89	111	135	199
10 am	82	93	117	147
12 pm	41	88	66	75
2 pm	13	67	41	53
4 pm	86	99	96	103
6 pm	196	336	298	411

From these data it be concluded that the initial idea of controlling this wasp is to capture large number of hornets by using traps during the highly activity of this predator during the two months of September and October of 6 pm and 8 am (Ken et al. 2005; Glaiim, 2009 and Taha, 2014)

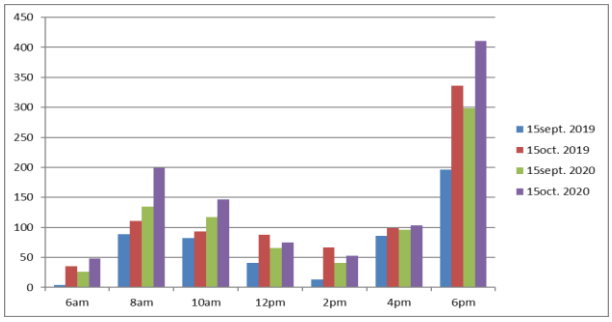


Figure 3. Number of *V.orientalis* / minute from 6 Am to 6 Pm during mid of September and October of 2019 and 2020 seasons.

REFERENCES

Abd Al-Fattah M. A. and Ibrahim Y.Y. (2009). The serious Effects of The Dangerous Insect Predator (*vespa orientalis* L.) on Honeybee Colonies in Giza governorate. Conference on Recent Technologies in Agriculture.

Ahmed, N.S. (1999). Studies on oriental hornet *Vespa orientalisI*, FAB. (Vespidae, Hymenoptera) as a predator of honeybee *Apis mellifera*, L. (Apidae, Hymenoptera) in upper Egypt. Ph.D. Thesis, Fac. Agric. Mini Univ., 179pp.

Donovan, B.J. (1992). Problem caused by immigrant German and common wasps in New Zealand, and attempts at biological control. Bee world 73(3): 131-148.

Duncan, D. B. (1955). Multiple Range And Multiple F Tests. Virginia Polytechnic Institute Blacksbhrg, Virginia

Glaiim, M. K. 2009. Hunting behavior of the oriental hornet, *Vespa orientalis* L., and defense behavior of the honey bee, *Apis mellifera* L., in Iraq. Bulletin of the Iraq Natural History Museum. 10 (4): 17-30.

Gomaa ,A.M. and Abd El-Wahab, T.E.(2006). seasonal abundance and the efficiency of yeast liquid culture (*candida tropicalis*) as bait for capturing the oriental wasps (*vespa orientalis* L.) under egyptian environment .

Ken, T., Hepburn, R.H., Randloff, S.E., Yusheng, Y, Yiqiu, L., Danyin, Z. and Neumann, P. (2005). Heat balling wasps by honeybees. Naturwissenschaften, 92: 492-495.

Khodairy, M.M. and A.A. Awad, 2013. A Study on the Sensory Structure, in Relation to Some Behavioral Ecology of the Oriental Hornet (*Vespa orientalis* L.) (Hymenoptera: Vespidae). Life Science Journal, 10(2): 1207-1216

Nowar, E. E. (2016). Oriental Hornet (*Vespa orientalis*) as AFB Disease Vector to Honeybee (*Apis mellifera* L.) Colonies. Middle East Journal of Applied Sciences Volume : 06 , Issue :04 , pp 934-940

Papachristoforou, A., J. Sueur, A. Rortais, S.Angelopoulos, A. Thrasyvoulou, and G. Arnold, 2008. High frequency sounds produced by Cyprian honeybees *Apis mellifera* cypria when confronting their predator, the Oriental hornet *Vespa orientalis*. Apidologie., 39(4): 468-474.

Shoreit, M.N. 1998. Field observations on the seasonal abundance and control of the oriental hornet, *Vespa orientalis* L. attacking honeybee\ colonies in Egypt. Assiut Journal of Agricul-tural Sciences. 29(1), 15 21.

Sihag, R.C. 1992. The yellow banded brown wasp *Vespa orientalis* L. 1. A predator and colony robber of honey bee (*Apis mellifera* L.) in Har yana (India). Korean J. of Apiculture. 7(1), 32-34.

Taha, A.A. (2014). Feet of some Climatic Factors on The Seasonal Activity of Oriental Wasp, *Vespa orientalis* L. Attacking Honeybee Colonies In Dakahlia Governorate, Egypt. J. Agric. Res., 92 (1),

دراسة سلوك اخطر عدو حشري (الدبور الشرقي) على طوائف نحل العسل في منطقة المنيا ، مصر

محمد سمير فؤاد ، محمود جمعه درويش و احمد صلاح محمد حسين

قسم الوقاية ـ كلية الزراعة ـ جامعة المنيا

يعتمد التعداد الموسمي للدبور الشرقي على عدد مصائد الدبور في منطقة المنيا خلال الموسمين 2019 و 2020م. وأشارت النتائج الى بدء ظهور الدبور الشرقي في الفترة من شهر يوليو الى شهر ديسمبر مع ذروة النشاط في شهر اكتوبر. ولكن بدأت اعداد الدبور الشرقي في النقص التدريجي خلال شهر ديسمبر في مواسم الدراسة. وفي جانب آخر تم حساب تأثير هجوم هذا المفترس على اعداد الاقراص المغطاة بالنحل وخلصت النتائج الى ان الهجوم المباشر للدبور زاد في اشهر النشاط ووصل للقمة في شهر اكتوبر (5 و 4.5 للطوائف المهاجمة مقارنة بالطوائف الغير مهاجمة 7 و 7.8). بينما تأثير سلبي متأخر للدبور الشرقي في شهر ديسمبر مع ذلك كان متوسط عدد الاقراص المغطاة بالنحل 1.25 و صفر في الطوائف المهاجمة مقارنة بالطوائف الغير مهاجمة 5 و 5.3 خلال الموسمين 2019 و 2020 بالترتيب. علاوة على ذلك تم تسجيل اكبر عدد للدبور في الساعة السادسة مساءا في منتصف اشهر النشاط من سبتمبر واكتوبر خلال موسمي الدراسة 2019 و 2020م.