J. Plant Prot. and Path., Mansoura Univ., Vol. 4 (12): 1109 - 1114, 2013

BEHAVIORAL REACTION OF THE ORIENTAL WASP, *Vespa orientalis* L ADULTS IN RESPONSE TO SOME OLFACTORY STIMULANT MATERIALS

Abd El-Kareim, A. I.[1]; A. M. Abou El-Naga[1]; H.M. Mansour[2] and Marwa B.M.Gomaa[2]

[1]Economic Entomology Dept., Fac. of Agric., Mansoura Univ., Egypt.

[2]Agriculture Res. Department, Plant Protection Res. Inst., Agriculture Res.center, Egypt.

ABSTRACT

The relative attractiveness of some olfactory stimulant materials to the oriental hornet wasp, Vespa orientalis L. was evaluated under laboratory and field conditions . Olfactory stimulant materials included some volatile oils (cinnamon, bananas, camphor and mint) and other natural materials (yeast, chicken litter, asber fermented grapes and sugar syrup as control). The obtained results revealed that the oriental wasp exhibited different degrees of selectivity in response to the tested olfactory stimulant materials.

V.orientalis adults exposed to different volatile oils showed the highest attractiveness to cinnamon followed by camphor and mint oils with significant differences. The wasps exhibited the lowest preferability to bananas.

The present study indicated that the oriental hornet wasp exhibited significantly positive response to asber fermented grape and chicken litter in comparison with yeast and sugar syrup. So, asber fermented grape and chicken litter successfully attracted the wasp; these materials can be used in monitoring populations of *Vespa orientalis.*

Traps baited with cinnamon oil proved to be good bio control agent against the oriental wasps as they strongly attractive to them. The oriental wasps, *V. orientalis* population was considerably decreased in treated apiary in comparison with untreated one. Therefore, cinnamon oil could be used against the oriental wasps in IPM programs.

INTRODUCTION

The oriental wasp, *Vespa orientalis* L. is considered to be one of the most important insect pests affecting honey bee industry in Egypt. The wasps attack foraging workers and guard bees at hive entrances and result in weakening strong colonies and minimizing their Productivity [Matheson et. al.,1989, and Sihag, 1992, El-Sherif,2003 and Bacandritsos et. al.,2006].. Furthermore, it attacks many fruit trees, especially date, grape and pear, (Mishra *et.al* 1989)

Several studies have demonstrate the potential of various materials as an attractive agents and baits to enhance integrated pest management control program for the oriental wasps (Abd El-Wahab & Gomaa, 2005 and Gomaa & Abd El-Wahab, 2006)..However, the wasps are selective in their feeding and show preferences to certain baits.

So, the aim of the present work was: To evaluate the relative attractiveness of selected volatile oils and other natural materials and to estimate the role of volatile oils on honeybee colonies as protective agents from wasp attacks.

MATERIALS AND METHODS

Influence of volatile oils on the wasp searching behavior :-

The oriental wasp adults, *Vespa orientalis* L., used in this study, were obtained by collecting adults from the hornet traps. The collected wasps were starved for 48 h before test.

Bioassay was carried out in an experimental screen-cages (20cm width X 20 cm length X 20 cm height) containing two sticky paper traps in two opposite sides. The experimental box was covered with fine meshed screen. The tested wasps were introduced into box through a pore , which was immediately closed.

To estimate volatile oil-seeking stimulants for the oriental wasps, the internal wall of one trap was coated with 2 ml of the oil, as well as 2 ml of distilled water on the other trap. A test was replicated five times (by using five wasps each time) for each volatile oil. Counts were done after 15 min. Statistical analysis was carried out by using one way ANOVA.

Influence of some natural materials on the wasp searching behavior

The efficiency of liquid yeast, chicken litter and fermented grape juice and sugar syrup (as control) was evaluated as baits for trapping the wasp, *V. orientalis*, using three a modified Abou-Enain,(1999) traps for each treatment. The traps were investigated weekly during October 2011 and 2012 with renewal of the lures. The collected wasps were killed and counted. The average number of the wasps/trap/ week was calculated.

Evaluation the potential of using cinnamon oil traps to enhance biological control of *V. orientalis* in apiary:

To test whether cinnamon oil traps would enhance biological control of the hornet wasp in the apiaries, population densities of *V. orientalis* were estimated in apiary encircled by three cinnamon oil traps or sugar syrup traps. Each apiary consisted of 40 colonies.

To estimate the density of *V. orientalis* population in apiaries surrounded and not surrounded by the oil traps, three sugar syrup traps were distributed inside each apiary. *V. orientalis* adults were collected weekly from the first week of April to the end of August 2013. The collected wasps were taken to the laboratory in polyethylene bags for investigation where they counted and the average number of wasps/trap/ week was calculatedestimated.

Data obtained were subjected to regular statistical analysis (one way ANOVA) and means were compared by using L.S.D. at 5%**.**

RESULTS

Attractiveness of the oriental wasp, *V. Orientals* in response to volatile oils:

The reactions of ***V. Orientals*** adults in response to the tested volatile oils(Cinnamon, bananas, camphor and mint) were observed under laboratory conditions.

Catches of experimental box traps baited, with volatile oils and unbaited are illustrated in Fig. (1).

The experimental box results revealed that the oriental wasp exhibited different degrees of attractiveness in response to volatile oils (Fig., 1). Cinnamon oil attracted the highest percentage of *V. orientalis* (96.66±9.43) followed by

camphor (80.0±17.16%) with a significant difference, while no significant differences in wasp response were observed among the other two oils, mint (66.86) and banana (50). *V. orientalis* obviously exhibited the lowest attractiveness to banana oil.

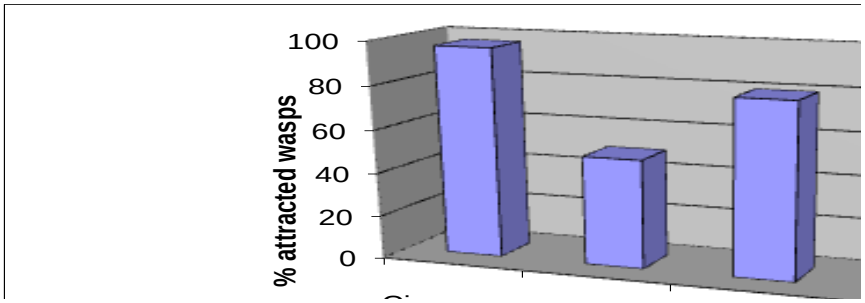

Fig :(1) Response of the oriental wasp, *Vespa orientalis* L. adults to some volatile oils (L.S.D. (p = 5 %) = 14.54).

Attractiveness of the oriental wasp, *V. orientalis* in response to some olfactory stimulant materials:

Tables (1 and 2) show the average number of ***V.orientalis*** adults attracted to different natural materials. ***V.orientalis*** adults showed different degrees of attraction to the different tested natural materials.

Table (1): Weekly average number of hornet wasps, *V. orientalis*/trap attracted to some natural materials with renewal of the materials, during October,2011.

Source of attractions	Av. No. of wasps / trap / week			
	1st week	2nd week	3rd week	4th week
fermented grape juice	234.0±10.15a	337.3± 4.0a	266.3±13.2 a	226±9.6 a
Chicken litter	216.7±11.1ab	322. ±4.1a	258.7±17.5ab	210.0±18.0ab
Liquid yeast	197.3±1.7 b	298.7±13.5bc	251.0 ±7.8 ab	197.3±16.2 bc
Sugar syrup (control)	196.3±23.7 b	276 ±25.7 c	241±7.8 b	174±14.9 c
L.S.D (P= 5%)	29.36	27.85	23.61	23.15

Table (2): Weekly average number of hornet wasps, *V. orientalis*/trap attracted to some natural materials with renewal of the materials, during October, 2012.

Source of attractions	Av. No. of wasp / trap / week			
	1st week	2nd week	3rd week	4th week
fermented grape juice	240 ±5.6 a	331±6.0 a	312.3±6.8a	234.3±4.7a
Chicken litter	240.3 ±3.2 a	339.3±10.0 a	282.3±15.3ab	265.7±28.9b
Liquid yeast	229.7±8.1 ab	337. 7±10.3 a	251.3±15.7bc	219.3±8.5b
Sugar syrup (control)	214.3±22.5 b	319.7±45.2 a	233.3±34.8c	206. 7±5.5b
L.S.D (P=5%)	21.4	42.8	36.3	30.6

From the above mentioned results it could be concluded that *V. orientalis* adults showed different responses towards the tested materials. However, fermented grape juice and Chicken litter exhibited the highest attractiveness for the wasp adults with no significant differences.

Yeast traps ranked the second group and recorded a moderate level of attractiveness with a significant difference from sugar syrup traps, while

sugar syrup traps lured relatively low numbers of *V. orientalis* adults, and represented the third group that was less significantly preferred.

Influence of cinnamon oil as bio-control agent against hornet population inside apiary:

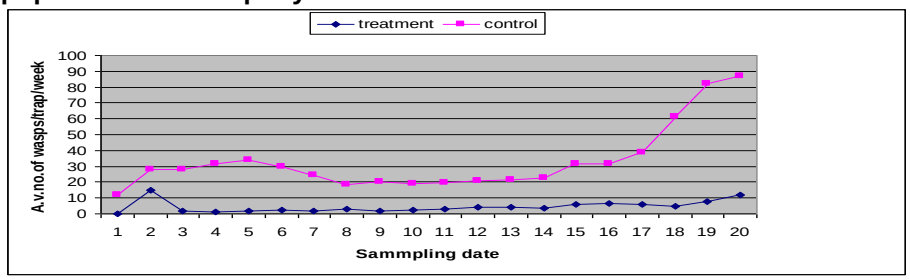

Fig. (2): Seasonal abundance of the oriental wasp, *Vespa orientalis* L. population in both treated and check apiaries

As shown in Fig. 2, the number of wasps in apiary surrounded by cinnamon oil traps was initially high and then fell continuously from the 3rd week of April till the end of August 2013,while in the check apiary, the number of wasps increased gradually during the same period.

Regression analysis: the regression of log abundance of wasps on time (days) for *V. orientalis* populations (Fig.3) in both treated and check plots indicated that cinnamon oil traps caused considerable reduction of the wasp population. The slope of regression line (b= 0.0344) was significantly low. On the contrary, wasp population in check apiary exhibited a tendency to increase. The slope of regression line was (b=0.28).

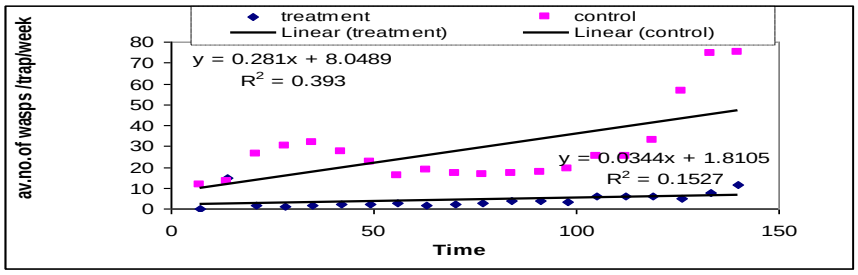

Fig. (3): The regression of abundance of wasps on time (days) for *Vespa orientalis* L. population in both treated and check apiaries.

As seen in Table 3, the average number of the oriental hornet was considerably lower in apiary treated with volatile oils compared with the untreated one. However, the average numbers of wasps/week/trap in cinnamon treatment were 6.8, 2.2, 3.0, 4.9 and 7.5, while, in the untreated apiary, the average numbers of wasps were 20.3, 24.4, 17.3, 21.8 and 59.7individuals during April, May, June, July and August, respectively. In respect to the reduction percentages of wasp population in treated apiaries in comparison with control ,they reached 66.3, 89.2,82.7, 77.5 and 87.4% during April, May, June, July and August, respectively.

Table, (3): Monthly percentage of reduction in wasp, *V. orientalis* population in apiary treated with cinnamon oil traps in comparison with untreated one(during 2013 season).

Month	Average numbers of wasps/trap		Reduction %
	Treatment	Control	
April	6.8	20.3	66.50
May	2.2	24.4	90.98
June	3.0	17.3	82.66
July	4.9	21.8	77.52
August	7.5	59.7	87.44

DISCUSSION

The obtained results show that the hornet wasp, *V. orientalis* exhibited different degrees of preference to the tested volatile oils. Hagen (1986) and Drew and Lioyed (1987) mentioned that species of hymenopterous wasps respond more to olfactory cause than visual cause.

According to Aihara (1980) and Mishra et al.(1989) many organic chemicals and fruit baits, showed varying degrees of it's attractiveness to *V. orientalis* .Abo-Sheaesha (1994) mentioned that *V. orientalis* attracted to piece of filter paper wetted with a mixture of volatile oil and paraffin oil. Also, Sheaesha and Serag El-Dien (2004) added that the volatile oils, caryophylline, linalool, geranial and citronellal attract the hornet to some extent, since the superior one was citronellal.

The obtained data revealed that cinnamon oil exhibited the highest attractiveness to the hornet wasp in comparison with the other oils. Schoonhover (1992) illustrated that the difference in attractiveness may be due to the modifications in behavioral response of the hornet wasp to these compounds according to their chemical structure and physical properties.

The efficiency of liquid yeast (Candida tropicalis), chicken litter, fermented grape juice and sugar syrup(as control) were tested as lures for the wasp *V. orientalis*, The obtained data showed that the wasps, exhibited different responses to the compounds. However, fermented grape juice and Chicken litter exhibited the highest attractiveness for *V. orientalis* adults followed by liquid yeast in comparison with the control (sugar syrup). Klein and Adler(1996) reported that baiting the traps with meat or fermented honey(Shoreit, 1998) can improve the capability of the traps in capturing and control of *V. orientalis* in apiaries.

Uses the liquid yeast culture for capturing the wasps in the traps could be ascribed to the odor that attracts the wasps to the traps in addition to its high nutritional value where it contains vitamins, amino acids and hormones (Gomaa ,1995; and Amany 2002). According to the conclusion of Gomaa and Abd El-Wahab (2006) that application of liquid yeast culture (*Candida tropicalis*) as bait is an efficient procedure to capture and prevent those large numbers of wasps from invading the apiaries

So cinnamon oil or fermented grape juice could be used as baits for controlling oriental wasps in IPM programs.

REFERENCES

Abo-Sheaesha,M.A.and F.S.SeragEl-Dien (2004) Attractiveness of volatile oil to the oriental wasps (Vespa orientalis fab.) attacking apiaries. J.Agric.Sci. Mansoura Univ.29 (1) : 417-423.

Abo-sheaesha, M.A.(1994).Studies on *Prays citri* Mill .(yponomeutidae,lep.) and its control .Ph.D .Thesis faculty of Agric. Al-Azhar University .

Aihara, S.(1980) .Control of gaint hornets by mixture of honey and agrichemical. Honeybee science 1:23-24 In Japanese.

Amany, A. Bahr and A.M. Gomaa, (2002). The integrated system of bio-and organic fertilizers for improving growth and yield of triticale. Egypt. J. Appl. Sci., 17: 512-523. 4.

Bacandritsos. N, Papanastasion .I, Saitanis .C, and Roinioti .E. (2006) .Three non-toxic insect traps useful in trapping wasps enemies of honey bees. Bulletin of Insectology 59 (2): 135-145.

Drew, R. A. I. and A. C. Lioyed (1987). Relationship of fruit flies (Diptera:Tephritidae) and their *Bactrocera* spp. to host plants. Ann. Ent. Soc.Am., 80: 629-636.

Gomma,A.M.(1995).Response of certain vegetable crops to bio fertilization. Ph.D.Thesis,Fac.Agric .,Cairo University.

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 . J. Appl.Sci. Res., 2(11): 1042-1046.

EL-Sherif , M.E. (2003) Seasonal fluctuation of oriental hornet, *Vespa orientalis* FAB., its trapping efficiency and honey bee activities. J. Agric. Sci. Mansoura Univ., 28(4):3133-3147.

Hagen, K. S. (1986). Ecosystem analysis: plant cultivars (HRP), entomophagous species and food supplements. In: Boethal, D.J., Eikenbary, R.D. (Eds.), Interactions of Plant Resistance and Parasitoids and Predators of Insects. John Wiley & Sons, New York, pp. 151–197.

Klein, Z. and H. Adler. (1996).Wasps and their control in Israel .Abstracts of papers presented at the joint international conference of FAOPMACEPA on pest control in the 21st century. Tel Aviv Israel.

Matheson, A., K. Clapperton, H. Moller and P. Alspach, (1989). The impact of wasps on New Zealand bee-keeping- the 1986/ 1987 wasps survey. New Zealand Beekeeper No. 203: 28-31 (Apic. Abst. 1286/90).

Mishra, R.C.; J. Kumar And Gupta, J. KGupta. (1989). A new approach to the control of predatory wasps (*Vespa* spp.)of the honeybee (*Apis mellifera* L.) J. of Apic.Rese. , 28(3) : 126-130.

Schonhoven, L.M.(1992).Insect –plant interactions. VOL.IV:CRC press Boca Raton Ann Arbor, London, Tokya

Shoreit,M.N.(1998).Field observation on the seasonal abundance and control of *Vespa orientalis* F.attacking honeybee colonies in Egypt.j.Appl.Sci.,13(4)250-256.

Sihag, R.C. (1992).b The yellow banded wasp *Vespa orientalis*: opulation density, bee capture efficiency and predation rate on honeybee *Apis mellifera* L. Corean J. Apic. 7(1): 35-38.

سلوك الحشرة دبور البلح الاحمر تجاة بعض الجازبات

عبد الستار ابراهيم عبد الكريم[1] ،احمدابو النجا[1] ، حمدى متولى منصور[2]و مروه بسيونى محمود خليل[2]

[1]-قسم الحشرات الاقتصادية- كلية الزراعة – جامعة المنصورة

[2]-مركز البحوث الزراعية – معهد وقاية النباتات

سلوك حشرة الدبور الشرقي تجاه بعض المواد المنبهه بالرائحة:

تم تقيم الجاذبية النسبية لبعض المواد المنبهات بالرائحة للدبور الشرقي تحت الظروف المعملية والحقلية .وقد اشتملت المنبهات على بعض الزيوت الطيارة (القرفة-الموز والكافور والنعناع) هذا بالإضافة لبعض المواد الطبيعية الاخري (الخميرة-لحم الدجاج-والعنب المتخمروالمحلول السكري ككنترول.

ولقد أوضحت النتائج مايلي:

1-أبدى الدبور الشرقي درجات مختلفة من الاختيارية تجاه المواد المختبرة

2-أظهر الدبور تفضيلا عاليا للزيوت الطيارة وبفارق معنوي لزيت القرفة بلية الكافور ثم زيت النعناع بينما كان زيت الموز اقل الزيوت جذبا للدبور.

3-سجل الدبور الشرقي استجابة معنوية موجبة تجاه كل من عصير العنب المختمر ولحم الدجاج بالمقارنة بالخميرة والمحلول السكري

4-تم تقيم دور زيت القرفة كجاذب للدبور بالمصائد في جزئية تعداد الدبور الذي يهاجم خلايا النحل تحت الظروف الحقلية ولقد أوضحت النتائج انخفاض تعداد الدبور داخل المناحل المحاطة بمصائد الزيت بالمقارنة بتعداد الدبور بالمنحل المحاط بمصائد المحلول السكري

5-وهذا يوضح امكانية استخدام مصائد زيت القرنفل في برامج المكافحة للدبور

قام بتحكيم البحث

أ.د / لبيب محمود شنب	**كلية الزراعة – جامعة المنصورة**
أ.د / محمود رمزى شريف	**مركز البحوث الزراعية**