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RESEARCH ARTICLE

EFFICACCY OF NEW DESIGNED TRAPS FOR CONTROLLING THE ORIENTAL HORNET (VESPA ORIENTALS) IN EGYPTIAN APIARIES AND ITS MEASURMENTS·

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This study was carried out at a private apiary in Diarb Negm, Sharkia governorate and Meat Ghamr Region, El-Dakhlia Governorate, Egypt, during 2012, 2013.Results showed the monthly average numbers for catching of *V.* o*rientalis* adults was recorded at October followed by September and November. The best trap was the new trap with mean captured wasps 72.11, 82.34, 77.63 and 75.31 for Sharkia, Dakhlia governorate at both 2012, and 2013 years, respectively .also , results showed the monthly average numbers for catching of *V. orientalis* adults in the four directions during 2013. From which it can be seen during 2013 season that the highest population of *V. orientalis* adults was recorded at October followed by September and November. Results , also showed that the comparison between the new trap and bottle trap at the four directions (East , West, North and South) to evaluate the recommended directions to the beekeeper . As a conclusion, the highest occurrence of *V. orientalis* was at east and south direction and the lowest mean at north and west directions. Results showed the monthly average numbers for catching of *V. orientalis* adults in the three heights (0.5, 1.0 and 1.5 m above the land) during 2013. From which it can be seen during 2013 season that the highest occurrence of *V. orientalis* was at 1.0 m above the apiary land as best height. The results of this study reveal that the new trap (plastic bottle 20L.) was the best trap for the *V. orientalis*. The effect of trapping on populations sizes and suggests that trapping can be used to control the wasps populations.

The obtained results obviously showed that , there were significantly influenced by the trap height. However, the efficacy of the trap at 0.5 m was the lowest of all. So, the use of new trap may be an efficient solution for controlling the wasps that invade bee hives in Egypt.

Introduction

The Oriental hornet (*Vespa orientalis* L.) is prevalent throughout the countries of the Mediterranean basin and also in the Near East. Wasps are predatory–carnivorous insects feeding mainly their brood with animal proteins (insects, pieces from fresh or spoiled meat and fish), while the adults feed on carbohydrates (nectar, honeydew and ripe fruits).

V. orientalis one of the most important insect pests affecting honey bee industry in Egypt **(Shoreit, 1998**). It causes intense damages in apiaries, where the best combination of proteins from animal origin (bees and larvae) and carbohydrates (nectar and honey) **(Bacandritsos*et al.*, 2006)**. The wasps attack foraging workers and guard bees at hive entrances and resulted in weakening strong colonies and minimizing their Productivity **(Matheson *et al.*, 1989, Sihag, 1992, and El-Sherif, 2003).**

The Oriental hornet causes considerable damage to bee hives in late summer and autumn, when their colony sizes are peaking for the season. At first they attack on the weak bee colonies, which are the most defenseless, and then damages extended to the healthier ones (**Ifantidis, 2003,Wegner and Jordan, 2005**).

Abd El-Wahab and Gomaa, 2005, **Gomaa and Abd El-Whab, 2006)** demonstrated the potential of various materials as an attractive agent and bait to enhance the control program for the oriental wasps**.** However, the wasps are selective in their feeding and show preferences for certain baits.

different trials has been carried out for controlling this pest through bait traps, which proved to be highly effective in controlling of *V. orientalis***(Bacandritsos*et al.*, 2006).**

Ibrahim and Mazeed (1967) studied the efficacy of seven types of trap and the honey baited traps were considerably more efficient than the unabated trap. The wooden trap of the Ministry of Agriculture was the most efficient one followed rather closely by the ordinary tin-can trap.

Orlov*et al*. (1988) described trapping apparatus effective in collecting *Vespa orientalis*, without damaging either them or the nests. The body of the trap consists of a tube fitted over the flight hole of the nest curving and tapering into a long, tubular detachable and interchangeable collector made of air-permeable material.

Khalil, *et al.* (2001) tested sticky traps, yellow, white, blue and green. Results indicated that the tested colures could be divided into two groups according to their attraction to the oriental wasps; the first contains the higher attractant colures that included white, black and red colors, and the second less attractant group which included yellow, blue and green colures. Generally white sticky trap proved to be the most attractant.

Bacandritsos*et al*. (2006) compared three improved types of traps (wood-glue, plastic bottle, double chamber) in combination with two different animal baits (fish and meat), free of insecticides, in order to control the populations of the wasps in apiaries. The results showed that the use of the wood-glue trap was a reliable solution for controlling the wasps in apiaries.

So, the present work is based on field experiments aimed to study the efficacy of new designated traps in order to control *V. orientalis a*dults in an apiaries.

MATERIALS AND METHODS

The current work was carried out at private apiaries in Diarb Negm, Sharkia governorate and Meat Ghamr Region, El-Dakhlia Governorate, Egypt, during 2012, 2013.

To determine weekly relative abundance of the oriental hornet wasp *V. orientalis* population, screened traps were used. Control trap was made of wooden bars and wire screen with diameters of 45 X 45 X 85 cm (Figure, 1a). The new tested traps were plastic bottles (20L. water bottle with piece of queen excluder in the end) (Fig, 1b) and (2 L. plastic bottle with piece of queen excluder at both sides) (fig, 1c).

The wasps' collection:

- A set of traps (three traps) were randomly distributed in between the experimental colonies (60 colonies) hanging above colonies. These traps established and baited with date and yeast from the first week of January until the last week of December through the two years of the study, 2012 and 2013. The time of the bait placement was early in the morning. The baits were changed regularly (every three days) (**Bacandritsos*et al.*, 2006**). Samples were collected weekly and the hornets attracted and caught within the given traps were counted and the average number of wasps/trap/week was calculated.
- The four direction (east, west, north, and south) of the traps were examined and three heights of traps (0.5, 1.0, 1.5 m. above the earth).

The data obtained were subjected to regular statistical analysis (one way ANOVA) and mean comparison were carried out using L.S.D. at 5%.

RESULTS AND DISCUSSION

Data presented in Table (1) showed the monthly average numbers for catching of *V.* o*rientalis* adults during the first and second seasons of study (2012 and 2013). From which it can be seen during the first season that the highest population of *V. orientalis* adults was recorded at October followed by September and November; with means of 275.5, 178.5 and 169.5 individuals for Sharkia governorate ,and 315.5, 209.5 and 175.5individule for Dakahlia governorate, respectively, while during the second season, the highest monthly mean catches of *V. orientalis* was recorded at October (310.5) followed by September (189.5) and November (160.0) individuals, for Sharkia and was 290, 188.5 and 171 individual at Dakhalia for the same months , respectively.

As a conclusion, the obtained data indicated that the highest occurrence of *V. orientalis* on the apiary was during September – October and November for both years of the study.

Also , data showed that the best trap was the new trap with mean captured wasps 72.11, 82.34 , 77.63 and 75.31 for Sharkia , Dakhlia governorate at both 2012, and 2013 years , respectively .

While the wooden trap was captured 53.24, 63.65, 62.1 and 60.51wasp for Sharkia , Dakhlia governorate at both 2012, and 2013 years , respectively .

And the bottle trap captured 26.66, 24.04, 25.64 and 26.86 for Sharkia , Dakhlia governorate at both 2012, and 2013 years , respectively .

Data presented in Table (2) showed the monthly average numbers for catching of *V. orientalis* adults in the four directions during 2013. From which it can be seen during 2013 season that the highest population of *V. orientalis* adults was recorded at October followed by September and November.

Data , also showed that the comparison between the new trap and bottle trap at the four directions (East , West, North and South) to evaluate the recommended directions to the beekeeper and the data showed that the highest mean captured wasps recorded at both east and south direction for the two traps with 33.35wasp/trap and 30.49 wasp/trap for Sharkia and 33.16 wasp/trap and 31.27 wasp/trap for Dakhlia for new trap , and was 15.94 wasp/trap, 13.92 wasp/trap for Sharkia 13.71 wasp/trap,11.65 wasp/trap at Dakhlia for bottle trap

As a conclusion, the obtained data indicated that the highest occurrence of *V. orientalis* was at east and south direction and the lowest mean at north and west directions.

Data presented in Table (3) showed the monthly average numbers for catching of *V. orientalis* adults in the three heights (0.5, 1.0 and 1.5 m above the land) during 2013. From which it can be seen during 2013 season that the highest population of *V. orientalis* adults was recorded at 1.0 m.

Data showed that for wooden trap, the best height was 1.5 m with mean captured wasp 669.4 wasp/trap, followed by the height 1.0 and 0.5m with 474.7 and 180.5 wasp/trap, respectively. While the new trap recorded the best height at 1.0 m followed by 1.5 m and 0.5 m with mean 925.0, 761.8 and 734.4 wasp/trap, respectively.

Also , the bottle trap recorded best height at 1.5 m followed by 1.0 m and 0.5 m with mean 211.6, 201.6 and 120.5 wasp/trap, respectively.

As a conclusion, the obtained data indicated that the highest occurrence of *V. orientalis* was at 1.0 m above the apiary land as best height.

The results of this study reveal that the new trap (plastic bottle 20L.) was the best trap for the *V. orientalis*. This type of trap was closed and the insects had access to the bait indirectly in contrary to the other traps. In the second year of the experiment the numbers of trapped wasps were relatively lower than in the first one. The fluctuations of population densities of wasps may depends on various factors such as reproductive success, distribution of colonies, dispersal of queens and mortality factors **(Archer, 1980 and Bacandritsos*et al*., 2006)**. the effect of trapping on populations sizes and suggests that trapping can be used to control the wasps populations.

The obtained results obviously showed that , there were significantly influenced by the trap height. However, the efficacy of the trap at 0.5 m was the lowest of all. In addition, the above results show that catches in the trap was significantly influenced by the trap design. So, the use of new trap may be an efficient solution for controlling the wasps that invade bee hives in Egypt.

Because of the new trap collected more numerous number of hornet wasps than other traps in apiary. So,. It could be concluded that the new plastic bottle trap not only used for detecting the hornet wasp population swarming activity but also could be incorporated in an integrated management control program of this pest.

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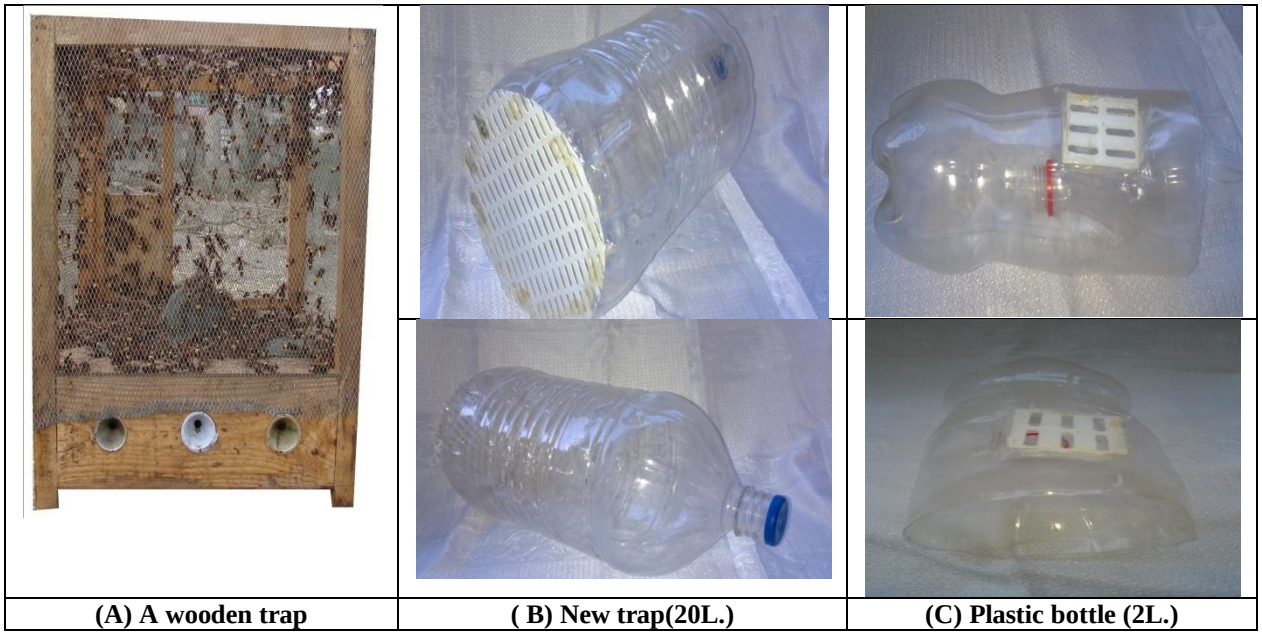

(A) A wooden trap	(B) New trap(20L.)	(C) Plastic bottle (2L.)

Fig.(1).The experimental traps: (A) A wooden trap, (B) New trap(20L.) and (C) plastic bottle (2L.).

Table (1): Monthly means of captured oriental hornet wasp adults/week/trap in the experimental apiary with the three traps at Sharkia and Dakahlia governorate during 2012/2013 seasons.

Month	2012						2013						L.S.D. 0.05
	Sharkia			Dakahlia			Sharkia			Dakahlia			
	W.T.	N.T.	P2	W.T.	N.T.	P2	W.T.	N.T.	P2	W.T.	N.T.	P2	
Jan.	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Feb.	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Mar.	2.53 cd	4 a	0.7 f	3.43 abc	3.53 ab	1.43 f	1.53 ef	2.53 cd	0.9 f	2.43 de	2.63 bcd	1.53 ef	**0.89**
Apr.	17.53 e	22.53 b	8.53 h	21.43 c	27.43 a	11.43 g	16.43 f	19.4 d	7.63 i	17.63 e	22.4 b	10.63 g	**0.87**
May	26.43 g	32.52 d	12.5 i	33.5 c	45.5 a	11.5 j	19.5 h	29.5 f	10.4 k	31.5 e	36.6 b	12.53 i	**0.83**
Jun.	16 e	22 b	11 g	18.5 d	23.5 a	9.5 h	20.4 c	24 a	12.5 f	19.4 cd	19.5 cd	10.4 gh	**1.19**
Jul.	16.5 g	29.5 d	7.5 l	21.5 f	32.5 b	10.5 j	14.5 h	35.5 a	9.5 k	23.5 e	31.5 c	11.5 i	**0.84**
Aug.	65.5 f	102.5 c	29.5 k	72.5 d	125.5 a	31.5 j	49.5 g	126 a	33 i	69.5 e	119.5 b	36.5 h	**1.03**
Sep.	125.5 h	178.5 d	65.5 j	176.5 e	209.5 a	51.5 l	175.5 f	189.5 b	71.5 i	170.2 g	188.5 c	56.5 k	**0.88**
Oct.	205.5 g	275.5 d	99.5 h	225.2 e	315.5 a	87.5 j	214.5 f	310.5 b	78.5 k	206 g	290c	91.5 i	**1.03**
Nov.	143.5 f	169.5 d	75.5 g	171.5 c	175.5 b	62.5 j	211 a	160 e	69.5 i	169.5 d	171 c	71.5 h	**1.1**
Dec.	22 e	32 b	12 i	20 f	29.5 c	11.5 i	23.5 d	36.5 a	15.5 h	17.5 g	21.5 e	19.2 f	**1.17**
Total	**638.9**	**865.3**	**319.9**	**763.8**	**988.1**	**288.5**	**745.2**	**931.5**	**307.7**	**726.1**	**903.7**	**322.3**	
Mean	**53.24**	**72.11**	**26.66**	**63.65**	**82.34**	**24.04**	**62.10**	**77.63**	**25.64**	**60.51**	**75.31**	**26.86**	
L.S.D.0.05	**67.9**	**89.5**	**33.9**	**80.3**	**101.8**	**28.4**	**84.7**	**97.9**	**29.9**	**75.8**	**94.8**	**30.5**	

(W.T.=Wooden trap, N.T.=Plastic bottle 20L.(New Trap), and P2= Plastic bottle 2L)

Means in each column followed by different letter(s) are significantly different at 5% level.

Table (2): Means of captured oriental hornet wasp, *Vespa orientalis* adults/trap/week with the two traps at Sharkia and Dakahlia Governorate in the four directions (East, West. North and south) during 2013 seasons.

Month	N.T.								P2								L.S.D. 0.05
	Sharkia				Dakahlia				Sharkia				Dakahlia				
	E	W	N	S	E	W	N	S	E	W	N	S	E	W	N	S	
Jan.	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Feb.	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Mar.	**1.33 a**	**0.33 h**	**0.33 h**	**1.1 b**	**0.71 e**	**0.33 h**	**0.99 cd**	**1.32 a**	**0.72 e**	**0.33 h**	**0.33 h**	**0.51 g**	**1.07 bc**	**0.61 f**	**0.91 d**	**0.95 d**	**0.095**
Apr.	**6.16 c**	**2.2 i**	**2.9 f**	**5.55 d**	**7.65 b**	**1.62 k**	**2.9 f**	**8.65 a**	**3.62 e**	**2.33 h**	**1.86 j**	**2.61 g**	**1.64 k**	**1.1 m**	**0.93 n**	**1.3 l**	**0.11**
May	**7.16 c**	**4.52 e**	**3.2 h**	**6.3 d**	**10.46 b**	**3.5 g**	**3.2 h**	**13.5 a**	**4.2 f**	**2.86 i**	**2.27 j**	**3.32 h**	**3.31 h**	**1.92 k**	**2.35 j**	**2.92 i**	**0.145**
Jun.	**10.2 c**	**7.23 d**	**5.31 g**	**12.25 b**	**12.21 b**	**6.41 e**	**6.65 e**	**14.26 a**	**5.63 f**	**3.23 j**	**3.64 i**	**4.61 h**	**4.64 h**	**3.61 i**	**2.64 k**	**3.74 i**	**0.25**
Jul.	**11.61 d**	**8.95 ef**	**7.46 g**	**13.38 c**	**15.53 b**	**7.43 g**	**9.53 e**	**19.53 a**	**7.55 g**	**4.43 i**	**5.53 h**	**8.55 f**	**9.55 e**	**5.43 h**	**4.26 i**	**8.25 fg**	**0.78**
Aug.	**21.53 d**	**15.53 e**	**12.53 g**	**23.53 c**	**29.53 b**	**13.7 f**	**10.53 i**	**32.6 a**	**10.43 i**	**9.26 j**	**7.53 k**	**12.43 g**	**12.38 g**	**7.56 k**	**6.8 l**	**11.65 h**	**0.71**
Sep.	**155.2 a**	**75.53 e**	**55.76 g**	**139.43 b**	**140.2 b**	**95.53 d**	**59.43 f**	**122.76 c**	**58.96 f**	**32.43 k**	**25.43 l**	**40.63 i**	**44.61 h**	**21.72 m**	**19.32 n**	**39.36 j**	**0.986**
Oct.	**130 a**	**80 f**	**62 h**	**116 b**	**114 c**	**89 e**	**64 g**	**109 d**	**62 h**	**43 l**	**31 m**	**56 j**	**58i**	**32.6 m**	**25 n**	**46.33 k**	**1.89**
Nov.	**46 b**	**32 e**	**25 h**	**40 d**	**56 a**	**42 c**	**27 g**	**42 c**	**30 f**	**15 j**	**12.83 k**	**32 e**	**22.5i**	**13.36 k**	**11 l**	**21.83i**	**1.528**
Dec.	**11.43 a**	**6.3 g**	**5.28 h**	**9.57 c**	**10.7 b**	**7.51 e**	**4.48 j**	**11.3 a**	**7.92 d**	**4.27 j**	**3.9 k**	**6.84 f**	**6.85 f**	**3.34 l**	**4.94i**	**4.77i**	**0.26**
Total	400.2	231.9	178.8	365.9	397.9	266.2	188.8	375.2	191.25	115.9	95.7	167.05	164.55	89.2	78.3	139.81	
Mean	33.35a	19.33b	14.90c	30.49a	33.16a	22.18b	15.73c	31.27a	15.94a	9.66b	7.98b	13.92a	13.71a	7.43b	6.53b	11.65a	

(N.T. =Plastic bottle 20L. (New Trap), and P2= Plastic bottle 2L)

Means in each column followed by different letter(s) are significantly different at 5% level.

Table (3): Average number of attracted wasps/trap at different heights (m.) of traps during September – October and November, 2013.

Month	Week	W.T.			N.T.			P2			
		0.5	**1.0**	**1.5**	**0.5**	**1.0**	**1.5**	**0.5**	**1.0**	**1.5**	
Sep.	1st	**46.56 g**	**80.55 e**	**101.43 d**	**166 b**	**188.43 a**	**129.4 c**	**33.23 i**	**42. 2 h**	**51.1 f**	**2.5**
	2nd	**55 e**	**128 d**	**135 c**	**185 b**	**216 a**	**184.33 b**	**35 g**	**47 f**	**57 e**	**2**
	3rd	**51 g**	**93 e**	**122 d**	**138 b**	**167 a**	**130 c**	**39i**	**46 h**	**55 f**	**1.71**
	4th	**48 g**	**97 e**	**135 d**	**154 b**	**164 a**	**143 .66 c**	**33 h**	**50 f**	**51.5 f**	**1.77**
Total		**199**	**398.9**	**495.2**	**503.6**	**733.3**	**588.2**	**138**	**184.9**	**213.2**	
Mean		**49.75**	**99.73**	**123.80**	**167.87**	**183.33**	**147.05**	**34.5**	**46.225**	**53.3**	
Oct.	1st	**41 g**	**106 e**	**188 d**	**195 c**	**225 a**	**204 b**	**22 h**	**52 f**	**52.43 f**	**1.63**
	2nd	**66 f**	**140 e**	**193 b**	**190 c**	**244 a**	**179 d**	**26i**	**54 h**	**59 g**	**1.71**
	3rd	**26 h**	**136 e**	**220 c**	**191 d**	**284 a**	**259 b**	**19i**	**59 g**	**63 f**	**1.715**
	4th	**37 h**	**155 e**	**238 d**	**299 b**	**352 a**	**289 c**	**18i**	**62 g**	**71 f**	**1.715**
Total		**169.4**	**539.5**	**842.8**	**876.4**	**1107**	**933.4**	**86.4**	**228.5**	**247.8**	
Mean		**42.35**	**134.88**	**210.70**	**219.10**	**276.75**	**233.35**	**21.6**	**57.125**	**61.95**	
Nov.	1st	**41 g**	**104 e**	**158 d**	**172 c**	**217 a**	**181 b**	**26 h**	**50 f**	**42 g**	**1.72**
	2nd	**51 f**	**130 e**	**176 d**	**204 b**	**225 a**	**190 c**	**31i**	**49 g**	**46 h**	**1.729**
	3rd	**41 h**	**134 e**	**165 d**	**220 b**	**241 a**	**197 c**	**39i**	**48 f**	**45 g**	**1.73**
	4th	**39 h**	**115 e**	**169 d**	**225 b**	**249 a**	**194 c**	**40 gh**	**42 f**	**41.26 fg**	**1.62**
Total		**173.2**	**485.6**	**670.2**	**823.2**	**934.8**	**763.7**	**137.2**	**191.3**	**173.8**	
Mean		**43.3**	**121.4**	**167.6**	**205.8**	**233.7**	**190.9**	**34.3**	**47.825**	**43.45**	
Grand Total		**541.6**	**1424**	**2008.2**	**2203.2**	**2775.1**	**2285.3**	**361.6**	**604.7**	**634.8**	
Grand Mean		**180.5f**	**474.7e**	**669.4d**	**734.4b**	**925.0a**	**761.8c**	**120.5i**	**201.6h**	**211.6g**	

(W.t=Wooden trap, Nt=Plastic bottle 20L.(New trap), and P2= (Plastic bottle 2L)

Means in each column followed by different letter(s) are significantly different at 5% level.

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