

## Seasonal Abundance and the Efficiency of Yeast Liquid Culture (*Candida tropicalis*) as Bait for Capturing the Oriental Wasps (*Vespa orientalis* L.) Under Egyptian Environment

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**Abstract:** Seasonal abundance and the efficiency of liquid culture of yeast (*Candida tropicalis*) as bait to capture the oriental wasps (*Vespa orientalis* L.), were studied at Dirut location, Assiut governorate during 2003 seasons. The oriental wasps started to appear in the first week of April and gradually decreased to the minimum levels during June (late spring) and July (earlier summer). Then, the activity of wasps increased gradually from the second week of August to the fourth week of September. Total numbers of wasps reached the highest values in October followed by September and November and then the number of oriental wasps decreased until disappeared at the fourth week of December. The modified traps recommended by Ministry of Agriculture were baited with 100% of  $1.26 \times 10^5$  freshly prepared yeast liquid culture (*Candida tropicalis*) captured the highest mean numbers of oriental wasps after 24 hr. and 7 days during the active period of wasps (September, October and November). Using liquid yeast culture at 25% concentration recorded the lowest mean numbers of wasps captured in the traps.

**Key words:** Oriental wasps, seasonal variations, capturing, bait, yeast liquid culture.

### INTRODUCTION

The oriental wasp, *Vespa orientalis* L. is considered one of the most important insect pests affecting honey bee industry in Egypt. Furthermore, it attacks many fruit trees, especially grapes and dates<sup>[6]</sup> (Ibrahim and Mazeed, 1967). The wasps attack foraging workers and guard bees at hive entrances and resulted weakening strong colonies and minimizing their productivity<sup>[8,12]</sup>. In some circumstances, the wasps enter the hive and carry off both larvae and pupae. The wasps bite and discard the head and the abdomen of the adult bee and flies back to their nest with the thorax to feed the wasp larvae<sup>[10]</sup>. The population activity of the wasps varied greatly according to the prevailing weather factors. In Egypt many authors<sup>[11,6,14,7]</sup> mentioned that the activity of oriental wasps is very low in winter, spring and early summer and gradually increase to reach the peak of abundance in the autumn particularly during October. The number of wasps starts to fall off gradually during the second half of November and disappeared in the middle of December. Different types of traps either baited or not baited for capturing oriental wasps were used by Ibrahim and Mazeed<sup>[6]</sup> they tested seven types of traps that currently used in Egypt. They found that the wooden trap recommended by Ministry of Agriculture in Egypt with honey baits was the most efficient one followed by the ordinary tin-can trap. Ahmed<sup>[2]</sup> recorded that using Ministry of Agriculture trap exhibited a highest fitness for the high season of hornet

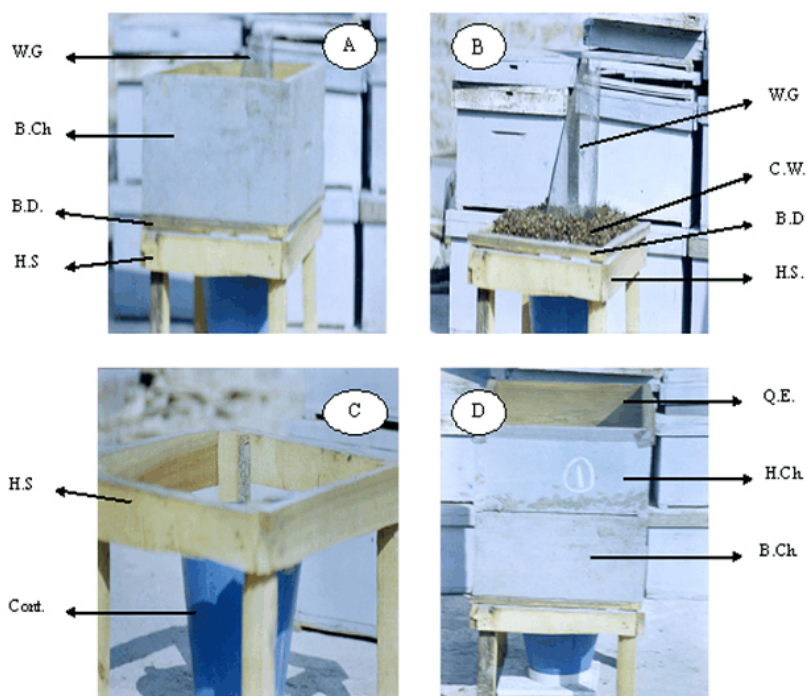
population than the hanged trap (Abou- Elezz trap). Also, he found that the poison bait having 10 gm Lannate 90% mixed with 1Kg honey gave speed action on capture the wasps. Irrespective of the high nutrient contents of yeast cultures (*Candida tropicalis*) of protein, amino acids and vitamins, they emerges special odor during their growth especially in liquid culture that attracts honey bee workers to feed on it<sup>[1]</sup>.

This work aims to study the seasonal fluctuations in numbers and activity of the wasps in Dirut, Assiut governorate. Also, the efficiency of various concentrations of liquid culture of yeast (0,25,50 and 100%) as an attractive agent and bait to the oriental wasps were taken into consideration.

### MATERIALS AND METHODS

The present investigation was carried out in a private apiary yard located at Dirut, Assiut governorate, Egypt during 2003. For preparing the traps, the big wooden trap recommended by the Ministry of Agriculture<sup>[6]</sup> was modified as follows:

This trap is constructed of two wooden boxes of honey bee hive, one is empty honey chamber placed a top of the empty brood chamber. One circular opening is about 20 cm in diameter was cut in bottom board of the empty brood chamber with the exception one wire of gauze cone about 25 cm long was fitted into the opening and was directed inwards (Fig.1A&B). The top of the



**Fig. 1:** The construction of trap.

B.D.: Bottom board, H.S.: Hive stand,  
W.G: Wirw gauze cone, H.Ch.: Honeychamber,

Q.E.: Queen excluder, C.W.: Captured wasps,  
Cont.: Container of plastic, B.ch.: Brood chamber

wire cone has a small inner hole about 2.5 cm in diameter that allows for the entrance of the wasps but prevents their escape. The top cover of the upper box (empty honey chamber) was made of queen excluder to allow for the light, which attracts the wasps upwards. The two boxes were placed on a hive stand about 40 cm high and the bait put in container of plastic 35 cm high placed under the bottom board (Fig.1C).

- 500 g sugar + 500 ml water (control).
- 500 g sugar + 125 ml yeast culture + 375 ml water (25%).
- 500 g sugar + 250 ml yeast culture + 250 ml water (50%).
- 500 g sugar + 500 ml yeast culture + 500 ml water (100%).

**1-Seasonal abundance of the oriental wasps (*Vespa orientalis* L.):** This experiment was conducted from March to December, 2003 and five traps baited with sugar solution (1:1) were used for this study. The traps distributed randomly in the experimental apiary and the total number of captured wasps were counted every week. Weekly mean temperatures and relative humidity (R.H) at Dirut region were obtained from the general authority for meteorology, Cairo, Egypt.

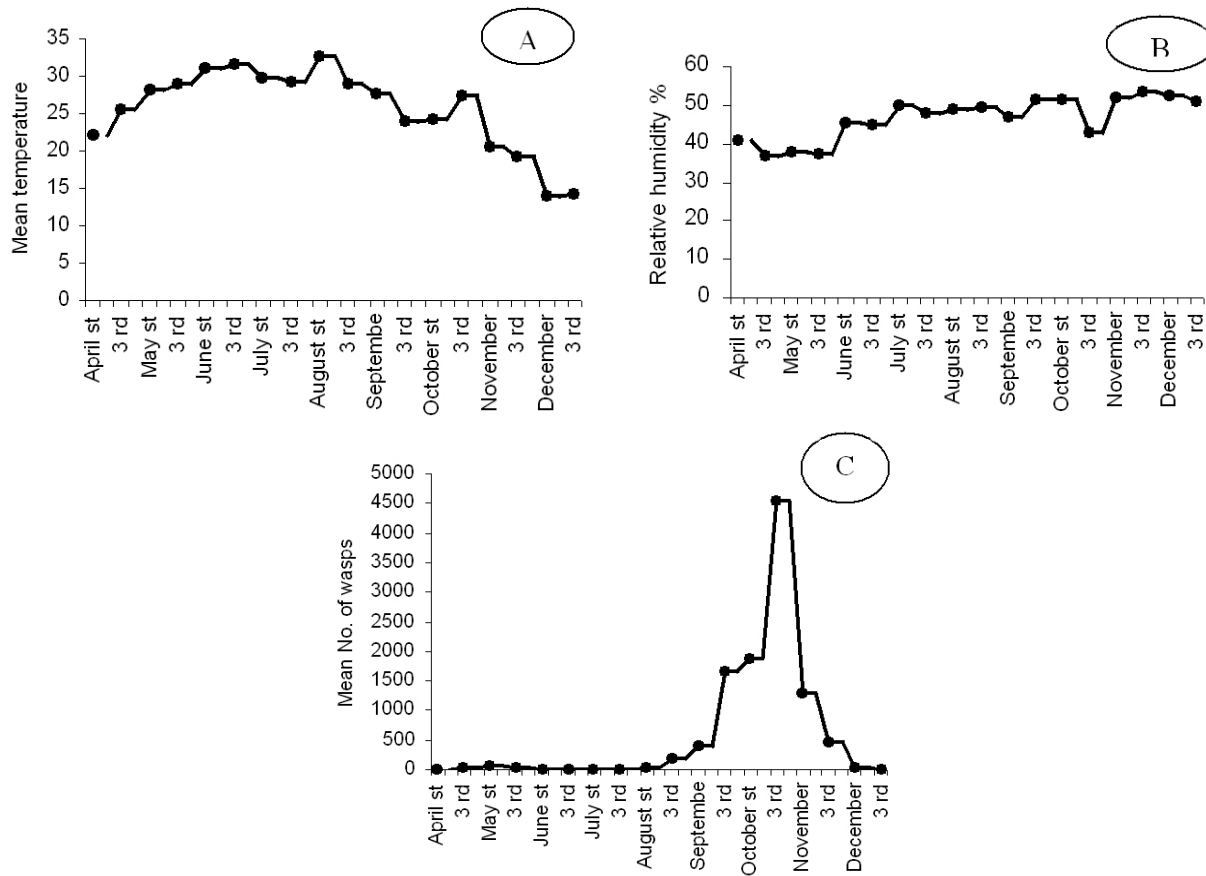
Twelve traps were used in this study, where three traps were used as replicates for each concentration of liquid yeast culture and the other three baited with sugar solution (1:1) as a control.

**2-The effect of yeast liquid culture (*Candida tropicalis*) as bait on the captured oriental wasps (*Vespa orientalis* L.):** This experiment was conducted from August to October 2003. A soil yeast culture (*Candida tropicalis*) was isolated and grown to the late exponential phase ( $1.2 \times 10^5$  CFU/ml) on a sterilized medium containing in tap water: 10% molasses, 0.3% (w/v) urea and 0.1% lactic acid<sup>[5]</sup>. Three concentrations of the tested liquid yeast culture were used as follows:

Analysis of variance (ANOVA) was carried out for the obtained data according to the method of Waller and Duncan<sup>[13]</sup>. The correlation coefficient values between the number of captured wasps and both temperature and relative humidity were calculated.

## RESULTS AND DISCUSSIONS

**1- Seasonal abundance of the oriental wasps (*Vespa orientalis* L.):** Regarding to the seasonal abundance of the oriental wasps (*Vespa orientalis* L.) the data presented in Table (1) and Fig. (2 C) indicated that the wasps started to appear at Dirut location during the first week of April but in scarce number (13 wasps/ trap) then increased gradually to the third week of May (40 wasps/ trap). Thereafter, the weekly numbers of captured wasps in the traps decreased to low value during June (late spring) and



**Fig. 2:** The effect of temperature and relative humidity on the weekly mean number of oriental wasps.

**Table 1:** Seasonal abundance of wasps *Vespa orientalis* L. at Dirut Assiut governorate during the period from April to December, 2003.

Time	Mean No. of wasps in the trap								
	Spring			Summer			Autumn		
	April	May	June	July	August	September	October	November	December
First week	13	70	6	2	21	390	1870	1301	32
Second week	17	135	7	2	51	640	3201	640	12
Third week	31	40	4	3	170	1651	4550	470	5
Fourth week	65	22	4	9	350	3301	1611	42	0.0
Total	126	267	21	16	592	5982	11232	2453	49

July (earlier summer). In summer season, marked increases in the wasps from the second week of August (51 wasps/ trap) to the fourth week of September (3301 wasps/trap) were recorded. Weekly mean numbers of oriental wasps reached to the highest value during the autumn season particularly in the third week of October (4550 wasps/ trap) and the first week of November (1301 wasps/ trap). Total number of the wasps reached the highest value in October (11232 wasps / trap) followed by September (5982 wasps/ trap) and November (2453 wasps/ trap) respectively. A sharp decline took

place during the second week of December and the wasps disappeared at the fourth week of December.

The obtained results clearly indicate that the *Vespa orientalis* L. started to appear in Dirut, Assiut governorate in April then decreased gradually to recorded the minimum levels during June and July. In early summer the wasps increased gradually to record their highest numbers in the late summer and early autumn. During the seasonal activity of wasps, the highest numbers were recorded in October, September and November respectively. Also the oriental wasps at Dirut region

**Table 2:** Correlation coefficient between the mean numbers of wasps and the mean temperature and relative humidity (R.H.%) during the different seasons of 2003.

Season	Correlation coefficient (r value)	
	Temperature °C	Relative humidity %
Spring	0.06	- 0.67 *
Summer	- 0.79 *	0.077
Autumn	+ 0.872 *	- 0.74 *

\*: Significant correlation at 0.05 probability.

**Table 3:** The efficiency of different concentrations of yeast liquid culture (*Candida tropicalis*) on the captured oriental wasps by the trap during the period from September to November 2003.

Concentrations of Liquid yeast	Mean No. of wasps in the trap					
	September		October		November	
	24 h.	7 days	24 h.	7 days	24 h.	7 days
25%	10 a	474 a	19 a	1082 a	39 a	246 a
50%	17 b	929 a	33 a	1928 a	60 a	351 a
100%	36 c	3056 c	64 b	4948 b	113 b	805 b
Control	6 a	237 a	14 a	803 a	21 a	180 a
L.S.D.	5.45	2018.56	22.83	2616.51	48.25	339.20

A,b,c for the comparison between the different concentrations of liquid yeast and control.

completely disappeared in the fourth week of December. The obtained results seem to confirm the findings of Mellor,<sup>[9]</sup> Sharkawi<sup>[11]</sup> and Ibrahim and Mazed<sup>[6]</sup> at Giza, Egypt where they stated that the population density of the oriental wasp *Vespa orientalis* L. was very low during spring and early summer then gradually increased to reach the peak of abundance in September, October and early November. In Upper Egypt Ahmed<sup>[2]</sup> recorded that the population density of the oriental wasp in three sites Abu-Tisht, Quena and Isna started in spring from March and reach the highest numbers in September and October. In other studies on the population density of wasps at Zagazig and El-Mullak districts in Egypt, Khater *et al.*<sup>[7]</sup> found that *Vespa orientalis* L. started to appear at both Zagazig and El-Mullak districts during March but in scarce numbers. Gradual increases occurred during the June and recorded the highest numbers during the first period of September then decreased gradually to completely disappear at the end of December.

Correlation coefficient in Table (2) reveals that there is a positive significant correlation between the weekly numbers of oriental wasps captured in the traps and mean daily temperature during spring and autumn, while a negative significant correlation was recorded in summer season. Furthermore, a negative significant correlation were detected between weekly numbers of wasps and relative humidity (R.H.%) in spring and autumn, while this correlation was slightly positive in summer season. These results were shown in Fig. (2 A) where in spring season mean number of wasps increased with the highest temperature. After that the wasps decreased in early summer (June and July) and returned to increase gradually in late summer (September) with the decrease

of temperature. The number of wasps reached to the highest number in October with the decrease of temperature, but in November the number decreased slightly until disappeared in the fourth week of December. The effect of relative humidity (R.H.%) on the activity of wasps was shown in Fig. (2 B). It was observed that in spring season relative humidity was low and the wasps increased gradually until the earlier of summer. In autumn season the relative humidity reached its highest value in November and December with reduction of the wasps to the minimum numbers. Khater *et al.*<sup>[7]</sup> found a positive significant correlation between the monthly oriental wasps caught and the mean of daily temperature. Also he stated a slight negative correlation between the mean numbers of wasps and RH % was detected. Also, Ibrahim and Mazed<sup>[6]</sup> observed that the degree of temperature affects the activities of the oriental wasps where warm nights lead to the mortality of all the trapped wasps. In contrast, warm nights lead to great activities of the wasps during the following day as indicated by the large numbers caught in the traps.

**2-The effect of liquid yeast culture (*Candida tropicalis*) as bait on the captured oriental wasps (*Vespa orientalis* L.):**

The efficiency of liquid yeast culture (*Candida tropicalis*) as bait on the captured oriental wasps, data presented in Table (3) show that traps baited with 100% of Liquid yeast culture captured the highest numbers of *Vespa orientalis* after 24 hr. and 7 days of baiting the traps during September, October and November (36& 3056 wasps/ trap), (64& 4948 wasps/ trap) and (113& 805 wasps/ trap) respectively. Application of 25% of liquid yeast culture recorded the lowest mean numbers of captured wasps in the traps. Statically analysis of the numbers of captured wasps indicated that there are significant differences between the traps baited with 100% of liquid yeast culture and the other concentrations i.e., 25% and 50% of liquid yeast culture and control traps. Ibrahim and Mazed<sup>[6]</sup> and Ahmed<sup>[2]</sup> recorded that using trap of Ministry of Agriculture baited with honey exhibited a highest fitness for the high season of oriental wasps population than the hanged trap (Abou- Elezz trap). In the present study, 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<sup>[4,3]</sup>. Abd El-Wahab and Gomaa (2005) detected that feeding honey bee colonies with liquid yeast culture induced a high level of honey bee biological activities.

It could be concluded that the beekeepers at Dirut location, Assiut governorate should be more careful during the peak of oriental wasps abundance which occurred from August till November. They should take all necessary procedures such as using the baited traps to

capture and prevent those large numbers of wasps from invading their apiaries. Application of liquid yeast culture (*Candida tropicalis*) as bait is efficient procedure to capture the oriental wasps by the recommended traps.

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