

Effect of Two Hive Height Levels on some Honeybee Activities and Hornet Attacking under Nasr City, Conditions, Cairo, Egypt.

Abolaban, G. F.

Dept. of Plant protection, Fac. of Agric. Al-Azhar Univ., Cairo, Egypt.



ABSTRACT

The research was carried out at apiary of Department of Plant protection, Faculty of Agriculture, Al-Azhar University, Cairo, Egypt, to determine the effects of locality levels of hives on acceptance, mating success and pre-oviposition period of Carniolan F₁ hybrid and Italian F₁ hybrid queens and, the effect of locality levels of hives on brood inch² and pollen collection per gram, as well as, the effect on wasp traps efficiency under Nasr City conditions. The mean percentage of acceptance was 100% for lower and upper (Carniolan F₁ hybrid and Italian F₁ hybrid queens) except mating success in lower Carniolan F₁ hybrid was 88.89% while the pre-oviposition period for Carniolan F₁ hybrid and Italian F₁ hybrid were (12.50, 11.83, 10.83 and 10.00 days) respectively. The mean of sealed worker brood inch square / colony were (133.33, 74.66, 46.60 and 35.11). The mean pollen gathering in gram / colony were (3.08, 4.33, 3.35, 2.76 and 2.35 for lower and 1.07, 1.55, 1.09, 0.81 and 1.00 for upper from (6-8, 8-10, 10-12, 12-2 and 2-4 Am) respectively. The relation between number of *Vespa orientalis* and pollen gathering was obviously noticed in upper more than lower. The results were statistically analyzed and discussed.

INTRODUCTION

The queens rearing is one of the major objectives of apiaries especially for the commercial beekeepers, and it is the main factor in beekeeping as there is only one queen in honeybee colony. It is known that, economic characteristics of the honeybee colony are dependent mainly on the quality of its queen (Harris, 2009). The queen quality, in turn, depends up on the genetic, the environmental factors, breeding conditions and the queen rearing methods (Zedan, 2002, Taha, 2005).

Pollen is the natural major of protein source of the honeybee colonies, it is very important and necessary for the development, worker brood area producing, strength, and healthy of the honeybee colony. A good relationship between pollen and sealed worker brood cell of honey bee activities and their products under suitable environmental conditions according to the role which say no pollen no bees (Harbo, 1986 and Chinh *et al.*, 2005).

Predatory wasp named the yellow-banded brown wasp or oriental hornet, (*Vespa orientalis* L.) populations attacking honeybee colonies (Akre and Mayer, 1994), is important as a primary pest of honeybee in the Middle East (Mellor, 1928 and Wafa, 1956). The wasp workers fly near the hives, attack and capture bee guards at hives entrances and catch honeybee foragers visiting flowers and they may enter honey bee hives and carry larvae, pupae, honey, pollen and adults (Al- Heyari *et al.*, 2016). These wasps fly back to their nests to feed their brood, causing weakness to the honeybee hives, and minimize bees productivity in honey, pollen, wax and other products (Khodairy & Awad, 2013; Abdelaal & El- defrawy, 2014 and Iftikhar & Mahmood, 2015).

The present study aimed to evaluate the influence of two hive levels (zero and 20 m. high) on acceptance, mating success, pre-oviposition period, stored pollen and sealed worker brood areas, moreover assessment of wire traps to collecting wasp hornet by using pheromone and baits wire traps under the environmental conditions of Nasr city, Cairo, Egypt.

MATERIALS AND METHODS

The study was carried out at the apiary of Department of Plant Protection, Faculty of Agriculture, Al-Azhar University, Cairo, Egypt, to evaluate the effects of two hive levels (zero & 20 m.) on acceptance, mating success and pre- oviposition period of Carniolan F₁ hybrid and Italian F₁ hybrid colonies. However, the effect of two hive levels (zero & 20 m.) on brood area inch² and pollen collection per gram, as well as, the effects of two hive levels (zero & 20 m.) on wasps traps efficiency under Nasr City conditions.

The effect of two height hive levels (zero and 20 m. high) on acceptance and mating success percentages, preoviposition period and sealed worker brood of F₁ hybrid, Carniolan and Italian honeybee queens:

At this experiment we are preparing 12 similar colonies as queenless mating boxes; each colony consists of four combs (two honey and pollen combs and the other two sealed brood combs). All combs were covered with bees (Sharma and Kumar, 2001). And it was repeated three times, in summer 2017, the newly emerged queens which rearing at the same conditions of F₁ hybrid, Carniolan and Italian honeybee virgin queens were marked (by different colours) and introduced to the similar colonies queenless mating boxes, under screening cages. At the second day small notches were made under the cage then the bees released the queen after short period and recorded acceptance percentages. The examination was made periodically every day until virgin queens were mated and started egg laying, then percentages of success mating and preoviposition periods were calculated. The sealed worker brood inch², activity was measured at (13) day intervals, by using a langstroth frame divided into square inches for each colony at upper and lower height.

Pollen gathering activities

Six colonies were chosen, nearly similar, in strength, stored food, headed by mated queen sisters which were reared at the same factors and conditions and the number of combs covered with bees. The experimental colonies were grouped, into two groups (upper and lower) three replicates for each group were

used. Pollens were collected by pollen traps and weighted each two hours daily for about twenty one days, by electric balance to the nearest 0.01 mg (g/colony) at the efficiency of trap equal 80%.

Determination of the efficiency of the pollen trap.

The efficiency of the pollen trap in collecting pollen loads was determined by counting 100 worker bees for each hive entering as pollen loads on their hind legs through the empty trap. The number of pellets that fall in the tray was counted and the efficiency of the fixed trap was calculated according to the equation reported by Khattab (1976) as the following:

$$\text{pollen trap efficiency} = \frac{\text{number of pollen pellets in the box}}{200} * 100$$

The effect of two height hive levels (zero & 20 m. high) on the population abundance of the oriental hornet by two types of wire traps and manual control.

The daily activity of oriental hornet, pheromonal wire traps (vispula plus) and bait wire traps (bait consist of: fermented sugar, honey, grapes, fruits, molasses and yeast), three replicates for each trap at upper and lower levels, were used weekly starting from 8 a.m. to 8 p.m. during the experimental days, during autumn 2017. The caught hornets were counted and calculated (wasps number / wire trap / day).

Statistical analysis:

Data collected were statistically analyzed and the treatment means were compared at 5% probability levels by LSD test (SPSS software ver. 20 for windows 7 following the methods of (Steel and Torrie 1980).

RESULTS AND DISCUSSION

Data presented in Table (1) showed that the mean percentage of acceptance were 100% for lower and upper (Carniolan F₁ hybrid and Italian F₁ hybrid colonies) except

Table 1. Effect of two height levels (zero & 20 m. high) on acceptance, mating success queens, pre-oviposition period and sealed worker brood area inch²/ colony of honeybee during summer at Nasr city conditions, Cairo, Egypt.

Treatment Parameter	Zero		20 m. high	
	Italian F ₁	Carniolan F ₁	Italian F ₁	Carniolan F ₁
No. introduced queens	9.00	9.00	9.00	9.00
No. accepted queens	9.00	9.00	9.00	9.00
No. succeeded queens	9.00	8.00	9.00	9.00
Success mating (%)	100	88.89	100	100
Pre-oviposition period	12.50a	11.83ab	10.83bc	10.00c
Sealed worker brood	133.33a	74.66b	46.60c	35.11c

Data followed by the same litters are not significantly different at 5 % by Duncan, 1955.

Data presented in Table (2) and Fig.(1) showed that the means of collected bee-pollen were 3.08, 4.33, 3.35, 2.76 and 2.35 g/colony for lower colonies, and 1.07, 1.55, 1.09, 0.81 and 1.00 g/colony for upper colonies at 6-8, 8-10, 10-12, 12-2 and 2-4 Am, respectively.

While data illustrated graphically. While data presented that in Fig.(2) showed that smallest mean daily number of *V. orientalis* was (1.67 but the biggest number was 9.00 / weir trap) at lower level but the smallest mean daily number of *V. orientalis* was (7.67 but the biggest was 22.33 / weir trap) at upper level respectively, showed the relation between number of *Vespa orientalis* and pollen

mating success in lower level Carniolan F₁ hybrid was 88.89% while the pre-oviposition period for Carniolan F₁ hybrid and Italian F₁ hybrid were (12.50, 11.83, 10.83 and 10.00 %) respectively. The mean of sealed worker brood inch square / colony were (133.33, 74.66, 46.60 and 35.11). Important factors affecting successful *A. mellifera carnica* virgin queen production in Sohag, Egypt at 2007 and 2008. They found spring season was favorable for queen rearing, followed by Autumn, Summer and Winter (Nageh, *et al.*, 2010). The length of pre-oviposition periods (or age at which the queen starts egg laying) is related inversely to the weight of the queen at emergence; queens which were light on emergence mated later than those which were heavy. (in langstroth hives, swarm boxes and small mating nuclei) (Eid *et al.*, 1980).

The light queens were mated within an average of 17 days after emergence, while the heavy ones were mated within 10 days (Taranov, 1973).

The brood rearing activity of carniolan race colonies at Giza Governorate started from the first week of February and increased gradually during the flowing months, March and April. The largest amount of brood was reared during April, with an average of 671,38 inch² /colony. These periods coincided with the beginning of the flowering and the major nectar flows coming from the Egyptian clover. Following this peak brood rearing declined gradually with the decrease of nectar and pollen sources where the amount of brood rearing was estimated by 11.66, 10.96 and 6.79% during May, June and July, respectively (Abd-AL-Fattah, 1983).

We can say the increase of sealed workers brood area inch² cusses by the increase pollen gathering quantities, not by the short of pre oviposition period, at the upper and lower levels.

gathering activity. Colonies in the lower level were more active in pollen collection compared to colonies in the upper level. Pollen area (in.²)/colony during spring and winter seasons is due to absent of oriental hornet and presence of Eucalyptus flow while attacking of oriental hornet lead to decreasing of the monthly mean of the stored pollen area (in.²)/colony during autumn Al Ayat (2016). Wasp workers fly near bee hives, attack and capture bee guards at hives entrances and catch honeybee foragers visiting flowers and they may enter honey bee hives and carry larvae, pupae, honey, pollen and adults (Al- Heyari *et al.*, 2016).

Table 2. Effect of two hive height levels (zero & 20 m.high) on pollen gathering of carniolan honey bee during autumn under Nasr city, conditions, Cairo, Egypt.

levels hr. Day	Zero							20 m						
	6-8 hr.	8-10 hr.	10-12 hr.	12-2 hr.	2-4 hr.	total	Mean	6-8 hr.	8-10 hr.	10-12 hr.	12-2 hr.	2-4 hr.	total	mean
1 st	2.38	3.11	2.00	1.51	1.67	10.67	2.13	0.47	0.66	0.52	0.22	0.37	2.24	0.45
2 nd	2.71	3.23	4.40	2.32	1.66	14.32	2.86	0.46	0.92	0.59	0.36	0.38	2.71	0.54
3 rd	2.62	3.31	2.89	1.98	2.39	13.19	2.64	0.27	1.22	0.73	0.21	0.48	2.91	0.58
4 th	2.57	3.93	3.10	1.94	1.91	13.45	2.69	0.61	1.05	0.65	0.38	0.35	3.04	0.61
5 th	3.40	3.80	3.03	2.35	1.87	14.45	2.89	0.68	0.96	0.62	0.28	0.57	3.11	0.62
6 th	3.39	3.90	3.91	3.40	2.83	17.43	3.49	0.46	1.16	0.95	0.29	1.11	3.97	0.79
7 th	3.85	3.89	2.73	2.85	2.19	15.51	3.10	0.85	1.20	0.83	0.45	0.52	3.85	0.77
8 th	3.18	3.91	3.61	2.91	2.65	16.26	3.25	0.75	0.98	0.81	0.51	0.79	3.84	0.77
9 th	2.87	3.91	3.56	3.06	2.48	15.88	3.18	1.01	1.69	1.25	0.35	0.50	4.80	0.96
10 th	3.30	3.91	3.30	2.94	2.44	15.89	3.18	0.94	1.17	1.22	0.67	0.63	4.63	0.93
11 th	3.12	4.15	3.49	2.97	2.52	16.25	3.25	0.84	1.65	1.01	0.78	0.60	4.88	0.98
12 th	3.09	4.26	3.45	2.99	2.48	16.27	3.25	1.76	1.40	0.86	0.64	0.89	5.55	1.11
13 th	3.17	4.13	3.41	2.97	2.48	16.16	3.23	1.31	1.61	0.98	1.18	1.00	6.08	1.22
14 th	3.13	4.38	3.45	2.98	2.49	16.43	3.29	1.69	1.84	0.83	1.26	0.70	6.32	1.26
15 th	3.13	4.63	3.43	2.98	2.48	16.65	3.33	1.21	1.62	1.53	1.31	0.88	6.55	1.31
16 th	3.14	4.91	3.43	2.97	2.48	16.93	3.39	0.70	2.34	1.65	1.19	1.05	6.93	1.39
17 th	3.13	4.96	3.44	2.98	2.49	17.00	3.40	1.52	1.64	1.63	1.48	1.59	7.86	1.57
18 th	3.14	5.11	3.43	2.98	2.48	17.14	3.43	1.73	2.02	1.60	1.31	1.35	8.01	1.60
19 th	3.14	5.51	3.43	2.98	2.48	17.54	3.51	2.77	2.01	1.16	1.42	1.24	8.60	1.72
20 th	3.14	5.61	3.44	2.98	2.49	17.66	3.53	1.16	2.43	1.69	1.30	2.96	9.54	1.91
21 th	3.14	6.40	3.43	2.98	2.48	18.43	3.69	1.25	2.98	1.84	1.37	2.97	10.41	2.08
total	64.74	90.95	70.36	58.02	49.44	-	-	22.44	32.55	22.95	16.96	20.93	-	-
mean	3.08	4.33	3.35	2.76	2.35	-	-	1.07	1.55	1.09	0.81	1.00	-	-

LSD at 5%
Between lower and upper
F 254.2748
P .0000 ***

LSD at 1% 0.351607

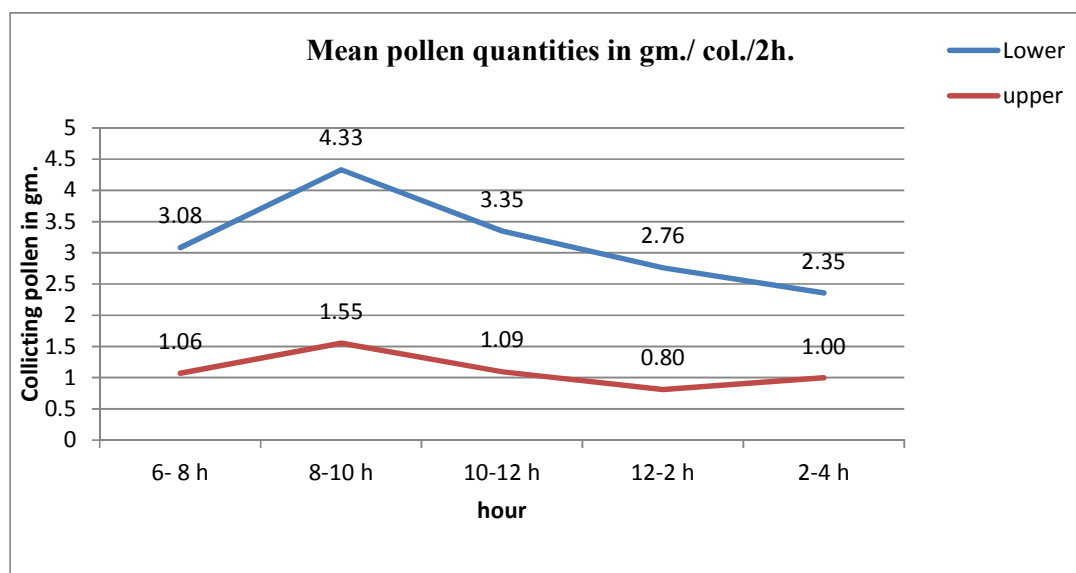


Fig. 1. Effect of two hive height levels (zero & 20 m. high) on pollen gathering by honeybee workers (in gm./ colony / 2 hours) under Nasr city, conditions Cairo, Egypt.

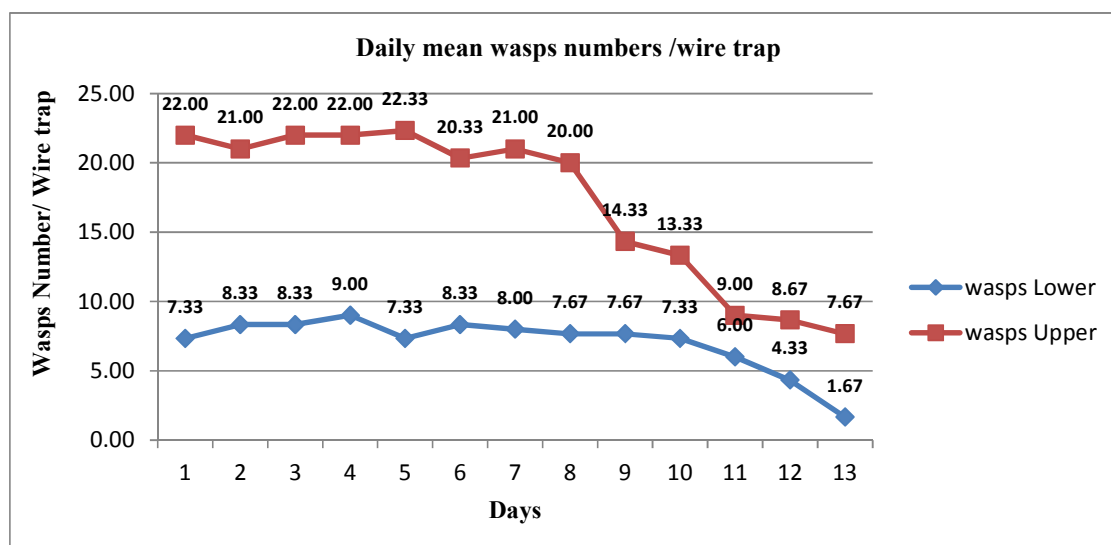


Fig. 2. Effect of two height levels (Zero & 20 m. high) on daily mean numbers of wasps which caught by wire traps under (Nasr city) conditions, Cairo.

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فعالية اختلاف ارتفاع مستوى الخلية على بعض أنشطة نحل العسل وهجوم الدبور الأحمر تحت ظروف مدينة نصر-القاهرة- مصر جمعه فتح الله أبولين قسم وقاية النبات - كلية الزراعة - جامعة الأزهر بالقاهرة

أجريت هذه الدراسة في منحل كلية الزراعة - جامعة الأزهر بمدينة نصر القاهرة خلال عام ٢٠١٧م، واستخدمت فيه طوائف نحل كرنبولي وإيطالي هجين أول وقسمت هذه الطوائف الى مجموعتين مجموعة على سطح الأرض والاخرى على ارتفاع ٢٠متر من سطح الأرض، وقسم هذا العمل الى ثلاث تجارب، التجربة الاولى كانت عبارة عن دراسة تأثير ارتفاع الخلية (صفر و ٢٠متر) على أنشطة الملكة حيث أوضحت النتائج أن نسبة نجاح قبول الملكات العذارى والتلقيح كانت ١٠٠% لكل من الهجين الأول الإيطالي والكرنبولي عدا الهجين الأول الكرنبولي الموجود على سطح الارض حيث كانت ٨٨.٨٩% اما بالنسبة للمدة المنقضية قبل وضع البيض فكانت (١٠.٨٣ و ١٠.٨٣ و ١١.٨٣ و ١٢.٥٠) يوماً عند مستوى ارتفاع صفر و ٢٠متر لكل من الهجين الأول الإيطالي والكرنبولي على التوالي كما أن مساحة حضنة الشغالات المقلدة (١٣٣.٣٣، ٧٤.٦٦، ٤٦.٦٠، ٣٥.١١) بوصة مربعة/طائفة عند مستوى ارتفاع صفر و ٢٠متر لكل من الهجين الأول الإيطالي والكرنبولي على التوالي. أما التجربة الثانية فتم فيها دراسة تأثير الارتفاع على نشاط طوائف نحل العسل في جمع حبوب اللقاح وذلك خلال ساعات النهار المختلفة للهجين الأول الكرنبولي وعلى مدار ثلاثة اسابيع حيث أوضحت النتائج أن متوسط إنتاج الطائفة كانت (٣.٣٥، ٢.٧٦، ٣.٣٥، ٤.٣٣، ٣.٠٨) عند مستوى ارتفاع صفر و (١.٠٠، ٠.٨١، ٠.٠٩، ١.٥٥، ١.٠٧) على ارتفاع ٢٠متر خلال ساعات النهار من (٦-٨، ٨-١٠، ١٠-١٢، ١٢-١٤، ١٤-٢٠، ٢٠-٤) على التوالي. التجربة الثالثة كانت لدراسة تأثير الارتفاع على اعداد الدبور الأحمر والتي صيدت بواسطة المصائد السلكية حيث كانت اعداد الدبابير على ارتفاع ٢٠متر أعلى من اعداد الدبابير عند مستوى ارتفاع صفر بحيث تراوحت في الأولى ما بين (٧.٦٧، ٢٢.٣٣) وفي الاسفل من (١.٦٧، ٩.٠٠) دبوراً لكل مصيدة/يوم وقد أثبت التحليل الإحصائي للنتائج وجود فروق معنوية.