

*Annals Of Agric. Sc., Moshtohor,  
Vol. 43(4): 1973-1980, (2005).*

**EFFECT OF DIFFERENT GRAFTING METHODS ON SOME  
IMPORTANT CHARACTERISTICS AND MATING SUCCESS OF  
CARNIOLAN F1 HYBRID QUEENS OF HONEYBEE  
BY**

**El-Dessouki, S.A.; Eissa, I.S.; El-Khouly, A.S. and Abo-Laban, G.F**  
Fac. of Agric. Al-Azhar Univ., Cairo, Egypt.

**ABSTRACT**

This study indicated that, the queen rearing in Carniolan F<sub>1</sub> hybrid colonies with double grafting gave the highest virgin queen weight of about 203.7 and 200.0 mg followed by 181.7 and 187.3 mg incase of wet grafting, while the lowest weight of virgin queen was 151.7 and 160.4 mg for dry grafting method which reared during the experiment years (2003 & 2004), respectively.

The results showed that, the mean percentage of mating success for the queens produced by the different grafting methods (double, wet and dry), were 57.5, 83.3 and 75.0 %, respectively. The lowest mean percentage of mating success was recorded by the queens produced by double and dry grafting methods. The highest success was found by the queens produced by wet grafting method.

The mean of preoviposition periods for the emerging virgin queens produced by grafting methods (double, wet and dry) were 10.69, 12.87 and 13.57 days, respectively. From the obtained results the shortest preoviposition periods were founded by double and wet grafting methods, while the longest preoviposition periods were at dry grafting method. The results were statistically analyzed and discussed.

**INTRODUCTION**

There is only one queen in honeybee colony which may consist of up to 60000 workers and up to several handered drones yet both bees and beekeepers attach the greatest importance to here presence, there is good reason for this: She is the mother of all other individuals in the colony .She may live several years, but worker bees live only a four weeks during the active season and without their constant replacement the colony dies. She is the custodian of the male parents contributions to the heredity of her female offspring. (Laidlaw 1975 & 1978). All, orate least nearly all, of the commercial rearers in the Egyptian apiaries was Doolittle's methods of transferring young larvae from worker comb in to specially prepared queen cell cups (Doolittle, 1888)

It is known that the economic characteristics of the honeybee colony are dependent mainly on the quality of its queen. The queen quality, in turn, depends on the genetic, the environmental factors, the breeding conditions and the queen rearing methods. Hoopingraner and Farrar (1959), Nagi, (1984) and Zedan (2002). At the same time the artificial insemination of honeybee queens is practiced in bee breeding programs, yet the natural mating is the sole route for propagating queens for commercial beekeepers. On the other hand there are many factors affecting the mating of honeybee queens. These factors may be summarized as follows: weight of newly emerged queens, age of virgin queens and seasonal variations El-Sayed (1977) and Severson and Erickson, (1989).

The purpose of the present study is to evaluate the different methods of grafting on the newly emerged honeybee queens weight, mating success and preoviposition period for Carniolan F<sub>1</sub> hybrid queens.

### MATERIALS AND METHODS

Four honey bee colonies Carniolan 1<sup>st</sup> hybrids were used in this experiment. And divided to two starter hives (queen less) and the other hives were finisher (Queen Wright). Modified hive after Diab (1986) and Bediar (1990).

#### Preparing young larvae (mother colony):

In order to obtain larvae at the proper age (24 hours), a prolific queen of a selected colony was confined with a marked empty worker comb from which worker bees had just emerged, in a special cage provided with queen excluders on both sides. Because the queen would prefer such comb to deposit eggs. After 24 hours, the comb with newly laid eggs was lifted out in the cage was placed in the center of the brood nest of the colony and kept in the hive. By using this technique the queen will obligate to deposit its eggs in the comb provided for this purpose. That helps to define the age of the larvae, which will be used for grafting, which not exceed than 24 hours, Hagag (1989).

- Preparing artificial wax cups after (Doolittle 1888) and placed it on the wood bar by wax (15 wax cups / wood bar).
- Polishing the empty artificial wax cups before grafting, Lilianke *et al.* (2003).
- Grafting by three methods (Double, Wet and Dry) after (Doolittle 1888).
- Placed grafted queen cell-cups at the frame holding by alternating system and introduced to starter colony (45. wax cups/colony)
- At the third day all accepted queen cell cups were transferred with frame holded them and inserted in the prepared finisher and ripening unit (modified hive) .30 queen cell cups per unit.
- After nine days of grafting the sealed queen cells are carefully appropriate time and bars each queen cell was put into a screened cage until emergence. (By natural incubation).
- The emerged virgin queens were weighted individually in known weight small glass vial by electric balance.
- Preparing of the queenless mating boxes; each consists of four combs langstroth (two honey and pollen grains combs and the other two langstroth

sealed brood combs). All combs were covered with bees after Sharma and Kumar.(2001)

- During the four periods of season, early spring, mid spring, late spring and early summer in 2004 the newly emerged queens were weighted and classified into 3 groups (5 replicates for each treatment) according to their grafting methods, remarked (by different colourations) and introduced to the queenless mating boxes, under screening cages and at the second day small notch's were made under the cage then the bees released the queen after short period. Examined periodically every day until mated and started egg laying then percentages of success mating and preoviposition periods were calculated. The data statistically analyzed by "F" test after Duncan's (1955).

## RESULTS AND DISCUSSION

### The weight of newly emerged queen:

Data (illustrated in Table 1 and represented in Fig. 1) proved that the highest averages of weight were obtained from the queens resulted from double grafting method (203.7 & 200 mg) during the two tested years, 2003 & 2004, respectively. The averages of queen weight by the wet and dry grafting methods were 181.7 & 187.3 mg and 151.7 & 160.3 mg during the two investigated years, respectively. In other words the lowest weight was by the queens of dry weight grafting method. The differences between the weight averages by the three methods carried out were statically highly significant. The L.S.D. values were 5.13 & 5.66 at 0.05 probabilities during 2003 & 2004 respectively. The present results were in agreement with that obtained by Askew (1957) who recommended double grafting method to get best queens in relation to the weight, Holzberlein (1958) stated that the prime principle of the double grafting system is to insure that the grafting larvae have an enough supply from royal jelly of the proper consistency, Szabo (1973) found that the weight of queens at emergence appeared to be reliable character for selecting for grafting the good queens, Taber (1980) and Dedej (1994) preferred the double grafting technique for good queen production.

In the respect to mating success: The data presented in Table 2 & Fig. 2. showed that, the mean percentage of mating success for the queens produced by different grafting methods of double, wet and dry were succeeded with percentages of 57.5, 83.3. and 75.0%, respectively. From the obtained data also showed that the lowest. Mean percentage of queens mating success was recorded by queens produced by the double grafting method, followed by the dry grafting one. The high mating success percentage was detected by the wet grafting method. The statistical analyses of data proved significant differences between averages of the three methods.

The data about the preoviposition period under the three treatments on honeybee queens showed that, the averages of this periods were 10.69, 12.89 and 13.57 days by the double, wet and dry grafting methods, respectively (Table 3 and Fig. 3) this result was in agreement with that obtained by Eid *et al.* (1980), who found that the light weight queens were mated within an average of 17 days after emergence, while the heavy ones were mated within 10 days.

Table (1): The effect of the honeybee queens by grafting methods (Double, Wet and Dry) on weight of newly emerged queens of the Carniolan, F<sub>1</sub> hybrid bee, during, the honey flow seasons (2003 & 2004) at Nassr City, Cairo.

Graf. Method and year Replicates	Year 2003			Year 2004		
	Double G.	Wet G.	Dry G.	Double G	Wet G.	Dry G.
	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)
1	200	190	160	190	180	150
2	190	180	160	190	170	150
3	190	180	150	200	180	150
4	220	180	150	180	180	170
5	210	180	150	190	180	170
6	220	190	160	220	180	170
7	200	170	160	220	180	160
8	190	170	150	220	180	160
9	200	190	160	200	200	170
10	200	190	140	210	190	160
11	190	180	150	200	180	160
12	210	170	150	190	190	160
13	190	190	160	210	180	170
14	210	180	160	200	190	160
15	200	170	160	200	180	160
16	200	180	160	210	200	160
17	210	170	160	230	200	160
18	210	200	150	180	200	170
19	190	190	140	190	200	170
20	200	190	150	210	180	150
21	200	180	150	190	200	160
22	200	200	160	210	200	140
23	200	190	120	210	200	140
24	210	180	170	190	200	190
25	200	170	150	200	190	160
26	210	180	150	190	190	140
27	200	190	140	190	180	150
28	240	170	150	190	190	170
29	220	170	140	190	170	160
30	200	180	140	200	180	170
<b>Total</b>	<b>6110</b>	<b>5450</b>	<b>4550</b>	<b>6000</b>	<b>5620</b>	<b>4810</b>
<b>Mean</b>	<b>203.667 A</b>	<b>181.667 B</b>	<b>151.667 C</b>	<b>200.000 A</b>	<b>187.333 B</b>	<b>160.333 C</b>

"F" Value for year 2003: 98.44 "F" value for year 2004: 199.14

L. S. D. 5%: 5.66 L. S. D<sub>5%</sub>: 5.13

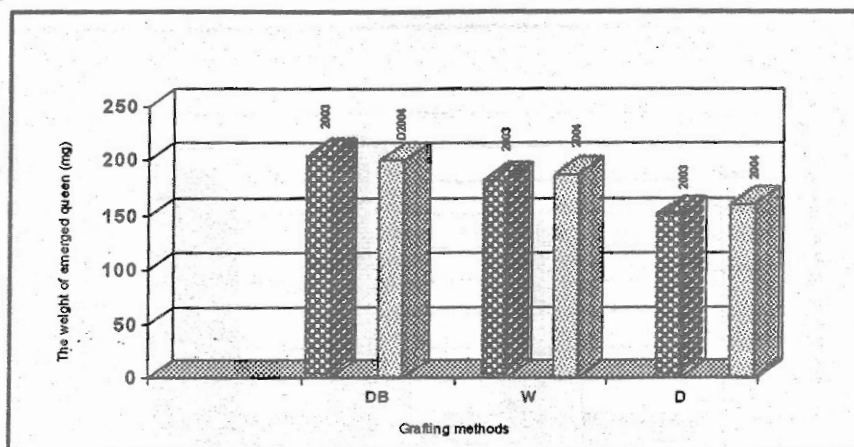


Fig. (1): The effect of different grafting methods, Double (DB), Wet (W) and Dry (D) on the weight of newly emerged Carniolan F<sub>1</sub> queens of hybrid during honey flow seasons (2003, 2004) at Nasst City, Cairo.

Table (2): Effect of different grafting methods on the queens mating success of Carniolan F<sub>1</sub> hybrid during the honey flow seasons (2004) at Nassr City, Cairo.

Graf. Method	Double G.	Wet G.	Dry G.
Season as time Repts.	Mating success percent	Mating success percent	Mating success percent
Early spring	60 %	100 %	70 %
Middle spring	70 %	83.33 %	85 %
Late spring	60 %	75 %	85.5 %
Early summer	40 %	75 %	60.5 %
Total	230 %	333.33 %	300 %
Mean	57.5 C %	83.3 A %	75.0 B %

" F" Value: 4.66

L. S. D. 5%: 19.51

Table (3): Effect of different grafting methods on the preoviposition period for queens of Carniolan F<sub>1</sub> hybrid bees during honey flow seasons(in days) (2004) at Nassr City, Cairo.

Graf. Method	Double G.	Wet G.	Dry G.
Season as time Repts	preoviposition period	preoviposition period	preoviposition period
Early spring	9.2	11.75	12.33
Middle spring	10.1	12.4	13.6
Late spring	11.42	13.33	14.02
Early summer	12.02	13.98	14.33
Total	42.74	51.46	54.28
Mean	10.69 C	12.87 B	13.57 A

" F" Value: 8.06

L. S. D. 5%: 1.96

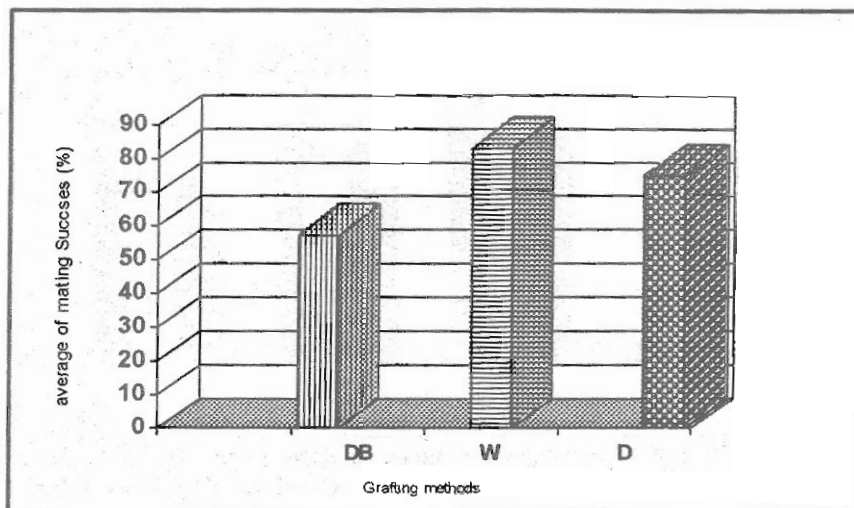


Fig. (2): The effect of different grafting methods, Double (DB), Wet (W) and Dry (D) on the mating success percentage of virgin Carniolan F<sub>1</sub> queens during the honey flow seasons (2004) at Nassr City, Cairo.

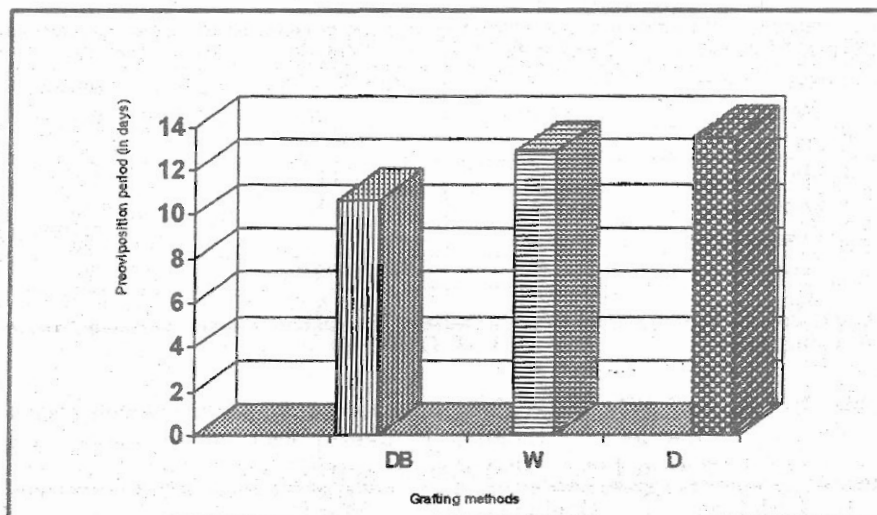


Fig. (3): The effect of different grafting methods, Double (DB), Wet (W) and Dry (D) on the preoviposition period newly emerged queens Carniolan F<sub>1</sub> hybrid during the honey flow season (2004) at Nassr City, Cairo.

#### REFERENCES

- Askew, A.C. (1957): Queen rearing on peleeisland. Gleaings in Bee culture .85 (12): 724-725.
- Bediar, E.I.H. (1990). Increasing honey production in Egypt. Ph. D. Thesis, Fac. Agric. Al- Azhar Univ., Cairo, Egypt.

*Effect Of Different Grafting Methods On Some Important..... 1979*

- Dedej. (1994): Effects of double grafting in queen rearing. *Ape-Nostra Amica*. 16:2,11-14.
- Diab, A.D..M. (1986): Biological and physiological studies on honeybee queens. Ph, D. Thesis, Fac. Agric., Al-Azhar Univ., Cairo, Egypt .
- Doolittle, G.M. (1888): scientific queen rearing *Am. Bee. J*, Hamilton, 111inois. 26pp
- Duncan, D.B. (1955): Multiple range and Multiple F tested. *Biometrics*, 11:1-42.
- Eid, M.A.; Ewies M.A. and Nasr M.S. (1980). The weight of newly emerged honeybee queens as an index of its potential productivity. *Bull Fac. Agric., Cairo Univ., Egypt*, 29:91-111
- El-Sayed, M.E.N. (1977): Studies on some factors affecting the mating of honey bee queens (*Apis mellifera*),Ph, D. Thesis, Fac. Agric., Cairo Univ., Egypt
- Hagag, S.M.(1989): Studies on some factors affecting honeybee queen quality, Ph,D. Thesis, of Agric., Al-Azhar Univ., Cairo, Egypt
- Hoopingarner, R. and Farrar. C.L.(1959): Genetic control of size in queen honey bees, *J. Econ. Ent.* 52:547-548.
- Holzberlein, J.W. (1958): Better queen (rearing cells),*Gleaning in Bee culture*. 86(3): 149-152.
- Lilianke, C.; Shneglv, Z.; Boxiong and Songkvn, SV (2003): Optimizing royal jelly production., *American Bee Journal* 33 (4):(221-224)..
- Laidlaw, H.H. (1975): Queen Rearing. *American Bee Journal*. 115(10);384-387.
- Laidlaw, H.H. (19778): Contemporary Queen Rearing. Dadantx Sons. Hamilton, Lllinos, 199pp.
- Nagi, S.K.A. (1984): Studies on some factors affecting rearing of queens honeybee *Apis mellifera (Hymenoptera Apidae)* under shambt conditions M.Sc . Thesis University of Khartoum Sudan. Vi=165 pp.+ 21 pl .
- Sharma, S.K. and Kumar, Y. (2001): Appropriate time and strength for *Apis mellefera* L. colony division and subsequent built up in Hisar (Haryana). *Annals-of-Biology*. 17: 1, 87-90.
- Severson, D.W. and Erickson, E.H. (1989): Seasonal constraints on mating and insemination of queen honey bees in a continental climate. *Apidologie*. 20:1,21-17.
- Szabo, T.I. (1973b): relationship between weight of honeybee queens (*Apis mellifera* L) at emergence and at the cessation of egg laying. *American Bee Journal*. 113(7); 250-251.
- Taber (1980): Bee Behavior. *Amer. BeeJour*. 121No. (1):852-853
- Zedan, E.W. (2002): Studies on some factors affecting of production quality of honeybee queens at Giza region M.Sc. Thesis, Fac. Agric., Cairo Univ, Egypt

## تأثير طرق التطعيم المختلفة على أوزان ونسبة نجاح تلقيح ملكات هجين أول كرنيولى لنحل العسل

سامي عبد الحميد الدسوقي، إبراهيم سليمان عيسى، عبد المنعم سليمان الخولي،  
جمعه فتح الله أبو لبن  
كلية الزراعة جامعة الأزهر

في هذه الدراسة استخدمت ثلاث طرق تطعيم (مزدوج، مبتل، جاف) و قدر  
اثر ذلك على اوزان الملكات العذاري و نسبة نجاح التلقيح الطبيعي و المدة اللازمه لبدء  
وضع البيض بعد التلقيح، وقد اوضحت النتائج الآتي:-

١. الملكات العذاري الناتجة من التطعيم المزدوج كانت اعلي وزنا من المبتل و الجاف  
خلال موسمي الدراسة. ٢٠٢،٧-١٨١،٧ - ١٥١،٧ ملليجرام في الموسم الاول  
(٢٠٠٣)، و ٢٠٠،٠-١٨٧،٣-١٦٠،٤ ملليجرام في الموسم الثاني (٢٠٠٤)

٢. الملكات الناتجة من التطعيم المبتل اعلي في نسبة التلقيح يليها التطعيم الجاف ثم  
اخيرا التطعيم المزدوج، حيث كانت ٨٣،٣% و ٧٥،٠% و ٥٧،٥% علي التوالي.  
المدة التي تسبق وضع البيض المخصب (وهي التي تقع من تاريخ خروج الملكه  
العذراء من البيت الملكي حتي وضع اول بيضه كان اقلها في حالة التطعيم  
المزدوج ١٠،٧ يوم و المبتل ١٢،٩ يوم و ١٣،٦ يوم في حالة التطعيم الجاف.  
و بالتحليل الاحصائي لهذه النتائج وجدت ان هذه الفروق بينها معنوية