

significant ($P < 0.05$) in 1989. While the different between diameter of queen cell in these treatment were non significant during 1989 and 1990. And also statistical analysis showed that the different between weight of virgin queens which produced in these treatment were highly significant ($P < 0.01$) in 1990 and non significant in 1989, while the different between weight of mated queen in these treatment were highly significant ($P < 0.01$) in 1990 and not significant in 1989.

From the above results it could be mentioned that, the feeding of honeybee colonies during the dearth season on the yeast as pollen substitutes, it was enhancement the characteristics of honeybee queens which reared in the colonies fed on its. Our results are in agreement with El-Berry (1963); Abdellatif, et al. 1971); Woyke (1971); Khattab (1976 & 1981); Atallah, et al. (1980).

b) Effect of the age at which honeybee brood was grafted on the biometric characteristics of reared queens:

Queen were reared from eggs and from larvae 1,2 and 3 days old. They were then naturally mated, the biometric characteristics of these queens are listed during 1989 and 1990 in table (20 a) indicated that, the grafting of eggs, and 1-day old of the worker larvae,

for queen rearing gave increase in all biometric characteristics of queens. Each increase of 1-day old in the age of larvae grafted was decreased not only the body weight but also other biometric characteristics of queens. In 1989. The mean depth of queen cells after emerged the reared queens were 1.84 ± 0.07 , 1.72 ± 0.08 , 1.60 ± 0.05 and 2.02 ± 0.06 cm, respectively. While the mean diameter of these queen cells were 0.96 ± 0.23 , 0.86 ± 0.05 , 0.80 ± 0.04 and 1.04 ± 0.08 cm/cell, respectively. The mean long abdomen of the queens which emerged from larvae 1 day, 2 days and 3 days old and from eggs 3 days old were 1.48 ± 0.073 , 1.38 ± 0.04 , 1.30 ± 0.07 and 1.50 ± 0.04 cm, respectively. While the mean diameter of abdomen emerged queens were 0.52 ± 0.02 , 0.42 ± 0.04 , 0.38 ± 0.04 and 0.62 ± 0.04 cm, respectively.

The mean weight of virgin queens in 1989 were 168.0 ± 1.28 , 142.8 ± 2.72 , 137.8 ± 2.68 and 178.2 ± 3.15 mg/queen, respectively. While the mean weight of mated queens were 200.2 ± 1.65 , 173.2 ± 3.80 , 162.5 ± 2.32 and 212.0 ± 2.47 mg/queen, which reared from worker larvae 1, 2 and 3 days old, and from worker eggs 3 days old, respectively Table (20 a).

Data about the effect of brood age was grafted on the biometric characteristics of emerged queens during

1990 are recorded in table (20 b) showed that the biometric characteristics of emerged queens which reared from worker larvae 1,2 and 3 days old and from worker larvae 1,2 and 3 days old and from worker eggs at 3 days old. The mean depth of the queen cells after emerged the reared queens were 1.96 ± 0.04 , 1.74 ± 0.05 , 1.58 ± 0.04 and 1.88 ± 0.06 cm/queen cm/queen, respectively, while the mean of diameter queen cell were 0.9 ± 0.004 , 0.82 ± 0.05 , 0.80 ± 0.03 and 1.06 ± 0.05 cm/queen, respectively. The mean long abdomen of the emerged queens were 1.50 ± 0.03 , 1.22 ± 0.10 , 1.18 ± 0.04 and 1.52 ± 0.07 cm/queen, respectively, while the diameter of abdomen the emerged queens were 0.50 ± 0.03 , 0.38 ± 0.04 , 0.32 ± 0.02 and 0.50 ± 0.04 cm/queen, respectively.

The mean weight of virgin queens from the above brood ages were 166.4 ± 2.06 , 146.6 ± 2.50 , 138.4 ± 2.26 and 179.4 ± 2.83 mg/queen, respectively, while the mean weight of mated queens were 196.0 ± 1.96 , 176.6 ± 2.50 , 162.4 ± 3.26 and 205.4 ± 2.67 mg/queens respectively.

For statistical analysis, the data in table (20 a,b) indicated that the different between long of abdomen queens which produced from used larvae, 1,2,3 day old and egg 3-day in grafting were highly significant ($P < 0.01$) in 1990, while the different between diameter of abdomen queens in these treatment were highly significant ($P < 0.01$) during 1989 and 1990, and also the

TABLE (20 a)
Effect of larvae age on the Bionetic characters of the
emergence queens during artificial queen rearing in 1989.

Treatments	Queen cell characters		Abdomen characters		Weight emergence day		
	Depth c.m.	Diameter c.m.	Long c.m.	Diameter c.m.	Virgin queen	Mated queen	
Larvae 1-day age	Range	1.7 - 2.1	0.9 - 1.0	1.4 - 1.6	0.5 - 0.6	165 - 172	195 - 205
	X + S.E.	1.84 + 0.075	0.96 + 0.228	1.48 + 0.073	0.52 + 0.0199	168.0 + 1.278	200.2 + 1.652
	C.V. %	9.09 %	5.70%	5.65%	8.60%	1.70%	1.85%
Larvae 2-day age	Range	1.6 - 2.0	0.7 - 1.0	1.3 - 1.5	0.3 - 0.5	136 - 150	164 - 182
	X + S.E.	1.72 + 0.0798	0.86 + 0.051	1.38 + 0.0373	0.42 + 0.0373	142.8 + 2.722	173.2 + 3.802
	C.V. %	10.40 %	13.25%	6.06%	19.92%	4.27%	4.92%
Larvae 3-day age	Range	1.5 - 1.8	0.7 - 0.9	1.1 - 1.5	0.3 - 0.5	132 - 146	158 - 171
	X + S.E.	1.60 + 0.0546	0.80 + 0.0446	1.30 + 0.070	0.38 + 0.0373	137.8 + 2.686	162.6 + 2.915
	C.V. %	7.65 %	12.50%	12.16%	22.02%	4.37%	3.19%
Egg 3-day age	Range	1.9 - 2.2	0.9 - 1.2	1.4 - 1.6	0.5 - 0.7	169 - 188	206 - 220
	X + S.E.	2.02 + 0.0562	1.04 + 0.083	1.50 + 0.0446	0.62 + 0.0373	178.2 + 3.147	212.0 + 2.465
	C.V. %	6.46 %	17.89%	6.67%	13.49%	3.96%	2.61%

\bar{X} = Mean S.E. = Standard Errors C.V. = Coefficients of Variability
 Long of abdomen L.S.D. 0.05 = 0.12 Diameter of abdomen L.S.D. 0.05 = 0.08
 Weight of virgin queen L.S.D. 0.05 = 7.7 Weight of mated queen L.S.D. 0.05 = 8.1
 Depth of queen cells L.S.D. 0.05 = 0.12

0.01 = 0.11
 0.01 = 11.1

TABLE (20 b)
Effect of larvae age on the Bionetic characters of the
emergence queens during artificial queen rearing in 1990.

Treatments	Queen cell characters		Abdomen characters		Weight of emergence queen m.g	
	Depth c.m	Diameter c.m	Long c.m	Diameter c.m	Virgin queen	Mated queen
Larvae 1-day age	Range	1.9 - 2.1	0.8 - 1.0	1.4 - 1.6	0.4 + 0.6	163 - 171
	X + S.E.	1.96 + 0.0399	0.90 + 0.004	1.50 + 0.0315	0.50 + 0.0315	166.4 + 2.064
	C.V. %	4.56 %	11.11%	4.71%	14.14%	2.06%
Larvae 2-day age	Range	1.6 - 1.9	0.7 - 1.0	1.4 - 1.5	0.3 + 0.5	137 - 150
	X + S.E.	1.74 + 0.0509	0.82 + 0.0489	1.22 + 0.1018	0.38 + 0.0373	146.6 + 2.487
	C.V. %	6.55 %	13.36%	18.69%	22.02%	3.82%
Larvae 3-day age	Range	1.5 - 1.7	0.7 - 0.9	1.1 - 1.3	0.3 - 0.4	133 - 145
	X + S.E.	1.58 + 0.0373	0.80 + 0.0315	1.18 + 0.0373	0.32 + 0.0199	136.4 + 2.283
	C.V. %	5.295%	8.84%	7.09%	13.98%	3.67%
Egg 4 day age	Range	1.7 - 2.0	0.9 - 1.2	1.3 - 1.7	0.4 + 0.6	169 - 186
	X + S.E.	1.88 + 0.0582	1.06 + 0.0509	1.52 + 0.0662	0.50 + 0.0446	179.4 + 2.634
	C.V. %	6.94 %	10.76%	9.76%	20.0 %	3.54%
						2.91%

\bar{X} = Mean S.E. = Standard Errors C.V. = Coefficients of Variability
 Depth of queen cells L.S.D. 0.05 = 0.17 0.01 = 0.24 Diameter of queen cells L.S.D. 0.05 = 0.16 0.01 = 0.22
 Long of abdomen L.S.D. 0.05 = 0.15 0.01 = 0.20 Diameter of abdomen L.S.D. 0.05 = 0.09 0.01 = 0.12
 Weight of virgin queens L.S.D. 0.05 = 7.7 0.01 = 10.8 Weight of mated queens L.S.D. 0.05 = 7.5 0.01 = 10.5

different between depth of queen cell in these treatment were highly significant ($P < 0.01$) during 1989 and 1990, while the different between diameter of queen cell in these treatment were significant ($P < 0.05$) in 1990 and non significant in 1989. And also statistical analysis, showed that the different between weight of virgin queens in these treatment were highly significant ($P < 0.01$) in 1990 and 1989, while the different between weight of mated queens in these treatment were highly significant ($P < 0.01$) in 1989 and 1990 also.

From the above results it could be mentioned that, queens were reared from eggs and from larvae 1,2 and 3 days old in this experiment indicated that, each increase of 1 day in the age of larvae grafted was decreased the biometric characteristics of emerged queens, the rearing of honeybee queens from worker larvae one day old or the worker egg 3-day old was the best grafting method.

Our results in agreement with **El-Berry (1963); Woyke (1971) and Jay (1981)** who reported that, queens were reared from eggs and from larvae 1, 2, 3 and 4 days old, they were then mated either naturally or instrumentally with semen, each increase of 1 day in the age of larvae grafted decreased not only the body weight, the size of the spermateca and the number of ovarioles of the virgin queens, but also the number of

overioles of the virgin queens, but also the number of spermatozoa in spermathecae of naturally and instrumentally inseminated queens.

c) Effect of types of queen cups which used in queen rearing on the biometric characteristics:

Queens were reared in bee-wax cups, plastic cups, paraffin-wax cups and bee-wax mixed with pollen for making queen cups, the biometric characteristics of emerged queens which reared in the above queen-cups in 1989 and 1990 are recorded in table (21 a,b) showed that, the rearing of queens in 1989 gave the results about the mean long abdomen of emerged queens were 1.42 ± 0.04 , 1.32 ± 0.04 , 1.42 ± 0.04 , and 1.48 ± 0.03 cm/queen, respectively, while the diameter of abdomen the queens were 0.44 ± 0.04 , 0.40 ± 0.03 , 0.42 ± 0.04 and 0.46 ± 0.02 cm/queen for the queens reared in bee-wax cups, plastic cups, paraffin-wax-cups and pollen-wax-cups, respectively.

The mean depth of queen cells were 1.82 ± 0.07 , 1.70 ± 0.05 , 1.82 ± 0.07 and 1.92 ± 0.05 cm/queen, respectively the mean diameter of queen cells were 0.98 ± 0.06 , 0.90 ± 0.05 , 0.88 ± 0.06 and 0.94 ± 0.03 cm/queen, respectively.

The weight of virgin queens in 1989 were 150.2 ± 3.90 , 143.8 ± 3.16 , 157.8 ± 4.50 and 159.6 ± 3.76 mg/queen, respectively while the mean weight of mated queens were