SUMMARY AND CONCLUSION

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Many attemtps have been made to increase the acceptance of honeybeen larvae or eggs grafted into artificial queen cells, especially in commercial queen rearing operations with Apis mellifera L. The present study was undertaken in the apiary and Laboratory of Plant Protection Dept., Faculty of Agriculture, Moshtohor, Zagazig University in 1989 and 1990. The factors which were taken in consideration from this study were (1) effect of feeding honeybee colonies on the acceptance of worker larvae and the number of emergence queens during the queen rearing in queenless colonies, (2) Rearing queen honeybee larvae in queenright colonies and in other colonies with queen restricted to the brood chamber by queen excluder or wire-screen excluder, (3) The acceptance of transplanted worker eggs in queen cells by queenless colonies, (4) The effect of grafting honeybee larvae with royal jelly (wet grafting) and without royal jelly (dry grafting) on the acceptance of larvae transplantation. (5) The correlations between the age of worker larvae which was grafted in artificial queen cups and the results of queen rearing activity, (6) The effect of the construction materials of queen cups on the acceptance of worker larvae for queen rearing: (a) The effect of bee-wax cups and plastic cups on the acceptance of queen larvae; (b) The effect of queen-cups composition from paraffin wax on the acceptance of grafted worker larvae during queen rearing: (c) The effect of bees-wax-cups mixing with pollen grains and diping in propolis

on acceptance of worker larvae during queen rearing, (7) The biometeric studies on some factors affecting on the emergence queen: (a) effect of feeding the colonies of honeybee on the biometeric characteristics of queens which was accepted and reared in these colonies; (b) effect of the age at which honeybee brood was grafted on the biometeric characteristics of reared queens: (c) effect of types of queen-cups which used in queen rearing on the biometeric characteristics.

I- The Effect of feeding honeybee colonies on the acceptance of worker larvae and the number of emergence queens during the queen rearing in queenless conlonies:

In this experiment the colonies of honeybee were feeding during the dearth seasons before queen rearing started and during the queen rearing in the same colonies, sugar syrup, supramin, Nestogen and dried brewer's yeast were used in this study, 3 colonies for each treatment, while 3-colonies was let without artificial foods as control, in this colonies the mean number of emergence queens was 7.8 queen/colony during 1989, while the mean number of emergence queens was 9.0 queen/colony during 1990. While in case of the colonies fed on sugar syrup, the mean number of emergence queen was 15.0 queen/colony during 1989, and was 15.8 queen/colony during 1990.

The colonies fed on supramin resulted the mean number of the emergence queens was 18.4 queen/colony in 1989, while the mean number, of emergence queens in 1990 was 17.0 queen/colony.

Feeding colonies with Nestogen and its the effect on queen rearing activity showed that, the mean number of the emergence queens in 1989 was 21.8 queen/colony, while the mean number of the emergence queens in 1990 was 19.3 queen per colony.

For the experiment of feeding with the dry brewer's yeast as pollen usbstitutes and its effect on the acceptance of the worker larvae grafted in queen cups indicated that the mean number of the emergence queens in 1989 was 24.6 queen/colony, while the mean number of the emergence queens in 1990 was 23.4 queen/colony.

For statistical analysis between the types of nutritions showed that the difference between types of foods were highly significant in two seasons of the experiment.

The above results indicated that the feeding of honeybee colonies on the dry brewer's yeast as pollen substitutes produced the emergence queens was more than the others types of the artificial foods which, were used in this experiment.

II- Rearing queen honeybee larvae in queenright colonies and in other colonies with queens festricted to the brood chamber by queen excluder or wire-screen excluder.

The acceptance of queen larvae by colonies with confined queens using queen excluder and wire screen showed that, the mean number of the emergence queens in 1989 was 14.3 queen/colony, for colonies with confined queens by queen excluder with the percentage of 47.7% (129 queens out

of the 270 queen-cells grafted in 9 colonies), while the mean number of the emergence queens in colonies with confined queens by wire screen excluder was 17.9 queen/colony with the percentage of 59.7%, it was more than that produced from the colonies confined its queens by queen excluder.

The acceptance of queen larvae by colonies with confined queens using queen excluder in 1990 showed that, the mean number of the emergence queens was 16.0 queen per colony, with the percentage of 53.3%, while the mean number of the emergence queens in the colonies confined queens by wire screen excluder was 18.6 queen/colony, with the percentage of 62.0% out of the grafted queen cells: it was more than that produced from the colonies contined its queens by queen excluder.

The acceptance of queen larvae by colonies with free queens (queenright colonies) after removing the queen excluder and wire screen excluder from these colonies before one-week of the queen rearing started: permitting the queen to move freely both in the brood chamber and in the super box; which contained the queen cups grafted. The acceptance of queen larvae by colonies with free queens after removing the queen excluder indicated that: the mean number of emergence queens was 9.7 queen/colony with the percentage of emerged queens was 32.2%, while the mean number of emergence queens in the colonies with free queens after removing the wire screen excluder was 13.4 queen/colony, with the percentage of 44.7%, this results was in 1989.

In both treatments similar results in 1990 indicated that, the mean number of the emergence queens after removing the queen excluder was 8.3 queen/colony with the percentage of 27.7%, While the mean number of the emergence queens in the colonies after removing the wire screen excluder was 10.9 queen/conloy; with the percentage of 36.3%. The number of the emergence queens which reared in the colonies after removing the wire screen excluder was more than the queens emerged from colonies after removing the queen excluder. But the statistical analysis showed that not significant difference between treatments.

III- The acceptance of transplanted worker eggs in queen-cells for rearing by queenless colonies:

In commercial apiaries, queens of honeybees (Apis mellifera L.) are reard from workers larvae grafting in queen-cups, in this experiment, the transplantation of worker eggs at 1-day, 2-days and 3-days in bess-wax cups was reared in queenless colonies, the mean number of the emergence queens in 1989 were 5.0, 8.7 and 14.0 queen/colony out of 20 eggs grafted in queen cups per queenless colony. While the mean acceptance of transplanted the worker eggs at 1 day, 2 days and 3 days old in 1990 were 3.7, 6.3 and 16.0 emerged queens per colony, respectively. Statistical analysis for the age of the eggs indicated that, the differences were singnificant in 1989 ($P < 0.05$), while these differences between the old of worker eggs were highly significant in 1990 ($P < 0.01$). The grafting of the worker eggs at 3days old produced more

emergence queen than the other age of eggs (1-day and 2-days old).

IV- Effect of grafting honeybee larvae with royal jelly (wet grafting and without royal jelly (dry grafting) on the acceptance of the transplantations of the worker larvae:

The present study considers the consequences of transplantation with a royal jelly as wet grafting, in another group of trails; the queen cups were grafting with larvae without royal jelly as dry grafting. The results indicated that, the mean number of the emergence queens from colonies grafted the worker larvae with royal jelly (wet grafting) in 1989 was 19.25 queen/colony, with the percentage of 64.2%. While the mean number of the emergence queens in 1990 was 22.75 queen/colony: the percentage was 75.8%.

The mean number of the emergence queens in queenless colonies grafted with the worker larvae without royal jelly (dry grafting) in 1989 was 11.75 queen/colony; with the percentage of 39.2%. While the mean number of the emergence queens in these colonies in 1990 was 13.25 queen/colony: with the percentage of 44.2%. The transplantation the worker larvae with royal jelly in artificial queen-cups for queen rearing was much higher in the emergence queens than those reared without royal jelly, statistical analysis indicated that, these differences was highly significant in 1990, while was not significant in 1989. The dry grafting is more economic value for royal jelly production and for commercial of the queen rearing in the beekeeping companies.

V- The correlations between the age of worker larvae was grafted in wax-queen cups and results of queen rearing activity:

Queens were reared from larvae 1, 2, 3 and 4 days old larvae transferred to the bee-wax queen-cups, 30 of each was fixed in a fram per a queenless colony, three queensless colonies were treated with one age of the worker larvae, this experiment carried out during 1989 and 1990. The mean number of the emergence queens in 1989 which accepted and emerged from colonies grafted with larvae at 1-days, 2-days, 3-days and 4-days old were 21.7, 17.0, 9.7 and 1.7 queen per colony, respectively. While the mean number of the emergence queens in 1990 for each larval age were 18.3, 12.3, 6.7 and 2.3 queen/colony, respectively. These results indicated that; each increase of 1-days in the age of larvae grafted decrease the acceptance of queen cells and the number of the emergence queens, the best results was came from the transplantations (grafting) the worker larvae in queen cups at 1-day old (24 h. or less from hatching of the worker eggs). The statistical analysis of the differences between the ages of the worker larvae which grafted in queen-cups and acceptance were highly significant ($P < 0.01$).

VI- The effect of the construction material of queen-cups on the acceptance of the worker larvae for queen rearing:

The material from which the artificial queen cells were studies in this experiment:

a) Effect of bees-wax cups and plastic cups on the acceptance of queen larvae:

The results indicated that the mean number of the emergence queens grafter in bees-wax-cups with royal jelly (wet grafting) was 21.3 queen/colony, while in case of plastic-cups was 20.0 queen/colony. The grafting without royal jelly in bees-wax cups was 15.0 queen/colony, while in case of plastic cups was 10.0 queen/colony. The statistical analysis showed that the differences between the types of queen-cups was not significant; while the differences between types of grafting was highly significant, ($P < 0.01$) in (1989). While in 1990 the mean number of the emergence queens in case of bees-wax queen-cups grafted with royal jelly was 17.7 queen/colony, while in case of plastic cups was 15.3 queen/colony. While the dry grafting (without royal jelly) in bees-wax cups indicated that the mean number of the emergence queens was 12.3 queen/colony, while the mean number of the emergence queens in case of the plastic cups was 13.3 queen/colony. The statistical analysis showed that, the differences between the types of queen cups was not significant, while the differences between the types of grafting was highly significant ($P < 0.01$).

(b)- Effect of queen-cup composition from paraffin-wax on the acceptance of grafted worker larvae during queen rearing:

Some factors affecting on the acceptance of grafted queen cells were studies in the present investigation especially the effect of queen-cups composition from paraffin wax on the acceptance and survival of grafted larvae. The mean number of the emergence queens which was grafted in

queen cups mixed bees-was with paraffin-wax at the percentage of 2%, 4%, 6%, 8%, 10%, 20%, 40% and 60% were 18.3, 17.7, 16.7, 13.7, 7.3, 0.0, 0.0 and 0.0 queen/colony compared with queen-cups made from bees-wax as control was 22.0 queen/colony in 1989. While in 1990 the mean number of the emergence queen were 19.7, 16.7, 14.4, 11.3, 5.0, 0.0, 0.0 and 0.0 queen/colony, respectively, while in the control (bees-wax cups) was 21.0 queen/colony. The statistical analysis showed that, the differences between types of queen-cups were highly significant ($P < 0.01$). From the results, it could be mentioned that, the honeybeen prefered to reared and acceptance its queen larvae which grafted in queen-cups contained the high percentage of the paraffin-wax.

(c)- Effect of queen-cups mixing with pollen grains and dipping queen-cups in propolis on the acceptance of worker larvae during artificial queen rearing:

The bees-wax was mixed with pollen grains for making queen cups with the percentage of 0.25%, 0.50%, 0.75%, 1.0%, 2.0%, 4.0% and 8.0%. The mean number of the emergence queens in these queens-cups in 1989 were 18.7, 15.0, 16.0, 11.3, 9.7, 7.3 and 2.3 queen/colony, respectively, compared with queens reared in bees-wax cups as control was 22.7 queen/colony. While the mean number of the emergence queens in 1990 were 20.3, 16.7, 16.3, 15.7, 13.0, 9.3 and 1.7 queen/colony, respectively, the mean number of the emergence queens in bees-wax cups as the control was 20.7 queen/colony. The statistical analysis between types of the queen-cups was highly significant ($P < 0.01$). The results indicated

that, an increase in the percentage of pollen grains in the bees-wax cups was decrease the acceptance of worker-larvae which reared in these queen-cups.

The mean number of the emergence queens which was reared in bees-wax cups dipping in propolis solutions at 100, 200 and 400 ppm, were equally acceplable of queen cells in 1989 were 20.0, 18.7 and 12.0 queen/colony, respectively. While the mean number of the emergence queens in 1990 were 20.0, 18.3 and 15.7 queen/colony, respectively, statistical analysis indicated that no difference between treatments. It could be mentioned that the mean number of the emergence queens was decreased with the increase of the concentration of the propolis.

VII- The biometric studies on some factors affecting on the emergence queens.

a) Effect of feeding the colonies on the biometeric characteristics of honeybee queens which was accepted and reared in these colonies:

Queens were reared in queenless colonies which was fed on different artificial foods, the emergence queens from these colonies and its queen-cells after emerging were measured as biometeric characteristics studies, the results showed that, the feeding of honeybee colonies on the dry brewer's yeast during the dearth seasons and during the queen rearing was produced the queens in good quality and inhancement the biometric characteristics of these queens, the mean weight of virgin queens reared in colonies fed on the yeast was 168.8 mg/queen in 1989 and was 169.6 mg per

queen in 1990. While the mean weight of the mated queens which was reared in the colonies fed on the yeast in 1989 was 200.4 mg per queen and was 197.6 mg/queen in 1990.

The yeast effect on the biometeric characteristics was the first and followed by nestogen, supramin, sugar syrup and then colonies without artificial feeding (control).

(b)- Effect of the age at which honeybeen brood was grafted on the biometeric characteristics of reared queens:

Oueens were reared from worker larvae 1, 2, 3-days old and worker eggs 3-days old, they were then naturally mated, the biometeric characteristics of these queens indicated that the mean weight of the virgin queens in 1989 were 168.0, 142.8, 137.8 and 178.2 mg/queen, respectively. While the mean weight of the mated queens in 1989 were 200.2, 173.2, 162.6 and 212.0 mg/queen in case of the queens reared from the worker larvae at 1-day, 2-days, 3-days old and worker eggs 3-days old respectively.

In 1990, the mean weight of the virgin queens reared from the worker larvae at 1-day, 2-days, and 3-days old were 166.4, 146.6 and 138.4 mg/queen, respectively. The mean weight of the virgin queens was reared from the worker eggs 3-days old was 179.4 mg/queen. While in the same year, the mean weight of the mated queens which was reared from the worker larvae at 1-day, 2-days and 3-days were 196.6, 176.6 and 162.4 mg/queen, respectively. The mean weight of the mated queens which was emerged from the worker eggs grafted in bees-wax cups 205.4 mg/queen.

The statistical analysis between the different ages of the honeybees brood was highly significant ($P < 0.01$).

The results indicated that, each increase of 1 day in the age of the brood grafted was decreased the biometeric characteristics of the emerged and mated queens, the grafting of queen-cups with the worker larvae at 1-day old (24 h. or less) and by the worker eggs at 3-days old gave the best results in queen rearing of honeybees.

(c)- Effect of types of the queen-cups which used in the queen rearing on the biometeric characteristics of the emergence queens:

Queens were reared in bees-was cups, plastic cups, bees-wax, mixed with paraffin-wax cups and bees-wax mixed with pollen for making the queen cups, the biometeric characteristics of the emerged queens and the mated queens which was reared in the above queen-cups showed that, in 1989 the mean weight of the virgin queens were 150.2, 143.8, 157.8 and 159.6 mg/queen, respectively. While the mean weight of the mated queens were 182.6, 172.8, 187.2 and 189.4 mg/queen, respectively, for the queens reared in queen cups making from bees-wax, plastic, paraffin bees wax and pollen bees-wax respectively. While in 1990, the mean weight of the virgin queens were 148.2, 145.6, 154.2 and 164.0 mg/queen, respectively. While the mean weight of the mated queens were 178.8, 176.0, 185.4 and 195.4 mg/queen, respectively. The results indicated that the mixing bees-wax with the other materials was more effect on the acceptance

of worker larvae grafted in queen-cups which was made from these materials and the biometeric characteristics of the emergence queens was clearly different, this points will be needed for more studies in the future.