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Effect of Introducing Larval Queen Cell Numbers and Rearing Season on Certain Developmental Features and Wet Weight of Commercially Produced Queens under Damietta Conditions (North Egypt)

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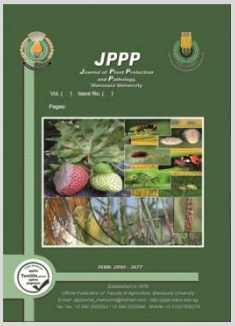

ABSTRACT

The present studies were carried out to investigate the quantity (as % of accepted larvae, sealed queen cells and emerged queens) and quality (as weight of queen at emergence) of queen honeybees as affected by some internal environmental factors related to rearing process during late winter period and summer season of two successive years, (2018/2019) at Damietta governorate, (North Egypt). No significant difference was found for all parameters between the two studied years. Significant increase in the percentages of acceptance, sealed queen cells and emerged queens as well as weight of queens at emergence were obtained when introducing 32 than 48 larval queen cells into starter and finisher queen rearing colony, respectively. Larval queen cells which presented on the middle position, (174.6 mg./queen) of rearing bar produced more frequently queens with heavy weight than those presented on the peripheral ones, (169.9mg./queen). The artificially reared virgin queens during summer season were significantly heavier (175.7 mg. /queen) than those reared during the period of late winter, (166.9 mg./queen).

Keywords: Internal factors affected queen rearing, Middle and peripheral positions on rearing bar, Rearing season, Queen Weight, Acceptance percentage

INTRODUCTION

It is known that honeybee rear queens naturally in three situations: the first when colony preparing for swarming, the second through superseded when queen is old and weak and the third during emergency when the queen has been accidentally killed or lost. The number, shape and site of the constructed queen cells in each case are discriminated by specific characteristics, (Cale *et. al.*, 1975).

Beekeepers have exploited the biology of queen rearing on demand for breeding or production proposes and has found numerous factors that influence the proportion of potential queen larvae the bees actually rear into queens, (Morse, 1979 and Laidlaw & Page 1997). furthermore, the factors that influence the selection of future queens are of interest in understanding the biology of honeybee reproduction and in themselves of importance for commercial queen rearing, (Breed *et. al.* 1984) .

The number of the colony received and the effect of location of a given larvae within honeybee nursing colony on the probability that it will be reared as a potential queens has been considered by various investigators, (Visscher, 1986; De Grandi - Hoffman *et. al.*, 1993; Sharaf El-Din, *et. al.*, 2000; Zeedan, 2002; Abd Al-Fattah *et. al.*, 2007 and Hamada, 2019). The production and quality of queens are, also, affected by rearing season, (Salem *et. al.*, 1976; Ali, 1994; Sharaf El-Din *et. al.*, 2000; Abd Al-Fattah, *et, al.*, 2003b & 2011 and Fathy *et.al.*, 2019). Weight at emergence and other characters were used to describe the queen reproductive potential (Woyke, 1971; Tarpy *et. al.*, 2000; Tarpy *et. al.*, 2004; Al-Ghzawi and Zaitoun, 2008; Abd Al-Fattah *et.al.*, 2011; Kumar & Mall, 2016 and Sharaf El-Din, 2016).

However, under the environmental conditions of many regions in Egypt, the swarming tendency has to appear in honey bee colonies mostly from the secon half of January and gradually increase to reach its climax between the second half of March and the first half of April, (El Dakhakhni, 1980; Abd Al-Fattah, 1983; Ghoniemy, 1984; Nour, 1992; Abd El-Rahman, 1998 & 2004; El Barbary, 2007; Marzouk, 2009; Hamada, 2012 and Abou Yahia, 2016). The commercial stations of queens production tend to start early in queen rearing to offer a great demand of beekeepers in the onset of the honey bee active season. But, are these queens will be in a reproductive potential for the fitness of colonies they head.

The objectives of the present study were to investigate the influence of changes in the number of introduced grafted larvae, the level of bar (holding the grafted queen cups), within the grafting frame and the period of late winter in comparison with summer season on the percentages of accepting the grafted larvae, sealing queen cells, queen emergence and weight of newly emerged virgin queens, under the environment of Damietta governorate.

MATERIALS AND METHODS

This study was undertaken at the private apiary established in Kafr Saad, region, Damietta governorate, during two successive years, (2018 and 2019). The effect of the number of introduced grafted larvae (32 or 48 grafted larvae) and the position at which the grafted cup (or the accepted cells) was hung (middle or peripheral) in the grafting frame within starting or finishing colony during late winter (January–February) and summer (July-August) seasons were evaluated through this work .

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Preparing the starter and finisher honey bee colonies:

Eighteen honeybee colonies of the local Carniolan F1 were weekly provided with a lot of young nurse bees, (by adding two capped worker brood combs just before emergence) and one pollen comb. This procedure occurs during 1-3 weeks according to season and prevailing environmental conditions. Daily feeding with 1:1 sugar syrup, (w: v) for two weeks before and during the period of queen rearing was done, (Abd Al-Fattah, *et. al.,* 2003a). These colonies were divided into two groups, the first contained 12 colonies used as starter colonies where six of them received frames of 32 grafted larvae (one grafted frame /colony) and the other six received frames of 48 grafted larvae as well. The second group contained six colonies used as finisher units as three of them received 32 successful larval queen cells and the other three received 48 successful cells as well to complete their development.

Twenty four hours before grafting, (or introducing the defined number of the accepted queen cells), queen and all combs containing unsealed brood, except one, were removed from the experimental colonies and workers of each queen-less colony were condensed on six combs in the brood chamber. Therefore, the combs of each prepared queen-less rearing colony were arranged from the hive wall beside the entrance as follow, one food store, one capped brood, one uncapped brood, one capped brood, two food stores then the feeder.

The grafted frame was inserted between the unsealed and sealed brood. The accepted queen cells were checked 24 hours after introduction, then they gently collected and each larval queen cell was fixed on another bar (as in its position on the grafting frame). Three rearing frames, each carried 32 larval queen cells distributed on two bars (16 cells each) were inserted in the prepared three finisher colonies to complete their development. The two bars were hung in the medium region of the frame. Another three frames, each carried 48 larval queen cells distributed on two bars (24 cells each) hung in the same medium region of frame were inserted in another group of the prepared finisher colonies to complete their development. The mature queen cells (after 9-10 days of grafting), were removed and each queen cell was separated under semi-ball screen cage on unripe honey comb in the same finisher colony until emerged.

Plastic cups were used in this work where each cup was previous with a young worker larva less than 24 hours. Old on a small droplet of 1:1 aqueous solution of royal jelly according to the commercial queen rearing technique (Laidlaw & pag, 1997). The obtained data were collected as means for statistical analysis. The following parameters were applied to evaluate the importance of the previous factors in the field of queen production: 1- Number and percentages of accepted larvae, sealed queen cells and emerged queens, 2- Weight of newly emerged virgin queens (not more than 12 hours) using an electrical balance to the nearest 0.01 mg.

Statistical analysis:

The percentage of acceptance, sealed cells and emerged queens were firstly transformed to angular (arc sine) according to the rules of Gomez & Gomez (1976). The split split complete block design was followed for data analysis and the means were compared by Duncan's Multiple Range Test. The program of MSTAT version 6.4 was applied for this analysis.

RESULTS AND DISCUSSION

The potential of queen-less starter colony in accepting the artificially grafted queen cups and finisher colony in sealing the introduced larval queen cells and incubating (nursing) these cells until emergence the new queens as well as the quality of the resulted queens (dependent on their weight at emergence) had been investigated under the expression of some environmental impulses during late winter period and summer season of two successive years (2018 and 2019). Two numbers of queen cells were offered (32 and 48 cells) during each developmental stage of queen rearing. The larval queen cells on each bar were imaginably divided into three positions, one in the middle and another two on the peripheral of bar to investigate the effect of cell position on the mentioned parameters.

1- Effect of the grafted queen cup numbers on the acceptance percentage by starter colony:

Results illustrated in Table (1) revealed that the ability of starter queen rearing colony in accepting the introduced grafted larval during late winter and summer seasons decreased with increasing the number introduced in the two years. The mean percentages of acceptance of the lower number of grafted larvae (32 grafted larvae/colony) were 75.5 % and 71.4 % during the years of 2018 and 2019, respectively with a mean value of 73.5 %.The corresponding figures for the higher number (48 grafted larvae/colony) were 67.4% and 64.3% for the two years, respectively, with a mean value of 65.8 %. There were highly significant differences between the two tested numbers of grafted larvae as shown in Fig.(1).

Table 1. Effect of rearing season, number of grafted cups and position of queen cell in rearing frame on the acceptance percentage by queen-less starter colony during two successive years (2018 & 2019)

Season &Year	32 grafted larvae			48 grafted larvae			Mean / cell position		Mean ± SE	
	Middle	Peripheral	Mean	Middle	Peripheral	Mean	Middle	Peripheral		
Late winter										
2018	81.3	58.3	69.8	76.4	54.2	65.3	78.9	56.3	67.6	± 6.654
2019	77.1	52.1	64.6	66.7	48.8	57.8	71.9	50.5	61.2	± 6.581
Mean	79.2	55.2	67.2	71.6	51.5	61.5	75.4 a*	53.4 b*	64.4B	± 4.496
Summer										
2018	77.1	85.4	81.3	68.1	70.8	69.5	72.6	78.1	75.4	± 3.844
2019	75.0	81.3	78.2	70.8	70.8	70.8	72.9	76.1	74.5	± 2.481
Mean	76.1	83.4	79.7	69.5	70.8	70.1	72.8 a*	77.1 a*	75.0 A	± 2.125
Mean / year										
2018	79.2	71.9	75.5	72.3	62.5	67.4	75.7	67.2	71.5 a	± 3.85
2019	76.1	66.7	71.4	68.8	59.8	64.3	72.4	63.3	67.9 a	± 4.113
Mean/grafted No.	77.6	69.3	73.5 A	70.5	61.2	65.8 B	74.1 a	65.3 b	69.7	± 2.671
± SE			± 3.147			± 3.147	± 1.768	± 4.596		

Means in the same column or row with the same capital letter, (s) do not significantly differed according to Duncan's Multiple Range test at o.o5 probability of 5%

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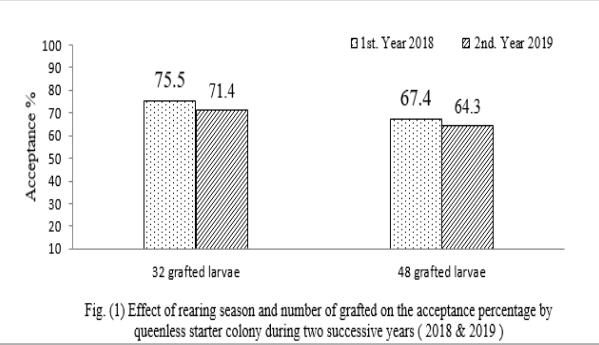

Fig. (1) Effect of rearing season and number of grafted on the acceptance percentage by queenless starter colony during two successive years (2018 & 2019)

These results are agreement with those reported by Zeedan (2002) who reported that the grafted larvae in cups located in the middle of bar were significantly more accepted (81.4%) than those located on the bar edge. Helaly (2018) found that the yield of royal jelly collected from grafted cups in the middle of bar was significantly increased than those collected from the edge queen cells. Also, Hamada, (2019) found that, under the same circumstances of north Egypt, the mean acceptance percentage of the middle position was 97.0% compared with 82.5% for the edge position.

During summer seasons of 2018 and 2019, the mean percentages of acceptance of the lower number of grafted larvae (32 grafted larvae/colony) were, 81.3 % and 78.2 %, respectively, with a mean value of 79.7 % .The corresponding figures for the higher number (48 grafted larvae/colony) were 69.5 % and 70.8 % for the two years, respectively, with a mean value of 70.1 %. The accepting percentages of grafted larvae were less during late winter where they were 69.8 % and 64.6 % for the two years, respectively, for 32 grafted larvae with a mean value of 67.2 %. They were 65.3% and 57.8 % for 48 grafted larvae with a mean value of 61.5 % as shown in Fig. (2). From the previous results, it is clear that the prevailing conditions throughout different seasons affected significantly on the accepting percentage of grafting larvae by the starter queen rearing colonies (Seeley & Heinrich,1981 and Abd Al-Fattah & El Shemy, 1996).

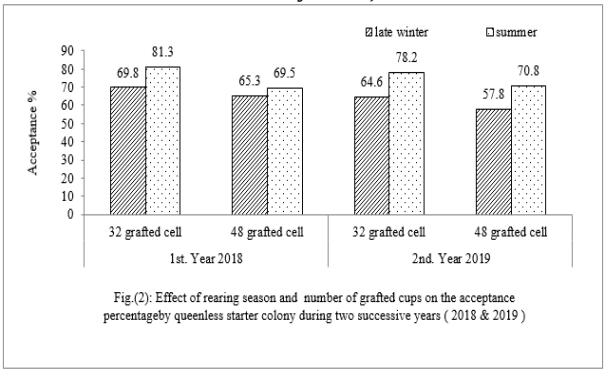

Fig.(2): Effect of rearing season and number of grafted cups on the acceptance percentageby queenless starter colony during two successive years (2018 & 2019)

It is also obvious that the higher acceptance of grafted larvae were recorded during summer followed by spring seasons where the environmental conditions, especially; the food sources are more available for bees. Nasr, (1976) found that the best period for queen rearing was from March to September where the nurse workers could produce and provide extra amounts of royal jelly to queen larvae. Many researchers in the same and other regions were, also, agreed with these findings (El-Sarrag & Nagi, 1985 and Abd Al-Fattah, *et.al.*, 2003b).

The queen cell position within rearing frame had a great impact on the accepting percentages of grafted larvae during late winter and summer seasons of the two studied years (Fig. 3).

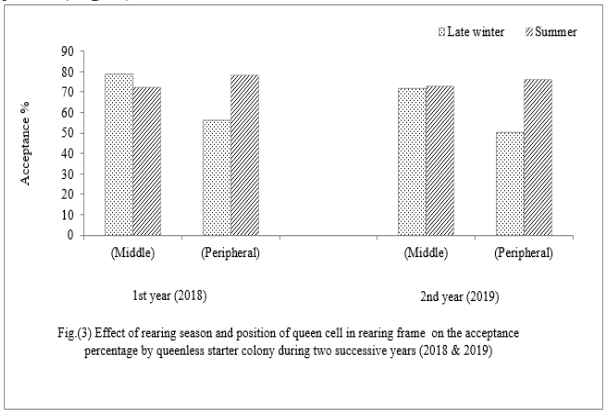

Fig.(3) Effect of rearing season and position of queen cell in rearing frame on the acceptance percentage by queenless starter colony during two successive years (2018 & 2019)

There were significant differences in the acceptance percentage of grafted larvae between the middle and peripheral positions of the grafted frame Table (1). The acceptance percentages of the middle position were 75.7% and 72.4 % with a mean value of 74.1 % for the two years. The acceptance percentages of the peripheral position were 67.2% and 63.3 % for the yeas of 2018 and 2019 with a mean value of 65.3 % as shown in Fig. (4).

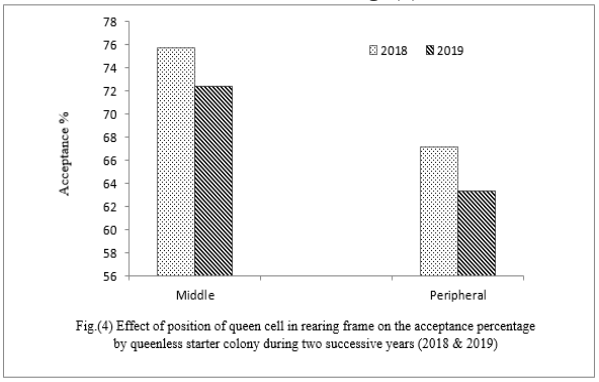

Fig.(4) Effect of position of queen cell in rearing frame on the acceptance percentage by queenless starter colony during two successive years (2018 & 2019)

The finding were agreed with the results finding by Zeedan (2002) who reported that the grafted larvae in cups located in the middle of bar were significantly accepted (81.4%) more than those located on the bar edge.Also, Helaly (2018) found that the yield of royal jelly collected from grafted cups in the middle of bar was significantly increased than those collected from the edge queen cells.

2- Effect of introducing different numbers of queen cells on the sealing rate, emerging rate and queen weight raised by finisher colony

A-Effect on the percentage of sealed queen cells

Results in Table (2) revealed that the ability of queen cells finisher colony in sealing the introduced larval queen cells during late winter and summer seasons decreased when the introduced number increase. The mean sealing percentages of the lower number of introduced larval queen cells (32 grafted larvae /colony) were 97.8% and 98.0 % during the years of 2018 and 2019, respectively, with a mean value of 97.7 %. The corresponding figures for the higher number (48 larvae cells/colony) were 93.8% and 96.5% for the two years, respectively, with a mean value of 95.2 %. There were highly significant differences between the two tested numbers of larval cells as shown in Table (2) and Figure (5).

During summer, lower number of larval queen cells (32 cells /colony) attained the highest percentage of sealing queen cells, (97.8 % and 100%) with a mean value of 98.9

% for the years of 2018 and 2019, respectively. The percentages of sealed queen cells of the higher introduced number (48 cells /colony) were 95.9% and 96.6% with a mean value of 96.2 % for the two years, respectively. This trend was noticed during late winter season as represented in Table (2). The rates of sealed queen cells for the two categories of introduced larval queen cell numbers, i. e. (32 and 48 cells/colony) were 97.8%, 96.0%, 91.7% and 96.5% for the two years, respectively. The mean values of the two tested numbers of queen cells during late winter were 96.9% and 94.1%, respectively. It is, also, obvious from data in Tables (2) that the difference between late winter (95.5%) and summer (97.6%) seasons as a mean percentage of sealed queen cells within queen-less building colonies were not significant.

Table 2. Effect of rearing season, number of grafted cups and position of queen cell in rearing frame on the sealing percentage of larval queen cells by queen-less finisher colony during two successive years (2018 & 2019)

Season &Year	32 grafted larvae			48 grafted larvae			Mean / cell position		Mean ± SE	
	Middle	Peripheral	Mean	Middle	Peripheral	Mean	Middle	Peripheral		
Late winter										
2018	100.0	95.6	97.8	93.1	90.3	91.7	96.6	93.0	94.8	±2.058
2019	98.1	93.8	96.0	97.2	95.8	96.5	97.7	94.8	96.2	±0.937
Mean	99.1	94.7	96.9	95.2	93.1	94.1	97.1	93.9	95.5 A	±1.038
Summer										
2018	100.0	95.6	97.8	98.6	93.1	95.9	99.3	94.4	96.8	±1.544
2019	100.0	100.0	100.0	93.1	100.0	96.6	96.6	100.0	98.3	±1.725
Mean	100.0	97.8	98.9	95.9	96.6	96.2	97.9	97.2	97.6 A	±1.101
Mean / year										
2018	100.0	95.6	97.8	95.9	91.7	93.8	97.9	93.7	95. 5 a	±1.696
2019	99.1	96.9	98.0	95.2	97.9	96.5	97.1	97.4	97.3 a	±0.827
Mean / grafted No.	99.5	96.3	97.7 A	95.5	94.8	95.2 B	97.5 a	95.5 a	96.5	±1.05
± SE			±0.897			±1.166	±1.027	±1.167		

Means in the same column or row with the same capital letter, (s) do not significantly differed according to Duncan's Multiple Range test at o.o5 probability of 5% . *Means in the same column or row with the same small latter with asters do not significantly differ according to Duncan's Multiple Range test of probability of 5%.

There were insignificant differences between the percentages of sealed queen cells that positioned in the middle of rearing frame and those positioned on the peripheral of it during summer season. These percentages were 97.9% and 97.2% for the middle and peripheral positions, respectively, Table (2).The same trend was occurred during late winter season where the mean percentages of sealed queen cells were 97.1% and 93.9% for the two positions, respectively, Table (2) and Fig.(6). In general, the mean percentages of the middle (97.5%) and peripheral (95.5%) cell positions were not significantly differed.

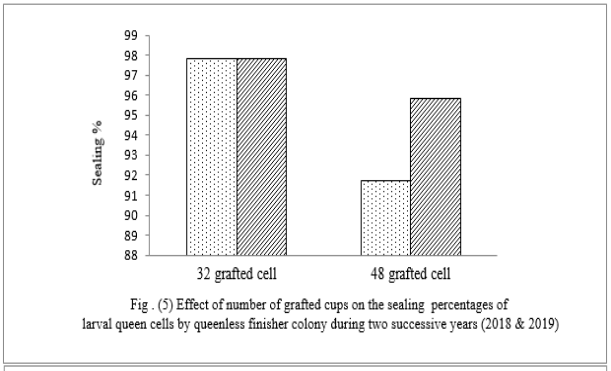

Fig . (5) Effect of number of grafted cups on the sealing percentages of larval queen cells by queenless finisher colony during two successive years (2018 & 2019)

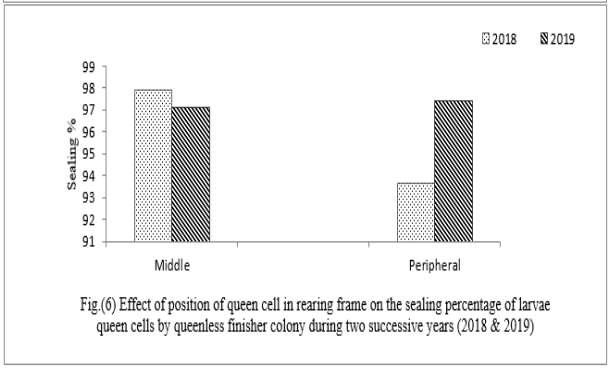

Fig.(6) Effect of position of queen cell in rearing frame on the sealing percentage of larvae queen cells by queenless finisher colony during two successive years (2018 & 2019)

B. Effect on the percentage of emerged queens

Data recorded in Table (3) represent the percentages of queen emergence within queenless finisher colonies during late winter and summer seasons of two successive years, (2018 and 2019).

During summer season, the rate of emerged virgin queens for the introduced category of 32 larval queen cells/colony were 96.8% and 99.0% of the number of sealed queen cells during the two years, respectively. This rate was not significantly differed with those obtained for category of 48 larval queen cells/ colony, which attained 97.8% and 98.5 % for the two years, respectively, (Fig. 7).

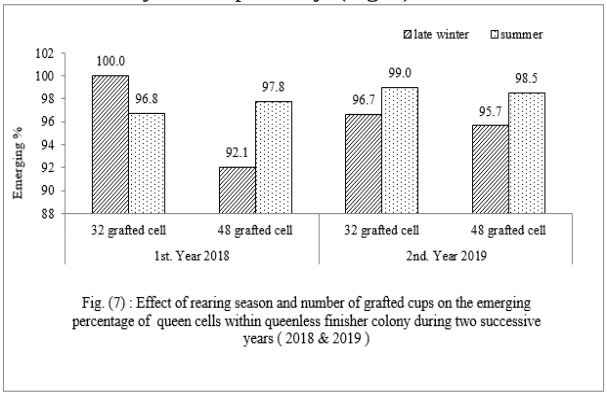

Fig. (7) : Effect of rearing season and number of grafted cups on the emerging percentage of queen cells within queenless finisher colony during two successive years (2018 & 2019)

The above two categories were not differed significantly during summer as they owned 97.8 % and 98.2% as a mean emerging percentages. The rates of emerged virgin queens within queen-less finisher colonies that received 32 and 48 larval queen cells/colony during late winter season of 2018 and 2019 were 100%, 96.7%, 92.1% and 95.6%, respectively, (Table 3 and Fig. 7). Significant differences were found between the mean of the first (98.4 %) and the second (93.9%) categories of the introduced queen cell numbers during this period. However, the emerging percentage was significantly increased when 32 larval queen cells, (98.1 %) than 48 larval queen cells, (95. 0%) were received by the finisher queen rearing colonies. (Table 3). In general, the rate of emerged queens during late winter season was not differed significantly, (96.1%) than those occurred during summer season, (97.3%).

Similar influence observed for the impact of queen cell position on the rate of emerged queens during summer seasons. Results in Table (3) appeared that the mean rate of queen emergence, during this season, were 99.3% and 95.3% for the middle and peripheral positions, with non-significant differences between them. During late winter season, the rates of queen emergence were 100% and 92.2% for the middle and edge positions with, significant difference between them, (Fig. 8). In general, the results indicated high significant differences in the emergence percentage of virgin queens between middle and peripheral positions of the tested colonies (Table 3 and Fig. 8). The mean of emergence percentage of middle position was 99.7% and for the peripheral was 93.7%.

Table 3. Effect of rearing season , number of grafted cups and position of queen cell in rearing frame on the emerging percentage Of queen cells within queen-less finisher colony during two successive years (2018 & 2019)

Season &Year	32 grafted larvae			48 grafted larvae			Mean / cell position		Mean ± SE	
	Middle	Peripheral	Mean	Middle	Peripheral	Mean	Middle	Peripheral		
Late winter										
2018	100.0	100.0	100.0	100.0	84.1	92.1	100.0	92.1	96.1	±3.975
2019	100.0	93.3	96.7	100.0	91.3	95.6	100.0	92.3	96.2	±2.26
Mean	100.0	96.7	98.4 a	100.0	87.7	93.9 b	100 a*	92.2 b*	96.1 A	±2.906
Summer										
2018	100.0	93.5	96.8	98.6	97.0	97.8	99.4	95.3	97.3	±1.4
2019	100.0	97.9	99.0	98.4	98.6	98.5	99.2	98.3	98.8	±0.45
Mean	100.0	95.7	97.9 a	98.5	97.8	98.2 a	99.3 a*	96.8 a*	98.0 A	±0.894
Mean / year										
2018	100.0	96.8	98.4	99.3	90.6	94.9	99.7	93.7	96.7a	±1.965
2019	100.0	95.6	97.8	99.2	95.0	97.1	99.6	95.3	97.5 a	±1.172
Mean / grafted No.	100.0	96.2	98.1 A	99.3	92.8	96.0 B	99.7 A	94.5 B	97.2	±2.22
± SE		±1.056			±1.964		±0.347	±2.576		

Means in the same column or row with the same capital letter, (s) do not significantly differed according to Duncan's Multiple Range test at o.o5 probability of 5% .

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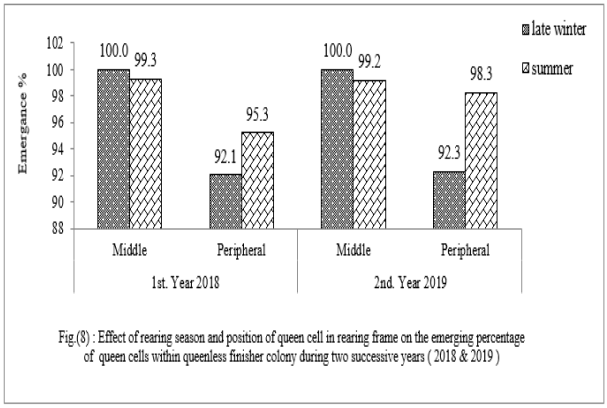

Fig.(8) : Effect of rearing season and position of queen cell in rearing frame on the emerging percentage of queen cells within queenless finisher colony during two successive years (2018 & 2019)

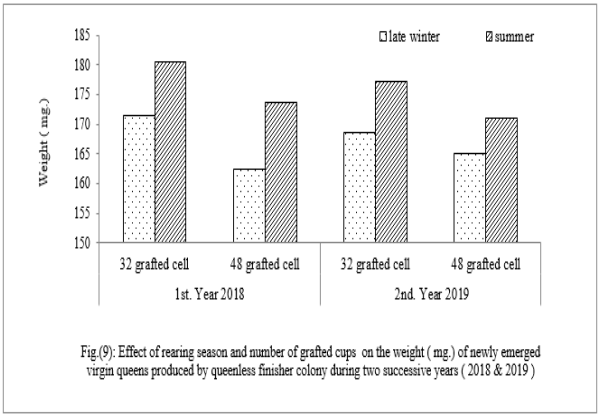

Fig.(9): Effect of rearing season and number of grafted cups on the weight (mg.) of newly emerged virgin queens produced by queenless finisher colony during two successive years (2018 & 2019)

C. Effect on the weight of emerged virgin queens

The weight of newly emerged virgin queens were pronouncedly influenced by the number of larval queen cells which nursed by the queen-less finisher colony during different seasons as registered in Table(4 and Fig. 9). During summer season, heaviest queens were resulted from batch queen cells of 32 queen cells/colony, where the mean weight was (178.9 mg/queen.) The weight of queens emerged from 48 queen cells/colony were approximately similar (173.9mg./queen) and do not significantly differed. Similar trend was observed during late winter period where the heaviest queens were resulted from the small category number, 32 cells/col. The mean weight of the produced queen was 170.1 mg. The category of 48 cells/colony issued light queens with a mean weight of 163.7mg.

Therefore, the obtained results cleared that a significant difference was found in the weight of newly emerged queens between the mean values of 32 queen cells, (174.6 mg.) and 48 queen cells (168.8 mg.) as shown in Table (4). Likewise, the mean weight of newly emerged queens during summer was significantly heavier (175.7 mg.) than those produced during late winter period (166.9 mg.).

It could be concluded from these results that the potential productivity of the queen-less building colony in queen rearing program increased when it received little numbers of larval queen cells, which appeared from the percentages of sealed queen cells and emerged queens. This potentiality may be due to the intensive care of nursing workers toward the immature queen cells during feeding and incubating periods, (Ibrahim, 1977**).**

Results in Table (4) appeared that, during summer season, the mean weight of queens emerged from cells located in the middle position of rearing frame was, 176.4 mg.) not differed from those produced on the peripheral position (174.9 mg.). However, results obtained during late winter period were differed where the means of queen weight were 171.4 mg and 162.5 mg. for queen reared in the middle and peripheral positions, respectively, Table (4) In general, the present of queen cells within the area of queen rearing frame (middle position) inside the brood nest of the honey bee queen rearing colony is more profitable in raising heavy queens, (174.6 mg.) than those presented at a peripheral (169.9 mg.) ones, (Table 4 & Fig. 10).

The extensive care and the consistency of brood nest temperature in the middle area than on the peripheral ones may be the reason of harvesting high weights of honeybee queens. These findings are agreement with those reported by Abd Al-Fattah, (1983),Visscher, (1986); De Grandi-Hoffman *et. al.,* (1993), Jones *et al.,* (2004); Chuda-Mickiewicz and Samborski, (2015) and Fathy, *et.al*.,(2019).

Table 4. Effect of rearing season, number of grafted cups and position of queen cell in rearing frame on the weight (mg.) of newly emerged virgin queens produced by queen-less finisher colony during two successive years (2018 & 2019)

Season &Year	32 grafted larvae			48 grafted larvae			Mean / cell position		Mean ± SE	
	Middle	Peripheral	Mean	Middle	Peripheral	Mean	Middle	Peripheral		
Late winter										
2018	174.8	168.3	171.6	170.5	154.2	162.4	172.7	161.3	167. 0	±4.459
2019	172.6	164.6	168.6	167.5	162.5	165.0	170.1	163.6	166.8	±2.189
Mean	173.7	166.5	170.1 bc	169.0	158.4	163.7 c	171.4 a*	162.5 b*	166.9 B	±3.214
Summer										
2018	181.5	179.7	180.6	173.7	173.6	176.6	177.6	176.7	177.2	±2.04
2019	178.9	175.6	177.3	171.4	170.8	171.1	175.2	178.2	174.2	±1.903
Mean	180.2	177.7	178.9 a	172.6	172.2	173.9 ab	176.4 a*	174.9 a*	175.7 A	±1.409
Mean / year										
2018	178.2	174.0	176.1	172.1	163.9	169.5	175.2	169.0	172.0 a	±2.116
2019	175.8	170.1	172.9	169.5	166.7	168.1	172.7	170.9	170.5 a	±1.349
Mean / grafted No.	177.0	172.1	174.6 A	170.8	165.3	168.8 B	174.6 a	169.9 b	171.3	±1.726
± SE		±2.056			±2.354		±1.604	±2.874		

Means in the same column or row with the same capital letter, (s) do not significantly differed according to Duncan's Multiple Range test at o.o5 probability of 5% .

***Means in the same column or row with the same small latter with asters do not significantly differ according to Duncan's Multiple Range test of probability of 5%.**

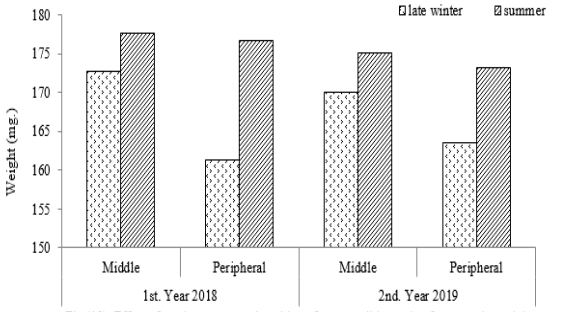

Fig.(10): Effect of rearing season and position of queen cell in rearing frame on the weight (mg.) of newlyemerged virgin queens produced by queenless finisher colony during two successive years (2018 & 2019)

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تأثير عدد كئوس اليرقات الملكية المطعومة وموسم التربية على بعض صفات التطور والوزن الرطب للملكات المنتجة تجاريا تحت ظروف دمياط – شمال مصر

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أجرى هذا البحث فى منحل خاص بمركز كفر سعد محافظة دمياط (شمال مصر) خلال فصلى (الشتاء و الصيف) لعامين متتاليين (2018- 2019) . لدراسة تأثير عدد اليرقات المطعومة ، وموسم التربية على بعض الصفات المية (نسة القبول لليرقات المطعومة – نسبة غلق البيوت الملكية – ونسبة الفقس) والنوعية (الوزن الحى للملكات حديثة الفقس) . و النتائج المتحصل لا توجد اختلافات معنوية فى الصفات المدروسة بين عامين الدراسة . - حقق التطعيم بعدد 32 كأس تفوقا ملحوظا فى نسبة القبول من اليرقات المطعومة – نسبة التغطية للبيوت الملكية – نسبة الفقس – ووزن الملكات حديثة الفقس عن التطعيم لعدد 48 كأس للطائفة . - اذداد متوسط وزن الملكة المرباه فى وسط اطار التطعيم (174.6 ملجم/ للملكة) عن ذلك المتوسط للملكات المرباه على المنطقة الحافية لاطار التطعيم (169.9 ملجم/ للملكة) - الملكات العذارى المرباهخلال فصل الصيف سجلت أوزانا أعلى بدرجة معنوية (175.7ملجم/ للملكة) عن تلك المرباه فى أواخر فصل الشتاء (166.9 ملجم/ للملكة)