Effect of some bee processes on the productivity of honeybee colonies in Egypt

M. M. M. Abolila[1], H. M. Sobhy[1], M. E. Morsy[2,] KH. M. A. Abdel Hameed[2], and S. H. A. Hekal[1] and Y. E. Abdel-Mobdy[3]

(https://orcid.org/0000-0002-1787-4981)

[1] Department of Natural Resources, Faculty of African Postgraduate Studies-Cairo University, Giza, Egypt.
[2] Bee Research Dep., Plant Protection Institute - Agricultural Research Center, Giza, Egypt.
[3]Entomology and Pesticide Department, Faculty of Agriculture, Cairo University, Gamma St, 12613, Giza, Egypt.

ABSTRACT

Field experiment was conducted on honey bee at the Bee research station in s plant protection station Res. In El- Sabahia, Alexandria Governorate, Egypt, during the flowering seasons of 2019 and 2020 for evaluating and study the effect of excluded and raising queens a week after the beginning of flowering during the flood season. The original queen is to be replaced by virgin queen, a queen cells, a natural queen rearing, and. Queens reserved inside the sect by queens barrier during the flood season to reduce brood area and increase the amount of nectar. Comparison is made between virgin queens, the queen cells, natural queen cells, and the control in terms of the amount of honey produced (kg.), the amount of royal jelly (mg), the number of swarms produced, the number of virgin queens produced, number of mating queens, percentage of acceptance of the virgin queen and the Queen cells and percentage of natural mating of virgin queens. The 25 equal strength colonies were choose and divided into 5 groups, each group having 5 colonies. Results showed that the treatment of natural breeding from it after taking of swarm recorded the highest mean values of amount of royal jelly and amount of honey produced followed by a queen barrier recorded the highest mean values of honey produced as compared with other treatments during both 2019 and 2020 seasons of clover plant and Brazilian pepper trees. In conclusion, the natural queen rearing colonies were superior compared to other treatments in the amount of royal jelly and the amount of honey produced during both seasons.

Keywords: honey bee, royal jelly, virgin queens vaccinated, Amount of honey produced, Number of virgin queen produced, Number of swarms produced

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INTRODUCTION

A honey bee is an insect that has three fundamental parts to its body: head, thorax and abdomen. A colony of a bee colony usually consists of a single queen bee; 10,000–60,000 female worker bees that are in charge of cleaning, nursing and serving the broods, foraging, transferring nectar, making the wax, and guarding their colony; and 1000–2000 male bees (drones) in the summer with the 'only' project of mating with a virgin queen from a overseas colony **(Davis and Cul¬lum-Kenyon, 2018).** Where honey bees are fundamental pollinators for agricultural and natural ecosystems, but are experiencing heavy mortality in North America and Europe due to a complex suite of factors. Understanding the relative importance of every factor would allow beekeepers to make more informed decisions and enhance evaluation of nearby and regional habitat suitability **(Calovi *et al.*, 2021).** The bees' nest or bee colony is the place a colony resides or is bodily located. In the hive, employee bees will assemble a honey ¬comb, which is a mass of hexagonal prismatic wax cells, for the bee queen to lay eggs and for the employee bees to keep their honey and pollen. Creating the wax comb is stated to be energetically costly. Secreted from the employee bees' stomach, the production of wax requires at least 6 grams of sugars in the structure of honey for every gram of wax secreted **(Mathis and Tarpy, 2007).** During the process, the employee bees will cluster together to enlarge their body temperature to 37 °C. The secreted wax will be chewed to make the wax 'workable' and fashioned into the common hexagon shapes that fit neatly or stick together. Regardless of how properly a residence is insulated to reduce heat loss and warmness gain, a proportion of energy is nonetheless lost to draughts prompted through air leakage. Research indicates that building air leakage can motive as plenty as 15−25% of wintry weather heat loss in buildings and can contribute to a giant loss of colonies

in climates where air conditioners are used on account that the power used to heat or cool our buildings leaks thru unwanted draughts **(Reardon, 2013).** In addition to heat loss, air leakage can purpose condensation that will damage the constructing substances and reduce indoor air quality. Honey bees use propolis for air sealing, and this approach ought to sound familiar to any residence builders or homeowners. To keep away from air leakage, they will use hermetic development whilst ensuring that junctions and gaps between constructing components such as at the window and door frames, walls, floors and ceilings, skirting boards, plumbing pipes, exposed rafters and beams, inbuilt heaters and air conditioners, and between varied materials (e.g. masonry walls and timber framing) are sealed with durable, bendy caulks and seals. Larger gaps will be sealed with expandable foam. The goal of this work used to be to learn about the impact of some bee procedures on the productivity of honeybee colonies in Egypt

MATERIALS AND METHODS

Excluded and raising the queens during the nectar season after beginning of flowering with week.

A - The original queen is to be replaced by Virgin queen, a queen cells, or a natural breed thereof, and the differentiation between them.

B - Queens are reserved inside the sect during the flood season to reduce brood area and increase the amount of nectar.

C - A comparison is made between virgin queens, the queen cells, natural education, queuing, and comparison with the control in terms of:

* The amount of honey produced .(kg.).

* The amount of royal Jelly. (gm.)

* The number of parcels produced.

* The number of Virgin queens produced.

* Number of mating queens.

* Percentage of acceptance of the virgin queen and the queen cells.

* Percentage of natural mating.

The experiment is conducted as follows:

The 25 equal colonies were choose in strength divided into 5 groups, each group having 5 colonies.

The first group:

The original queens were excluded with two brood frames covered with bees and placed in a breeding box far away from their original place. Then after that the Queen of Virgin is inserted on the fourth day and her consciousness under the cage of half a hate and gathering the royal food then removed the cage and left the Virgin queen working in the community on the third day to be pollinated and put eggs.

The second group:

The original queens are excluded with two brood frames covered with bees and placed in a breeding box far from their original place, then after that the queen cells is inserted on the fourth day and the royal food is collected and then the queen cells is hatched and the queen exits the solace to complete the pollination and egg laying.

The third group:

The original queens are excluded with two brooding frames covered with bees and placed in a breeding box far from their original place and the original cult is left to breed natural queen cells from them, then after that the royal food is collected from it on the fourth day and left for her one or two houses (at the same age) where hatching and mating are carried out to the Queen in the end of the flowering season.

Fourth group:

The queen is reserved during the flood season by a queue barrier to reduce the process of laying eggs and thus reduce the open brood inside the sect to reduce the consumption of nectar so that the workers take it in the hexagonal eyes and then after that the honey is sorted.

Fifth Group: (untreated)

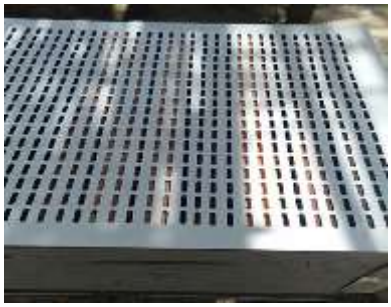
In which the original queen is excluded within the sect, working by nature laying eggs during the flood season without excluding or reserving, which is the known method used in all bees, and then the honey is sorted at the end of the flood season.

(1) Royal Jelly compilation

(2) Insert a virgin cage under a hemisphere

(3) Queens barrier

(4) Natural breeding queens hous



(5) Inculated queen

(6) A virgin returning from fresh inculation with the male's anus

(7) The weight of the beeswax frame

(8) Frame of honey product

Statistical analysis

All the data collected were subjected to statistical analysis of variance as described by **Gomez and Gomez (1984).** The treatment means were compared using LSD test at 0.05 level of significant.

RESULTS AND DISCUSSION

A) In pepper season

The results in **Table (1)** showed that the highest percentage of acceptance for virgin queen recorded with the treatments of entering a queen cells and natural breeding from it(1and1%), respectively, while the treatments of insert virgin, shear the original queen by a queen barrier and untreated no percentage has been recorded of acceptance for virgin queen, during both seasons .

Also, the highest percentage of queen cells acceptance recorded with entering a queen cells and natural breeding from it (1and1%), while the treatments of insert virgin, shear the original queen by a queen barrier and untreated don't percentage has been recorded of royal house acceptance. during both seasons .

Many authors talk about acceptance percentage. **Abd Al Fattah and El-Shemy (1996)** discovered that the plastic queen cups precipitated widespread expand in the acceptance share (84.7%) than wax queen cups (76%) when they grafted with young larvae and introduced into queen rearing colony. **Gençer, *et al.* (2000)** Found that supplemental feeding of rearing colonies improves the acceptance rate of grafted larvae ($p \leq 0.05$). Larval age did no longer have an effect on the acceptance rate.

Our obtained effects are in agreement with these obtained through **Diab (1986)** who referred to that the double grafting technique gave the high-quality end result of queen cells acceptance (60%), accompanied by using moist and dry strategies of grafting (52.22 and 42.22%) respectively, with excessive sizeable

variations between them. Also, **ElHanafy (1991)** who found that wet grafting approach gave vast higher consequences (81.7%) than dry grafting (50.8%) in the acceptance of grafted larvae. **Also, Dedei-S (1994**) reported that it was once a great different, in weight of virgin queen, number of ordinary larvae, quantity of emerged queens. All these parameters were greater in the double grafting technique.

However, **Wongsiri *et al.* (1989)** located that there used to be no extensive distinction between single grafting and double grafting in the number of regularly occurring cells. **Orosi-Pal (1957)** concluded that the cells on lower row have been greater regular than on the upper one. **Ali (1994)** who observed that the best possible wide variety of widely wide-spread queen cells was located on the bottom function observed by means of the center level, then the pinnacle one. According to Shah (2000) the percentage of established larvae that were grafted with dilute royal jelly amongst organizations confirmed statistical difference between acceptance of 1- and 2- day- old larvae among of top and decrease bar of the grafted frames. The corporations generic extra two-day-old larvae as in contrast to one-day-old larvae.

According to **El-Din-Haes (1999)** showed that the acceptance and body weight were step by step multiplied in the course of the season, probably due to the increase in the food aid round the apiary. Also, **Zeedan (2002)** who cited that there were extensive differences in the suggest of universal larvae between both spring (84.2%) and summer time (82.3%) from one side and each autumn (73.4%) and iciness (71.1%) from the different one. Also, **Hammad (2007)** recorded that the imply quantity of queen cells produced all through spring season used to be greater than in summer one. While, **Abd Al-Fattah and Shemy (1996)** determined that the plastic queen cups prompted full-size enlarge in acceptance percentage. They added

that no giant variations have been located between plastic and wax queen cups for the percentages of queen cells.

Sahinler *et al*. (1997) who determined that feeding colonies with pollen substitute improved the acceptance charges drastically ($P \leq 0.01$) in queenless phone builders. The age of larvae was once additionally necessary on the acceptance of cells. Also, **Sharaf El-Din et al. (1999)** located that feeding colonies with yeast gave the height end result of acceptance (85.50%) observed with the aid of soybean (82.20%) semidry date (77.80%), mandarin cortex jam (73.30%) and sugar syrup (61.10%) respectively. Also, **Shehata (2009)** found that the examined diets did now not have an effect on extensively percent acceptance of grafted queen cups as it ranged between 64.64- 70.89% and 58.89-63.56% when the grafted larvae aged 1 and two days, respectively compared to 68 and 63.33% for control. However, **Hanna (1963)** concluded that the larval age had no significant effects on the proportion of acceptance. Finally queen cell acceptance may additionally be controlled by unique elements such as larval grafting methods, phone queen cups, feeding and rearing season these factors pleasant of queen cellphone affect processioning through larval improvement and the pleasant of queen produced. Acceptance of grafting larvae in the exact indication of the colony condition.

Generally, in exclusive tactics the rate of acceptance and excellent of the reared queens stated to be varied. Besides the kinds of strategies used, the status of colonies being populous (two or three story) with younger worker bees masking the brood with ample food resources pronounced to affect the range and fine of the reared queens **(Büchler *et al*., 2013).**

All treatments of insert virgin, entering a queen cells, natural breeding from it, shear the original queen by a queen barrier and control not registered positive result of number of virgin queen produced, during both seasons.

The amount of royal jelly (gm.) recorded the maximum values with treatments of insert virgin (4.70 and 4.90), followed by entering a royal house (4.10 and 5.20) and natural breeding from it (8.80 and 9.30), while the minimum values of amount of royal jelly recorded with shear the original queen by a queen barrier (2.30 and 1.90) and untreated (1.70 and 1.30), respectively, during both seasons.

Number of swarms produced recorded the highest means values with treatments of insert virgin (1 and 1), followed by entering a royal house (1 and 1) and natural breeding from it (1 and 1), while the lowest means values of amount of royal jelly recorded with shear the original queen by a queen barrier (0 and 0) and control (0 and 0), respectively, during both seasons.

A new queen will be reared when the historical queen's reproductively decreases or the honey bee is geared up to swarm in a natural colony. At this time, employee bees will construct some queen cells and allow the historical queen to lay eggs in queen cells. These eggs in the queen cells will improve into new queens. Instead, worker bees pick to use eggs in employee cells rather than larvae to rear new queens in emergency queen rearing when the honeybee colony loses its queen **(Winston, 1987 and Winston, 1979).**

Number of virgin queens vaccinated recorded the highest means values with treatments of insert virgin (1 and 1), followed by entering a queen cells (1 and 1) and natural breeding from it (1 and 1), while the lowest means values of amount of royal jelly recorded with shear the original queen by a queen barrier (0 and 0) and control (0 and 0), respectively, during both seasons.

Percentage of natural insemination recorded the highest means values with treatments of insert virgin (1 and 1), followed by entering a queen cells (1 and 1) and natural breeding from it (1 and 1), while the lowest means values of amount of royal jelly recorded with shear the original queen by a queen barrier (0 and 0) and control (0 and 0), respectively, during both seasons.

Amount of honey produced recorded the highest means values with treatments of natural breeding from it (7.40 and 6.60), followed by shear the original queen by a queen barrier (6.25 and 5.90), insert virgin (5.45 and 4.45), while the lowest means values of recorded with entering a royal house (5.20 and 5.05) and control (4.95 and 5.15), respectively, during both seasons.

B) In clover season

The results in **Table (2)** showed that the highest percentage of acceptance for virgin queen recorded with the treatments of insert virgin and natural breeding from it (1 and1%), respectively, while the treatments of shear the original queen by a queen barrier and control no percentage has been recorded of acceptance for virgin queen, during 2019 season. In the second season, the highest percentage of acceptance for virgin queen recorded with the treatments of insert virgin, entering a queen cells and natural breeding from it (1, 1 and1%), respectively, while the treatments of shear the original queen by a queen barrier and control no percentage has been recorded of acceptance for virgin queen

Also, the highest percentage of queen cells acceptance recorded with entering a royal house and natural breeding from it (1 and1%), while the treatments of insert virgin, shear the original queen by a queen barrier and control don't percentage has been recorded of queen cells acceptance, during both seasons. All treatments of virgin

queen, entering a queen cells, natural breeding from it, shear the original queen by a queen barrier and control not registered positive result.

All treatments of insert virgin, entering a queen cells, natural breeding from it, shear the original queen by a queen barrier and control not registered positive result of Number of virgin queen produced, during both seasons.

The amount of royal jelly recorded the recorded the highest means values with treatments of natural breeding from it (8.20 and 10.20), followed by entering a queen cells (4.50 and 7.80) and virgin queen (3.80 and 6.50), while the minimum values of amount of royal jelly recorded with shear the original queen by a queen barrier (1.35 and 2.00) and control (1.50 and 1.95), respectively, during both seasons.

Number of swarms produced recorded the highest means values with treatments of insert virgin (1 and 1), followed by entering a queen cells (1 and 1) and natural breeding from it (1 and 1), while the lowest means values of amount of royal jelly recorded with shear the original queen by a queen barrier (0 and 0) and control (0 and 0), respectively, during both seasons.

A new queen will be reared when the historic queen's reproductively decreases or the honey bee is geared up to swarm in a herbal colony. At this time, employee bees will build some queen cells and allow the old queen to lay eggs in queen cells. These eggs in the queen cells will improve into new queens. Instead, employee bees prefer to use eggs in employee cells rather than larvae to rear new queens in emergency queen rearing when the honeybee colony loses its queen suddenly **(Winston, 1987 and Winston, 1979).**

Number of virgin queens vaccinated recorded the highest means values with treatments of insert virgin (1 and 1), followed by entering a royal house (1 and 1) and

natural breeding from it (1 and 1), while the lowest means values of amount of royal jelly recorded with shear the original queen by a queen barrier (0 and 0) and control (0 and 0), respectively, during both seasons.

Percentage of natural insemination recorded the highest means values with treatments of insert virgin (1 and 1), followed by entering a royal house (1 and 1) and natural breeding from it (1 and 1), while the lowest means values of amount of royal jelly recorded with shear the original queen by a queen barrier (0 and 0) and control (0 and 0), respectively, during both seasons.

Amount of honey produced recorded the highest means values with treatments of natural breeding from it (6.35 and 6.20), followed by shear the original queen by a queen barrier (5.75 and 5.70), entering a royal house (4.15 and 4.60), while the lowest means values of amount of honey produced recorded with insert virgin (4.15 and 4.60) and control (3.85 and 4.05), respectively, during both seasons.

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الملخص العربي

تاثير بعض العمليات النحلية على انتاجية طوائف نحل العسل فى مصر

**** ماهر محمد مصطفى ابوليله، * حسن محمد صبحى، ** محمد السيد السيد مرسى،**
**** خالد محمد احمد عبد الحميد، *سحر حسين عبدالله هيكل *** ياسمين امام عبدالمبدى**

* كلية الدراسات الافريقة العليا- جامعة القاهرة -جيزه
** قسم بحوث النحل- معهد وقاية النباتات- مركزالبحوث الزراعية – جيزه
*** كلية الزراعة – جامعة القاهره - جيزه

أجريت تجربة حقلية على نحل العسل في قسم بحوث النحل - محطة بحوث وقاية النباتات بالصبحية بمحافظة الإسكندرية، مصر، خلال موسمي 2019 و 2020 لتقييم دراسة تأثير استبعاد الملكات وحجزالملكات بعد أسبوع من بداية خلال موسم الفيض ويوضع ملكات عذراء بدلا من الملكات الاصلية التزهير المستبعدة، أوبيوت ملكية، أوتربية طبيعية منها، أوحجز الملكة الاصلية على اطارين أو ترك الملكة الاصلية داخل الطائفة لتقليل مساحة الحضنة وزيادة مساحة العسل، حجز تعمل في الطائفة على طبيعتها (مقارنة). تتم المقارنه بين بدون استبعاد أو الملكة العذراء، والبيت الملكى، والتربية الطبيعية منها، وحجز الملكة الاصلية والمقارنة مع الكنترول من حيث كمية العسل المنتج، وكمية غذاء ملكات النحل المنتج، وعدد الطرود المنتجة، وعدد الملكات العذارى المنتجة، وعدد الملكات الملقحه ونسبة قبول كلا من الملكات العذارى والبيوت الملكية على نجاح التلقيح أظهرت النتائج أن معاملة التربية الطبيعي منها بعد أخذ للملكات العذارى الناتجه. الطرد سجلت أعلى متوسط قيم لكمية غذاء ملكات النحل وكمية العسل المنتجة وكذلك ملكه ملقحة جديدة تليها معاملة حجزالملكة الأصلية بحاجزملكات سجلت أعلى متوسط قيم كمية العسل المنتج بدون اخذ طرد منها بالمقارنة مع المعاملات الأخرى بالرغم من اخذ طرد من المعامله التي تم ادخال ملكه عذراء لها ثم المعاملة التي تركت بها الملكة الاصليه تعمل على طبيعتها بدون استبعاد او حجزوبدون اخذ طرد منها اقلهم في انتاج الغذاء الملكى ولكن اعلى في انتاج كمية العسل من المعاملة ادخال ملكه عذراء خلال موسمي 2019 و2020 لنبات البرسيم وأشجار الفلفل البرازيلي. الخلاصة، تفوق معاملة التربية الطبيعية منها مقارنة بالمعاملات الأخرى في كمية غذاء ملكات النحل وكمية العسل المنتج في كلا الموسمين

Treatments		% Acceptance for virgin queen	% Queen cells acceptance	Number of virgin queen produced	Amount of royal jelly (gm.)	Number of swarms produced	Number of virgin queens vaccinated	% Natural insemination	Amount of honey produced (kg.)
		2019							
Insert virgin		1.00a	0.00b	0	4.7a	1.00a	1.00a	1.00a	5.45bc
Entering a queen cells		1.00a	1.00a	0	4.1a	1.00a	1.00a	1.00a	5.20bc
Natural breeding from it		1.00a	1.00a	0	8.80a	1.00a	1.00a	1.00a	7.40a
Shear the original queen by a queen barrier		0.00b	0.00b	0	2.30b	0.00b	0.00b	0.00b	6.25ab
Untreated		0.00b	0.00b	0	1.70b	0.00b	0.00b	0.00b	4.95c
LSD at (0.05)		**0**	**0**	**0**	**1.95**	**0**	**0**	**0**	**1.21**
		2020							
Insert virgin		1.00a	0.00b	0	4.90a	1.00a	1.00a	1.00a	4.45c
Entering a queen cells		1.00a	1.00a	0	5.20a	1.00a	1.00a	1.00a	5.05bc
Natural breeding from it		1.00a	1.00a	0	9.30a	1.00a	1.00a	1.00a	6.60a
Shear the original queen by a queen barrier		0.00b	0.00b	0	1.90b	0.00b	0.00b	0.00b	5.90ab
Untrea		0.00b	0.00b	0	1.30b	0.00b	0.00b	0.00b	5.15b

ted									c
LSD at (0.05)		**0**	**0**	**0**	**1.80**	**0**	**0**	**0**	**0.87**

Table (1): Effect of raising and holding queens during the flood season (Brazilian pepper trees)

Table (2): Effect of raising and holding queens during the flowering season **(**clover plant)

Treatments	**% Acceptance for virgin queen**	**% Queen cells Acceptance**	**Number virgin queen produced**	**Amount of royal jelly (gm.)**	**Number of swarms produced**	**Number virgin queens vaccinated**	**% Natural insemination**	**Amount of honey produced (Kg.)**
2019								
Insert virgin	1.00a	0.00b	0	3.80a	1.00a	1.00a	1.00a	3.85bc
Entering a queen cells	0.00b	1.00a	0	4.50a	1.00a	1.00a	1.00a	4.15bc
Natural breeding from it	1.00a	1.00a	0	8.20a	1.00a	1.00a	1.00a	6.35a
Shear the original queen by a queen barrier	0.00b	0.00b	0	1.35b	0.00b	0.00b	0.00b	5.75ab
Untreated	0.00b	0.00b	0	1.50b	0.00b	0.00b	0.00b	4.60c
LSD at (0.05)	**0**	**0**	**0**	**2.25**	**0**	**0**	**0**	**1.30**
2020								
Insert virgin	1.00a	0.00	0	6.50a	1.00a	1.00a	1.00a	4.05c
Entering a queen cells	1.00a	1.00a	0	7.80a	1.00a	1.00a	1.00a	4.60bc
Natural breeding from it	1.00a	1.00a	0	10.20a	1.00a	1.00a	1.00a	6.20a
Shear the original	0.00b	0.00b	0	2.00b	0.00b	0.00b	0.00b	5.70ab

queen by a queen barrier								
Untreated	0.00b	0.00b	0	1.95b	0.00b	0.00b	0.00b	4.10bc
LSD at (0.05)	**0**	**0**	**0**	**2.25**	**0**	**0**	**0**	**1.32**

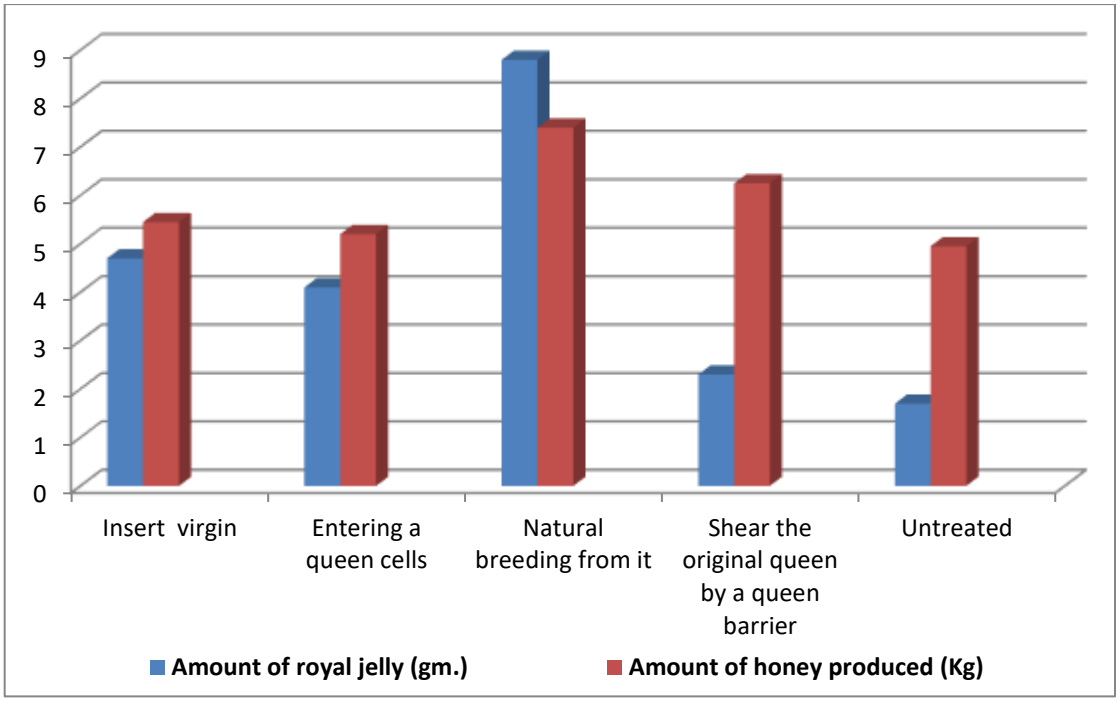

Fig. (1): Effect of raising and holding queens during the flood season (Brazilian pepper trees) during 2019 season.

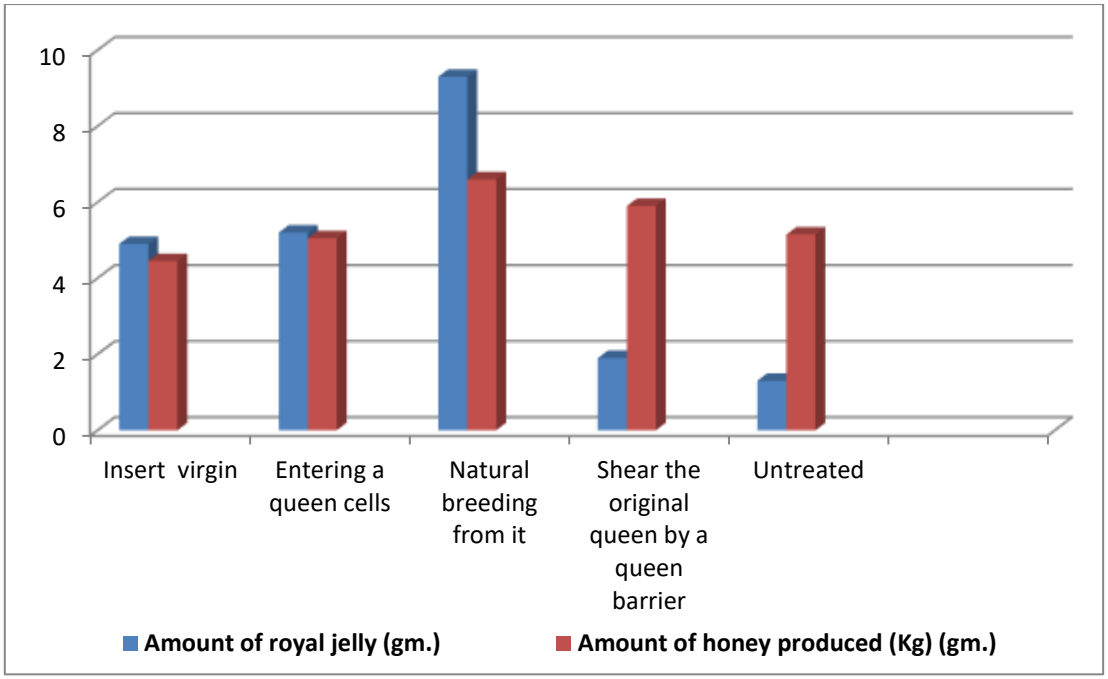

Fig. (2): Effect of raising and holding queens during the flood season (Brazilian pepper trees) during 2020 season.

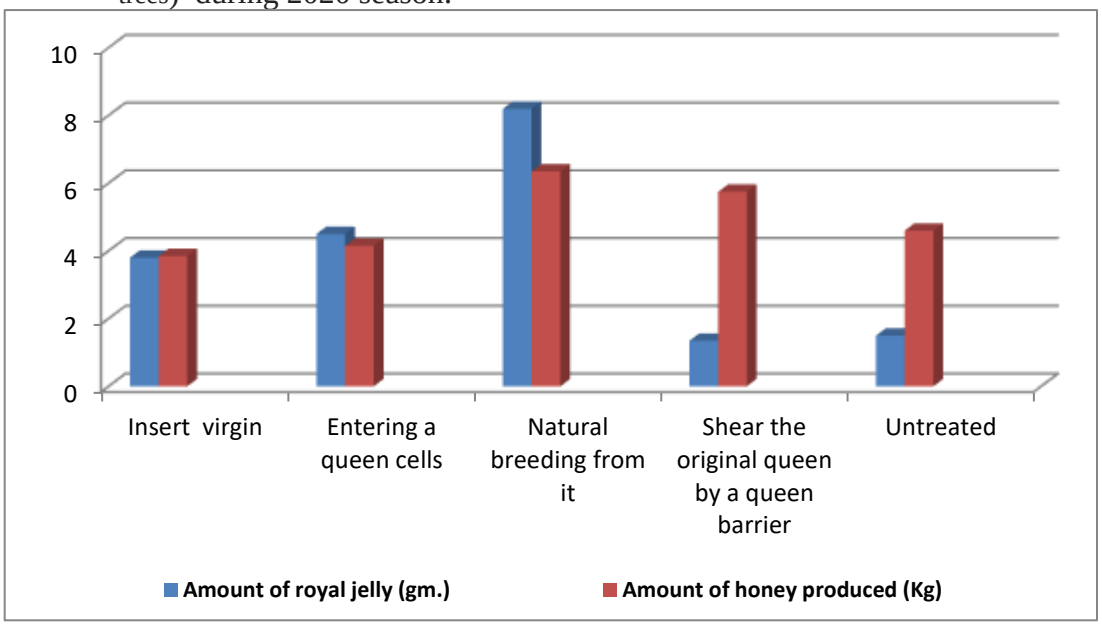

Fig. (3): Effect of raising and holding queens during the flowering season **(**clover plant) during 2019 season.

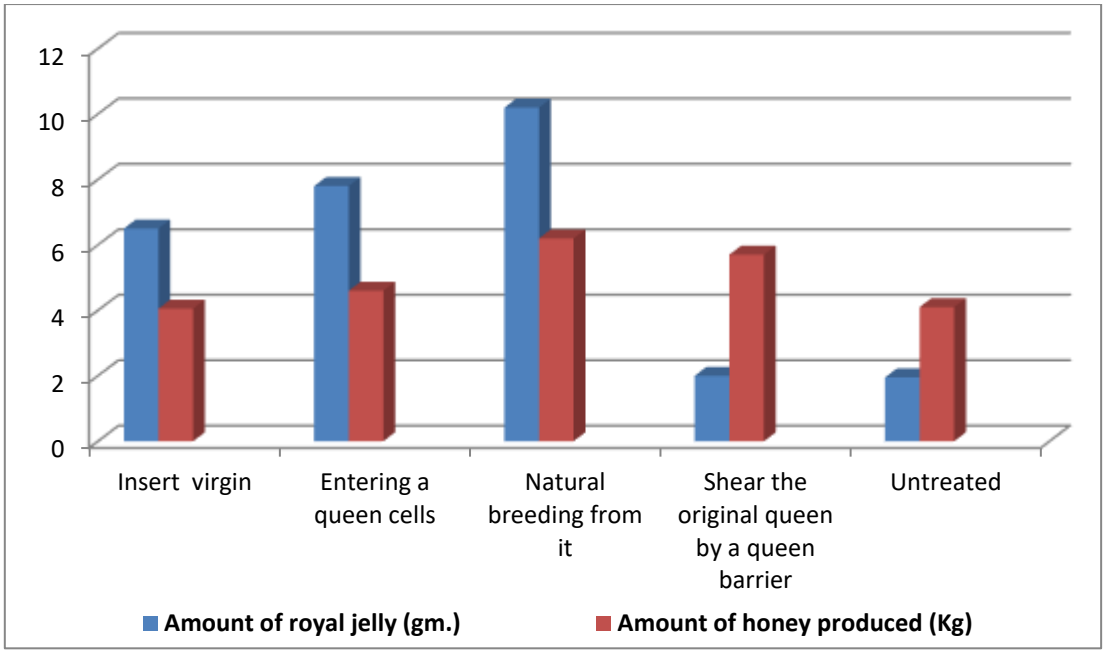

Fig. (4): Effect of raising and holding queens during the flowering season **(**clover plant) during 2020 season.