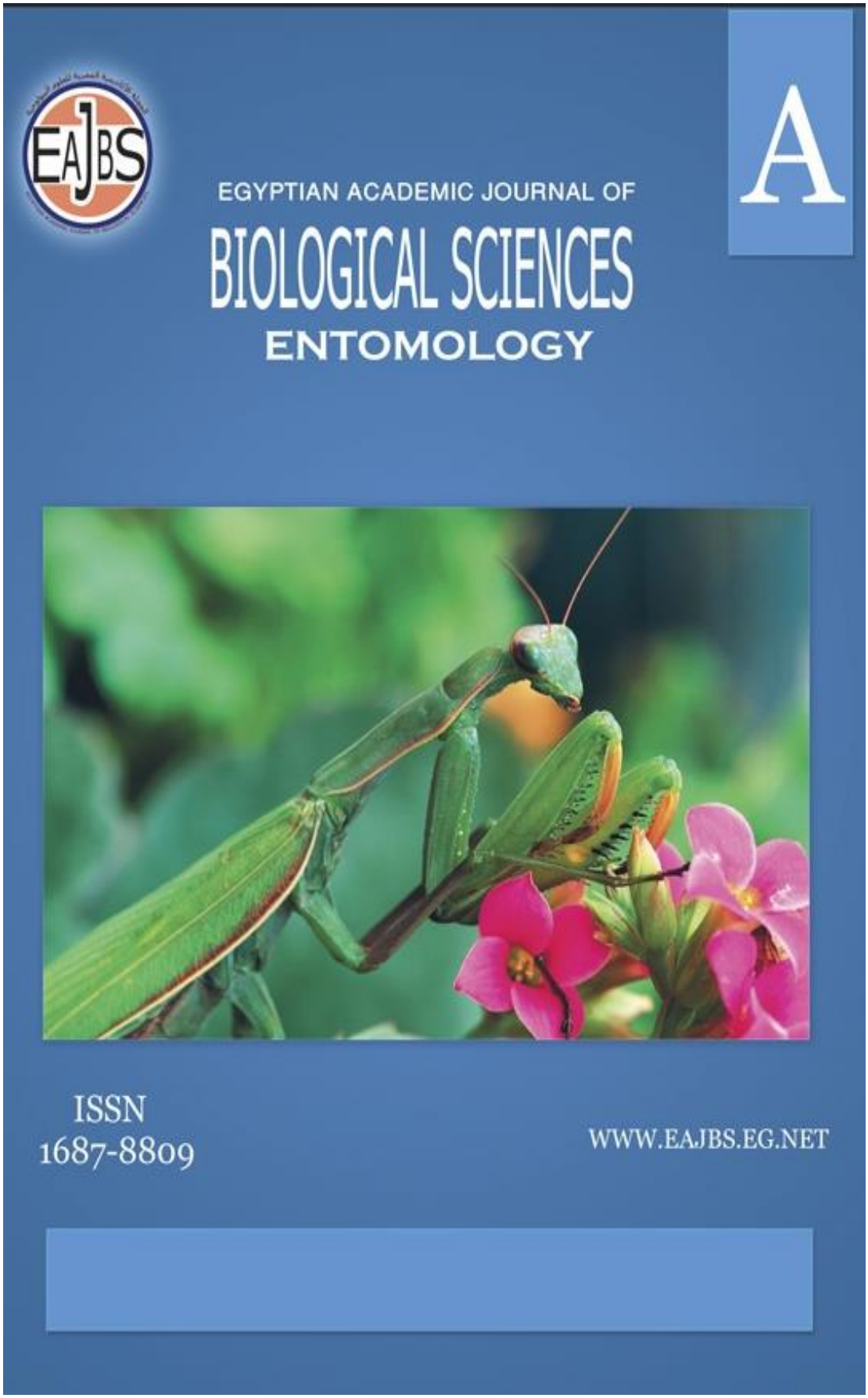

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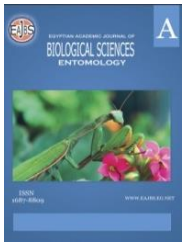

Effect of Different Seasons on the Royal Jelly Production Under Nasr City Conditions – Cairo - Egypt

Abd Rabu E. Hussain, Mohammed K. Abied, Gomaa F. Abo Laban and Amr I. Badwy
Plant Protection Department, Faculty of Agriculture, Al-Azhar University, Cairo, Egypt
Email: amrbadawy.5@azhar.edu.eg

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ABSTRACT

The study was executed at apiary of Plant protection Dept. Fac. of Agric. Al-Azhar Univ., Cairo, Egypt, during two successive years 2019 and 2020 to determine the effectiveness of different seasons on the acceptance rates of the larvae and royal jelly production. In the first year, the highest acceptance means for Italian hybrid 72.1 and 65.43% for Carniolan hybrid were recorded at mid-spring on the other hand, the lowest acceptance percentages means were 50.86 and 55.8 % recorded at early summer for Carniolan and Italian hybrids respectively. Also, results demonstrated that mid spring gave the best mean weight of royal jelly per queen cell cup 238.35 mg. for Italian hybrid and 236.31 mg. for the Carniolan hybrid. The lowest quantity means were recorded in early summer 187.24 mg./cup for Carniolan hybrid and 198.74 mg./cup for Italian hybrid. In the second year, the highest acceptance means were 66.42 and 62.96% at mid spring for Italian and Carniolan hybrids respectively. Whereas the lowest acceptance percentage means were 44.44 and 48.4 % at early summer for Carniolan and Italian hybrids. Also, results cleared that mid-spring gave the best mean weight of royal jelly per queen cell cup, 229.71 mg. for Italian hybrid and 227.5 mg. for Carniolan hybrid. The lowest quantity means were recorded at early summer 186.72 mg./cup for Carniolan hybrid and 189.06 mg./cup for Italian hybrid. As for the effect of the bar level, the middle bar level gave the best results for royal jelly quantity and cup acceptance while the upper level gave the least royal jelly quantity and acceptance percentages in different seasons. There was a significant difference in acceptance percent and the royal jelly production per cup cell between mid-spring and early summer. Mid-spring gave the best results while the early summer gave the least results.

INTRODUCTION

Royal jelly (RJ) is one of the most important products of honeybee colonies which is secreted by young worker bees (Patel *et al*. 1960; Haydak, 1970 and Lensky & Rakover 1983). As the hypophryngeal and mandibular glands become fully developed in the young worker (6-13 days old) with large functional secreting acini (Lass and Crailsheim, 1996; Rahman *et al.* 2014). Royal jelly is best recognized for antioxidant, antimicrobial, antibacterial, antiallergic, anti-inflammatory, antianabolic, neuroprotective, antihypertensive and immunomodulatory effects, besides the influence of specific enzyme inhibitors, Alzheimer, depression, infertility, digestive problems, aging, anemia, stress-related ailments, besides its antioxidant and antidiarrhoeal properties (Elnagar, 2010; Bilikova *et al*., 2015;

Asadi *et al*. 2019; Maghsoudlou *et al*. 2019; Zhang *et al*. 2019, and Abdelnour *et al.,* 2020). It is secreted for the nutrition of the queen bee and young larvae in the colony. Also, it is produced from some glands in the young workers' heads (hypopharyngeal and mandibular glands) and has been recognized to possess a wider range of uses for boosting human health (Knecht & Kaatz, 1990; Han *et al*., 2011; Abdelnour *et al.* 2019). RJ has a pH of 3.4 - 4.5; water (60-70%), protein (9-18%), lipid (3-8%), carbohydrate (7-18%), ash (0.8-3%), 10-Hydroxy-2-Decenoic acid (HDA) (> 1.4%) (Sabatini *et al*. 2009). Royal jelly is broadly applied in preparing of many pharmaceutical approaches, it has health and pharmacological properties which were verified on animals. This advantage is perhaps because of the existence of MRJPs in the RJ (Park *et al*. **2019**).The properties of RJ supported the use it as a well-known dietary supplement and different pharmaceuticals related to fertility disorders in human and animals (Azad *et al.* ; 2018Asadi *et al*. 2019; Maghsoudlou *et al*. 2019, and Zhang *et al.* 2019). Royal jelly production may be an alternative income for beekeepers in regions where honey production is low in periods of low flowering or sugarcane regions where honeydew does not reach the commercial value of floral honey, in addition to being less accepted by consumers. However, when analyzing production with Africanized honeybees, they observed values that are still far from those obtained in China, where currently accounts for 90% of world production, with colonies that produce up to 10 kg per colony per year (Blomstedt, 2013, and Sereia *et al.* 2013). China is the largest world royal jelly producing country which total production of royal jelly reaches to 3,500 tons (Blomstedt, 2013, Sereia *et al.* 2013, Cao *et al*. 2016, and Nie *et al*. 2017). There are numerous factors affecting royal jelly production (Ali, 1994; Sahinler and Sahinler, 2005, and El-Din, 2010). The most important of them are; the age of transferred larvae (Sahinler and Kaftanoglu 1997); feeding (Fuhai *et al*. 1993); number of transferred queen cell cups (Van-Toor *et al*., 1994, Kutluca *et al*., 1998 and Sahinler and Sahinler, 2002); harvesting interval (Ali, 1994 and El-Din, 2010), whether the colony is queenless or queenright (Van-Toor & Littlejohn, 1994); age of nurse workers (Ali, 1994); bee race (Shibi *et al*., 1993, Jianke *et al*. 2003, and Cao *et al.* 2016); seasons (Sahinler and Kaftanoglu 2005; El-Din, 2010; Helaly, 2018), and grafted bar levels and queen cells position (Helaly, 2018, and Fathy, 2019). The aim of this study is to investigate effect of different seasons on the acceptance grafted queen cell cups and quantity of the royal jelly.

MATERIALS AND METHODS

The experiment was carried out at the apiary of Plant protection Dept. Fac. of Agric. Al-Azhar Univ., Cairo, Egypt, on Italian and Carniolan hybrids under Nasr City conditions during two successive years of 2019 and 2020, to determine the effect of different seasons on the acceptance cups and the amount royal jelly. Seasons are elaborated as follows: late winter season (February) early spring season (March), mid spring season (April), the late spring season (May) and early summer season (June and July). Three colonies of the Italian and Carniolan honey bee hybrid have been prepared. They were chosen of the same population (4 sealed brood combs and 2 honey +pollen combs covered with honey bees). The grafting frame was inserted in the rearing colonies before the grafting by 2 hrs for polishing. Each honey bee colony queen was removed before the grafting process by 48hr (queenless). Grafting of the one-day larvae from marked comb into the plastic cups carefully. Forty-five queen cups were attached to three wooden bar sticks in each rearing colony. After 72 hours from the grafting larvae in queen cup cells on the bars, the larvae removed from the plastic cups by a Celestin needle, then collecting the royal jelly with a wooden spoon. Each queen cell was weighted according to its level (upper ,middle and lower) to calculate the average weight per cup and collecting the royal jelly then placed in a market container which was

weighed empty using electronic balance for 2 decimals numbers and numbered with a code number (the capacity of each container was five grams).The royal jelly was saved in the fridge.

Statistical Analysis:

All data were analyzed by using Analysis of Variance (ANOVA), followed by Duncan's Multiple Range Test to determine the differences between the obtained means using COSTAT computer program.

RESULTS AND DISCUSSION

The Effect of Different Seasons on Acceptance and Royal Jelly Quantity:

In the first year, the highest acceptance means were 72.1and 65.43% recorded at mid spring for Italian and Carniolan hybrids respectively. On the other hand, the lowest acceptance percentages means were 55.8% and 50.86% recorded at early summer for Italian and Carniolan hybrids. Also, in the second year, the highest acceptance means were 66.42% and 62.96% recorded at mid-spring for Italian and Carniolan hybrids respectively. Whereas the lowest acceptance percentages means were 48.4% and 44.44% recorded at early summer for Italian and Carniolan hybrids (table 1).

Table 1: acceptance percentage means of grafted queen cups for Italian and Carniolan hybrids during seasons of 2019 and 2020.

Years	First year /2019			Second year/2020		
Hybrids / Seasons	Italian hybrid	Carniolan hybrid	mean± s.e	Italian hybrid	Carniolan hybrid	mean± s.e
late winter	67.9	57.78	62.84 ±7.16 abc	52.35	47.9	50.12 ±3.14 cd
early spring	70.62	63.46	67.04 ±5.06 ab	59.01	55.06	57.04 ±2.79 abcd
mid spring	72.1	65.43	68.77±4.71 a	66.42	62.96	64.69 ±2.44 ab
late spring	69.14	64.44	66.79 ±3.32 ab	54.07	51.36	52.72 ±1.92 bcd
early summer	55.8	50.86	53.33 ±3.49 bcd	48.4	44.44	46.42 ±2.79 d
mean	67.11	60.4	63.75 ±4.75	56.05	52.35	54.20 ±2.62

Means within a column followed by different letters are significantly or highly significant according to Duncan's multiple range test at 5% probability.

In respect of the royal jelly quantity means mg./cup from Italian and Carniolan hybrids rearing colonies during different seasons in two successive years 2019 and 2020 are presented in Table (2). The data showed in the first year, mid-spring gave the best mean weight of royal jelly per both queen cell cup 238.35 mg. for Italian hybrid and 236.31 mg./cup for Carniolan hybrid .The lowest quantity means were recorded at early summer 198.74 mg./cup for Italian hybrid and 187.24 mg./cup for Carniolan hybrid and at the second year, mid-spring gave the best mean weight of royal jelly per both queen cell cup 229.71 mg./cup for Italian hybrid and 227.5 mg./cup for Carniolan hybrid .The lowest quantity means were recorded in early summer 189.06 mg./cup for Italian hybrid and 186.72 mg./cup for Carniolan hybrid. The results agree with El-Din (2000**)** who showed that the acceptance percentages of larvae and royal Jelly production per cup and/or per colony were higher in the

spring season than summer season the best month during spring was March while the best month during summer was July. The differences between the two seasons were significant. El-Waseef (2002) stated that the mean number produced queen cups were higher in spring – 1998 (16.77/col) and winter (5.741/col) than the summer (2.89/col) and autumn (0.20/ col) in the indoor colonies in a closed area. While, in the second experimental period (1999-2000) the mean number of produced queen cups was higher in winter (3.17/col) and summer (3.48/col) than in spring (3.00/col) and autumn (0.29/col) under the same conditions.

Table 2: Royal jelly quantity means, mg/cup of Italian and Carniolan hybrids during seasons of 2019 and 2020.

Years	First year/2019			second year/2020		
Hybrids / Seasons	Italian hybrid	Carniolan hybrid	mean± s.e	Italian hybrid	Carniolan hybrid	mean± s.e
late winter	202.77	193.12	197.94 ±6.82 b	197.15	192.19	194.67 ±3.51 b
early spring	232.1	223.43	227.76 ±6.13 a	223.29	211.54	217.42 ±8.31 a
mid spring	238.35	236.31	237.33 ±1.44 a	229.71	227.5	228.60 ±1.56 a
late spring	229.49	216.38	222.94 ±9.27 a	223.16	217.04	220.10 ±4.33 a
early summer	198.74	187.24	192.99 ±8.14 b	189.06	186.72	187.89 ±1.66 b
mean	220.29	211.3	215.79 ±6.36	212.47	207	209.74 ±3.87

Means within a column followed by different letters are significantly or highly significant according to Duncan's multiple range test at 5% probability. LSD 0.05 = 13.06

The Effect of Seasons and Bar Levels on Acceptance and Royal Jelly Quantity:

The data cleared the effect of seasons and bar levels in Table 3. The highest Italian acceptance percentages means were 65.93 72.59 75.93 66.67 and 58.89 % at late winter, early spring, mid-spring, late spring and early summer for middle bar levels respectively, while the lowest Italian acceptance means were 57.04, 61.11, 62.59, 57.41and 47.04% at late winter, early spring, mid-spring, late spring and early summer for upper bar levels respectively, while the highest Carniolan hybrid acceptance percentages means were 56.3, 67.41, 70.74, 63.33 and 51.11 % recorded at late winter, early spring, mid-spring, late spring and early summer for middle bar levels respectively, while the Carniolan hybrid lowest acceptance means were 51.11, 54.81, 57.04, 52.96 and 44.44% recorded at the early summer on the upper, lower and middle bars level respectively. The previous data show that the middle bar level gave the best results for royal jelly quantity and cup acceptance while the upper level gave the least royal jelly quantity and acceptance percentages in different seasons.

Table 3: Acceptance percentage means of grafted queen cups under different bars level for Italian and Carniolan hybrids during seasons of 2019 and 2020.

Hybrids	**Italian hybrid**				**Carniolan hybrid**			
Bar level / Seasons	upper	middle	lower	mean	upper	middle	lower	mean
late winter	57.04	65.93	57.41	60.12 ±5.03 abc	51.11	56.3	51.11	52.84 ±2.99 bc
early spring	61.11	72.59	62.96	65.56 ±6.16 ab	54.81	67.41	58.52	60.25 ±6.47 abc
mid spring	62.59	75.93	67.04	68.52 ±6.79 a	57.04	70.74	61.85	63.21 ±6.95 ab
late spring	57.41	66.67	60.74	61.60 ±4.69 abc	52.96	63.33	57.41	57.90 ±5.20 abc
early summer	47.04	58.89	50.37	52.10 ±6.11 bc	44.44	51.11	47.41	47.65 ±3.34 c
mean	57.04	68	59.7	61.58 ±5.72	52.07	61.78	55.26	56.37 ±4.95

Means within a column followed by different letter are significantly or highly significant according to Duncan's multiple range test at 5% probability.

In respect of the royal jelly quantity means mg/cup, it is found that the Italian hybrid gave the highest royal jelly quantity means recorded 201.44, 233.25, 238.7, 230.59 and 198.54 mg./cup at late winter, early spring, mid spring, late spring and early summer for middle bar levels respectively. The lowest Italian hybrid royal jelly quantity means were 198.48, 224.02, 231.81, 222.26 and 189.64 mg./cup recorded at late winter, early spring, mid-spring, late spring and early summer for upper bar levels respectively. In respect of the Carniolan hybrid the highest royal jelly quantity means were 196.9, 223.46, 235.78, 222.96 and 190.36 mg./cup recorded at late winter, early spring, mid-spring, late spring and early summer for middle bar levels respectively. The lowest Carniolan hybrid royal jelly quantity means recorded 189.55, 212.61, 229.74, 211.26 and 183.69 mg./cup in late winter, early spring, mid-spring, late spring and early summer for upper bar levels respectively. There was found a significant difference in acceptance percent and the royal jelly production per cell between mid-spring and early summer (Table 4).

Table 4: Royal jelly quantity means, mg/cup for bar levels of Italian and Carniolan hybrids during seasons of years, 2019 and 2020.

Hybrids	**Italian hybrid**				**Carniolan hybrid**			
Bar level / Seasons	upper	middle	lower	mean± s.e	Upper	Middle	lower	mean± s.e
late winter	198.48	201.44	199.95	199.96±1.48 c	189.55	196.9	191.51	192.65±3.80 cd
early spring	224.02	233.25	225.81	227.69±4.89 a	212.61	223.46	218.82	218.30±5.44 b
mid spring	231.81	238.7	231.57	234.03±4.05 a	229.74	235.78	230.2	231.91±3.36 a
late spring	222.26	230.59	226.13	226.33±4.17 a	211.26	222.96	215.92	216.71±5.89b
early summer	189.64	198.54	193.53	193.90±4.46 cd	183.69	190.36	186.88	186.98±3.33 d
mean	213.24	220.5	215.4	216.38±3.73	205.37	213.89	208.67	209.31±4.30

Means within a column followed by different letter are significantly or highly significant according to Duncan's multiple range test at 5% probability**.**

The results showed that the acceptance percentages of larvae and royal Jelly production per cup and/or per colony were higher in the spring season than summer season the best month during spring was March while the best month during summer was July. The findings were consistent with those obtained by Helaly (2018) mentioned that the highest acceptance percentages and royal jelly quantity means were recorded in the middle bar level, while the lowest results were recorded in the middle bar level. The results are contradicted with those reached by Eissa *et al.* (2012) indicated the lower position of bars gave the best result of acceptance (90%) followed by the middle (76.66%) then the upper bar which gave (53.3%).

CONCLUSION

The royal jelly isn't a natural protein nutrition of colony and human but became income for bee keepers around the world. Early and mass production more yield with little coast under Nasr City condition. The present investigation will provide some useful information about sperate and filter of royal jelly components as iso-insulin to use them pharmaceutical and apitherapy.

REFERENCES

Abdelnour, S. A., Abd El-Hack, M. E., Alagawany, M., Farag, M. R., and Elnesr, S. S. (2019). Beneficial impacts of bee pollen in animal production, reproduction and health. *Journal of Animal Physiology and Animal Nutrition*, 103(2), 477– 484.

Abdelnour, S. A., Abd El-Hack, M. E., Alagawany, M., Taha, A. E., Elnesr, S. S., Abd Elmonem, O. M., and Swelum, A. A. (2020). Useful impacts of royal jelly on reproductive sides, fertility rate and sperm traits of animals. *Journal of Animal Physiology and Animal Nutrition.*

Asadi, N., Kheradmand, A., Gholami, M., Saidi, S. H., and Mirhadi, S. A. (2019). Effect of royal jelly on testicular antioxidant enzymes activity, MDA level and spermatogenesis in rat experimental Varicocele model. *Tissue and Cell*, 57, 70– 77.

Azad, F., Nejati, V., Shalizar-Jalali, A., Najafi, G., and Rahmani, F. (2018). Royal jelly protects male mice against nicotine-induced reproductive failure. *Veterinary Research*

Forum, 9(3), 231– 238.

Bilikova, K., Huang, S. C., Lin, I. P., Simuth, J., and Peng, C. C. (2015). Structure and antimicrobial activity relationship of royalisin, an antimicrobial peptide from royal jelly of *Apis mellifera*. *Peptides*, *68*, 190–196.

Blomstedt, W. (2013). A curious beekeeper travels through China Part III royal jelly production and science. *American Bee Journal*, 153(11), 1171-1175.

Cao, L. F., Zheng, H. Q., Pirk, C. W., Hu, F. L., and Xu, Z. W. (2016). High royal jelly-producing honeybees (*Apis mellifera* ligustica) (Hymenoptera: Apidae) in China. *Journal of economic entomology*, 109(2), 510-514.

Duncan, D.B. (1955). Multiple range and multiple F tests. *Biometrics* 11, 1-42.

EL-DIN, H. A. S. (2010). Studies on royal jelly production in honeybee colonies (Doctoral dissertation, Cairo University).

Eissa, I.S.; Hussain, A.E.; Shehata, I.A.A. and Helaly, K.I.M. (2012). Study of certain factors affecting queen rearing in honey bee colonies on the acceptance rate of grafted queen cells. *Annals of Agricultural Science, Moshtohor,* Vol. 50 (1) 87–92.

Elnagar, S. A. (2010). Royal jelly counteracts bucks' "summer infertility". *Animal Reproduction Science*, 121(1–2), 174–180.

El-Wasseef, R.A.M. (2002). Ecological and Physiological Studies on Honeybee Colonies under Different Environmental Conditions. MSc. Thesis, Fac. Agric., Cairo Univ., 127pp.

Fathy, H. M.; Zohairy, A. M. I. and Hamada, M. A. I. (2019). Effect of Bar Level and Queen Cells Position within Grafted Frame on the Quality of Produced *Apis mellifera* carnica Queen in Manzala Region. *Journal of Plant Protection and Pathology*, 10(7), 349-354.

Fuhai, L.; Fuxiu, L.; Shengming, H. and Shibi, C. (1993). Study on the relationship between royal jelly yield and supplementary feeding. *China Pupular Science Press, Beijing-China*, 131-144.

Han, B.; Li, C.; Zhang, L.; Fang, Y.; Feng, M. and Li, J. (2011). Novel royal jelly proteins identified by gel-based and gel-free proteomics. *Journal of Agricultural and Food Chemistry*, 59(18), 10346– 10355.

Haydak, M. H. (1970). Honey bee nutrition. *Annual review of entomology*, *15*(1), 143-156.

Helaly, K.I. M. (2018). Study of some factors affecting the production of royal jelly under Kafr El. Shaikh governorate conditions. PhD. Thesis, Fac. Agric., AlAzhar Univ., 198p.

Jianke, L.; Shenglu, C.; Boxiong, Z.; Songrun, S. (2003). Optimizing Royal Jelly Production. *American Bee Journal*, *143*(3), 221-224.

Knecht, D. and Kaatz, H. H. (1990). Patterns of larval food production by hypopharyngeal glands in adult worker honey bees. *Apidologie*, *21*(5), 457-468.

Kutluca, S.; Genc, F., and Dodologlu, A. (1998). Besleyici kolonilere verilen ana arı yüksüklerinin sayısı ile hasat aralığının kolonilerin arı sütü verimine etkileri. *Turkis Journal of Veterinaryand Animal Science*, *22*, 363-369.

Lass, A. and Crailsheim, K. (1996). Influence of age and caging upon protein metabolism, hypopharyngeal glands and trophallactic behavior in the honey bee (*Apis mellifera* L.). *Insectes sociaux*, *43*(4), 347-358.

Lensky, Y. and Rakover, Y. (1983). Separate protein body compartments of the worker honeybee (*Apis mellifera* L.). *Comparative Biochemistry and Physiology Part B: Comparative Biochemistry*, *75*(4), 607-615.

Maghsoudlou, A.; Mahoonak, A. S.; Mohebodini, H. and Toldra, F. (2019). Royal jelly: Chemistry, storage and bioactivities. *Journal of Apicultural Science*, 63(1), 17– 40.

Nie, H.; Liu, X.; Pan, J.; Li, W.; Li, Z.; Zhang, S. and Su, S. (2017). Identification of genes related to high royal jelly production in the honey bee (*Apis mellifera*) using microarray analysis. *Genetics and molecular biology*, *40*(4), 781-789.

Park, M. J.; Kim, B. Y.; Park, H. G.; Deng, Y.; Yoon, H. J.; Choi, Y. S. and Jin, B. R. (2019).

Major royal jelly protein 2 acts as an antimicrobial agent and antioxidant in royal jelly. *Journal of Asia-Pacific Entomology*, *22*(3),684–689.

Patel, N. G.; Haydak, M. H. and Gochnauer, T. A. (1960). Electrophoretic components of the proteins in honeybee larval food. *Nature*, *186*(4725), 633-634.

Rahman, S.; Thangkhiew, I. and Hajong, S. R. (2014). Hypopharyngeal gland activity in task-specific workers under brood and broodless conditions in *Apis cerana* indica (Fab.). *Journal of Apicultural Science*, *58*(2), 59-70.

Sabatini, A. G.; Marcazzan, G. L.; Caboni, M. F.; Bogdanov, S. and Almeida-Muradian, L. B. D. (2009). Quality and standardisation of royal jelly. *Journal of Api. Products and Api. Medical Sciences*, *1*(1), 16–21.

Sahinler, N. and Kaftanoglu, O. (1997). Effects of feeding, age of the larvae, and queenlessness on the production of royal jelly. In *Bee Products* (pp. 173-178). Springer, Boston, MA.

Sahinler, N. and Kaftanoğlu, O. (2005). The effects of season and honeybee (*Apis mellifera* L.) genotype on acceptance rates and royal jelly production. *Turkish Journal of Veterinary and Animal Sciences*, *29*(2), 499-503.

Sahinler, N. and Sahinler, S. (2002). Effects of the number of queen cells and harvesting interval on the acceptance rates of the larvae, royal jelly quality and quantity. *Journal of Animal Veterinary Adv*anced, 1(3), 120-122.

Sahinler and Sahinler (2005). insisted that Carniolan and Comparison of Royal Jelly Production among Cross Breed of Honey Bee in Period of Nectar Flow and Non-Nectar Flow. *Journal of Apiculture*, 32(4): 385-389.

Sereia, M. J.; Toledo, V. A. A. d.; Furlan, A. C.; Faquinello, P.; Maia, F. M. C.; Shibi, C.; Shengming, H.; Fuhai, L. and Puxiu, L. (1993). Studies on the relationship between the bee races and the yield of royal jelly. *Honeybee, Royal jelly, Environment, Edited Dept. of Beekeeping Technology, Bee Inst. CAAS, Beijing, China*, 40-53.

Van Toor, R. F. and Littlejohn, R. P. (1994). Evaluation of hive management techniques in production of royal jelly by honey bees (*Apis mellifera*) in New Zealand. *Journal of Apicultural Research*, *33*(3), 160-166.

Wielewski, P. (2013). Alternative sources of supplements for Africanized honeybees submitted to royal jelly production. *Acta Scientiarum. Animal Sciences*, *35*(2), 165-171.

Zeedan, E. W. M. (2002). Studies on Certain Factors Affecting Production and Quality of Queen Honeybees (*Apis mellifera* L.) in Giza Region. MSc. Thesis, Fac. Agric., Cairo Univ., 134 p.

Zhang, X.; Yu, Y.; Sun, P.; Fan, Z.; Zhang, W. and Feng, C. (2019). Royal jelly peptides: Potential inhibitors of β-secretase in N2a/APP695swe cells. *Scientific Reports*, 9(1), 168.

ARABIC SUMMARY

تأثير المواسم المختلفة على انتاج الغذاء الملكي تحت ظروف مدينة نصر، القاهرة

عبدربه ع. حسين، محمد ك. عبيد، جمعه ف. أبو لبن وعمرو إ. بدوي
قسم وقاية النبات- كلية الزراعة- جامعة الأزهر- القاهرة- مصر

تم إجراء هذه الدراسة بمنحل كلية الزراعة جامعة الأزهر خلال عامى الدراسة 2019و 2020 لتحديد تأثير المواسم المختلفة على نسبة قبول اليرقات وإنتاج الغذاء الملكى و فى السنة الأولى كان متوسط أعلى نسبة قبول72.1 و 65.43% فى منتصف الربيع بالنسبة للهجين الإيطالى والكرنيولى على التوالى .بينما كان متوسط أقل نسبة قبول 50.86 و 55.8% سجلت فى الصيف المبكر للهجين الكرنيولى والايطالى على التوالى و حصلنا فى منتصف الربيع على افضل متوسط لكمية الغذاء الملكى للكأس 238.35 و236.31 مجم للهجين الايطالي والكرنيولى على التوالى . كما كان أقل متوسط للكمية بالنسبة للكأس فى الصيف المبكر وهو 187.24 و198.74مجم/ كأس للهجين الكرنيولى والايطالي على التوالى. كما كان متوسط أعلى نسبة قبول فى السنة الثانية 66.42 و 62.96% فى منتصف الربيع بالنسبة للهجين الإيطالى والكرنيولى على التوالى .بينما كان متوسط أقل نسبة قبول 44.44و 48.4 % سجلت فى الصيف المبكر للهجين الكرنيولى و الايطالى على التوالى و فى منتصف الربيع حصلنا على افضل متوسط لكمية الغذاء الملكى بالكأس 229.71 و227.5مجم/ كأس للهجين الايطالي والكرنيولى على التوالفى حين أن أقل متوسط للكمية بالنسبة للكأس سجلت فى الصيف المبكر وهى 189.06 و186.72 مجم/ كأس للهجين الايطالي والكرنيولى على التوالى.أما فيما يتعلق بوضع السدائب تبين أن السدابة الوسطى سجلت أفضل النتائج فى كمية الغذاء الملكى ونسب القبول بينما السدابة العليا سجلت أقل النتائج فى نسب القبول وكمية الغذاء الملكى خلال المواسم المختلفة كما أنه يوجد فرق معنوى بين منتصف الربيع والصيف المبكر فى نسب القبول وكمية الغذاء الملكى فى كل الأحوال .