

INFLUENCE OF DIFFERENT ARTIFICIAL DIETS ON LONGEVITY OF WORKER HONEY BEES (*Apis mellifera* L.)

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ABSTRACT

The present work was carried out to study the longevity of adult bees product from colonies feed with different diets. 65 newly emerged honey bees were caged for each genotype the number of dead bees was recorded daily and the mean life spane for each genotype was estimated.

It was found that the longevity of adult bees produced from colonies provided with different diets, (A.B.C.D.) and control were 20.3, 18.8, 18.8, 21.6, and 20.5 days respectively. The obtained results showed that were a significant differences among different adult bees produced from different colonies feed different diets owing to these result, it is seen the adult bees produced from diet D (Maize and Pollen) was longer lived than adult bees produced from A,B, and C diets.

INTRODUCTION

Honey bees depend mainly on pollen as source of protein, lipids, minerals and vitamins, necessary for normal growth and activity of different castes (Whal, 1963 and Klein Schmidt and Kondos, 1978). One of the beekeeper and scientist aim is to induce their colonies to produce more honey. There are many factors which influence honey production in any colonies. One of these is the genotype of bees in a colony. With respect to this factor there are different component of the complex behavior of honey production in a colony. The longevity or life length of the honey bee is one of the characters which have been develop to estimate the genetic value of queens in breeding programs. The objective of the present work is to evaluate the influences of some commonly used pollen substitutes on the longevity of adult workers.

The diet of adult worker bees consists of nectar and pollen. When nectar is in short supply, colonies of honey bees are often fed sugar syrup and when pollen is not available, the colonies are fed pollen supplements or substitutes (Standifer *et al.*, 1960 and Zaytoon *et al.*, 1988). Pollen is the most important requirement for bee growth. It is particularly essential in feeding broods. During the early adult life of worker bees all nitrogen is derived from pollen protein. Physiologically young bees, nurse bees, are characterized by percent protein content. Adding protein-containing food, pollen, to their diet substantially increases their longevity (De Groot, 1953).

Apiaries must frequently supply pollen or bee-bread substitutes artificially for the nourishment of their colonies. Natural pollen mixtures are more satisfactory than artificial protein supplements or foods. Including protein substances, even of poor value, increases the effectiveness of the pollen substitutes Wahl, 1963. Perlson, 1961 (mentioned that addition of

protein to the carbohydrate food of bees kept in cages improved their physiological conditions. De Groot, 1953 stated that the longevity of old bees is increased by supplementing the carbohydrate diet with various protein containing foods. He concluded that protein is important for old bees in summer and for winter bees Schatton and Engels, 1990 found that when the total protein content decrease, the number of deformed bees increase and body weight were decreased. Daly *et al.*, 1990 found that when the protein blood volume decreased, the weight and life span of worker reduced.

El-Banby and Gourgui, 1970 concluded that the life span and body weight increased when the rearing colonies were fed mixture containing more skimmed milk and yeast. Nelson, 1976 found that newly emerged caged bees survived for 42-60 days on diet of rapeseed flower. Winston *et al.*, 1983 showed that average span of adult life were 24.3 and 42.9 days respectively for colonies feed on the herring meal.

Both young and old bees respond by increased longevity to inclusion of protein containing foods in their diets. The adult worker bees need protein not only for growth and secretion of royal jelly, but also for maintenance of metabolism. It has been observed that wax production and successful wintering depend on provision of pollen.

The present work was carried out to evaluate of some different diets affected the longevity of adult workers.

MATERIALS AND METHODS

This study work was performed in apiary of faculty of Agriculture Al-Azhar University at Mustored during 2006-2007 to evaluate the influences of some commonly used pollen substitute and supplements on the longevity of adult workers.

1- Preparing of the bee colonies.

The first hybrid of carniolan bees race *Apis mellifera* was chosen to start the planned experiments.

Fifteen honeybee colonies of about equal strength containing at least four fram of brood covered with bees were chosen in the apiary .The colonies were divided into two groups.The first group contains six colonies to offered pollen substitute (A and B) three colonies for each substitute. While the second group contains six colonies to offered pollen supplements (C and D) Three colonies for each supplement. And three colonies were used as control offered natural pollen. Frontal pollen traps were fitted to the entrance.

2- Preparing of the diets.

Different components of pollen substitute and supplements were used as in Table 1.

The ingredients of the substitutes materials were mixed together, also the supplement materials were mixed together to have a semi dried baste the baste was spread on a plastic sheet taking into consideration to keep it thick (4 cm). The baste was spread on a plastic sheet taking into consideration to keep it thick (4cm). The baste was left for 24 hours to be a

little pit dried. The baste was divided into small pieces by means of a sharp knife. The cut baste 100g was provided to each colony every week the experimental period from December 2006 to April 2007. These bastes were placed directly over the brood combs cover with plastic sheets to avoid drying sucrose syrup (1 : 1 w/v) was continuously provided to every colony under investigation. Days sufficient for the number of (65) individual bees to die were recorded and average calculated.

Table 1: Different types of diets of pollen substitute and supplements.

| Percentage | Pollen substitutes | | Pollen supplements | |
|------------|--------------------|--------------------|---------------------|-------------------|
| | A | B | C | D |
| 50 | Soybean | Maize | Egyptian bean | Maize |
| 20 | melon shell juice | Orange shell juice | Mandrin shell juice | Apple shell juice |
| 10 | Orange shell juice | Melon shell juice | Apple shell juice | Mandrin |
| 10 | Yeast | Yeast | Pollen | Pollen |
| 10 | Agwa | Agwa | Agwa | Agwa |

Adding 5mL sesame oil for different diets

3-Preparing of cages used

Fifteen wooden cages were used. Their dimension were (10 x 10 x 10 cm). Groups of newly emerged bees produced from colonies feed different diets (A, B, C and D). Each of 65 individuals were introduced in each cage and fed with 10 gm. of each of the tested diets in past form. The cages bees were incubated in treatment colonies and provided with sugar (1:1 w/v) including control cages. All cages (three cages) of each treatment were inspected daily to counts continued till all bees of any experiment of treatments diet. Percentages of mortality were calculated for all treatments from the beginning of each experiment and continued till its end.

RESULTS AND DISCUSSION

The present was carried out to study the longevity of adult bees produced from colonies feed different diets.

Data recorded in Table (1) revealed that the average of longevity for adult bees produced from colonies provided with different diets, (A,B,C,D) and control were 20.3, 18.8, 18.8, 21.6 and 20.5 days respectively. The statistical analysis showed that were a significant differences among different adult bees produced from colonies feed different diets for this character. It not found significant difference between diet (B and C) on longevity of worker bees. Owing to these result, it is seen the adult bees produced from (D and control) were longer lived than adult bees produced from both A, B and C. Eishchen *et al.*, 1982 reported that the length of life in worker honey bees shows many variation from one year to another and h reported that these variation are influenced by different environmental and genetical factors. Macicka, 1987, reported that honeybees fed with carbohydrate feeds containing protein additives had longer life than bees fed on diets without protein additives. Rasmy, 2002 stated that the longevity of caged bees fed on

the mixture consist of 10% brewer year: 2 parts defatted soya flour: 1 part date paste was 24 days.

Darhous, 1990 studied the effect of different natural materials either alone or in mixtures on the length of life span of caged bees. He found that the corn flour with defatted soya flour finely grounded and wheat bran gave good results. Mostafa, 2000 studied the effect of different kinds of single and mixture materials as protenic diets on the length of life of newly emerged workers. He found that the Lt_{50} of honey bee workers fed on bee bread reached 29.20 days. David *et al.*, 1971 they found that the length of life in honeybees fed on candy fortified with 5% pollen increased than those fed on pollen free. It is clear that feeding newly emerged bees with diet (D) gave the longest being 21.6 days.

In my opinion it could be said that the environment factors also affects the length of life. For instance, nutrition in the larval stage may vary from mounth to mounth or from year to year and affect the span as a result of quality and quantity of problem available. The number of nurse bees relative to the among of brood nursed affects length of life for a honey production would be depend upon time and length of the nectar flow. Finally, it is clear that the length of life is the result of interaction between environmental factors, such as diet, and genetic factors.

Table 2: Life length of caged bees in the tested colonies per days.

| Different diets | Replicates | | | Totals | Full time days (means) | % of control |
|-----------------|----------------|----------------|----------------|--------|------------------------|--------------|
| | R ₁ | R ₁ | R ₁ | | | |
| Control | 20.5 | 19.8 | 21.4 | 61.7 | 20.5a | - |
| A | 19.0 | 20.6 | 21.4 | 61.0 | 20.3ab | 99.3 |
| B | 20.2 | 17.1 | 19.1 | 56.4 | 18.8b | 90.1 |
| C | 17.9 | 18.8 | 19.7 | 56.4 | 18.8b | 90.1 |
| D | 21.6 | 22.5 | 20.9 | 65.0 | 21.6a | 105.3 |

The means in the same column followed by the same letters do not differ significantly at level 0.05

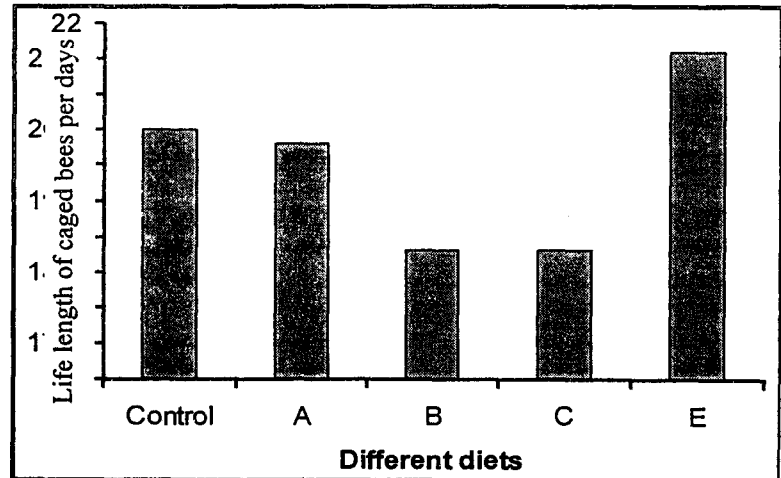


Fig. 1: Effect of different diets on longevity of worker honeybee

REFERENCES

- Daly, H.V.; degory, D. and Stone, N.D., (1990): Effect of persists by *Varroa jacobsoni* on morphometrics of Africanized worker honey bees. Journal of Agriculture Research 27(2): 126-130 (EngBb) Dep. Entomological Sci. California.
- Darhous, S.A.A., (1990) Effect of artificial feeding on honeybee, *Apis mellifera* L. M.Sc. Thesis, Fac. Agric. Zagazig Univ. P. 174.
- David, A.K. H. Shimanuki and E. W. Herberty, Jr. (1971), Diet and the longevity of adult honey bees. J. Econ. Ent. 64(6): 1415-1416.
- De Groot, A.P. (1953): Protein and amino acid requirements of the honeybees (*Apis mellifera* L.). Bee World 35, 98.
- Eishchen, F.A., Rothenbuhler, W.C. and Kulincevic, J.,M. (1982). Length of life and dry weight of worker honeybees reared in colonies with different worker-larvae rations. J. Apic. Res. 21(1):19-25.
- El-Banby, M.A. and Gorhui, W.A.,(1970). Development of trance bees whose colonies fed on sugar syrup and different kinds of pollen substitute. Res. Bull. Fac. Agric. Ain Shams Univ. 616: 22pp.
- Kleins Chmidt, G. J. and Kondos, A.C. (1978). The effect of dietary protein on coloney performance. Australas Beekpr 79(12): 251-257.
- Macicka, M., (1987). Effect of pollen and its substitutes on hypophartbgeal glands, fatty tissue, length of life and content of nitrogen compounds in the fat of bee bodies. Vedecke-Prace-Vyzkumnhoustavy-Vcelarskeha-v-Dole. 9:137-147.
- Mostafa, A.M. (2000). Influence of some supplementary feeding on physiological characters and productivity of honeybees. Ph.D. Thesis Fac. Agric. Assiut. Egypt, 159 pp.
- Nelson, D.L. (1976). Evaluation of rapeseed flour and pea protein concentrate as protein supplements for honey bees. Canadian Entomol., 108:845-848.
- Perison, L.E., (1961). The value of protein feeding. Pchelovodstvo, 38(11):16-19. Apicult. Abstr., 15:28, 1964.
- Rasmy, H. M (2002). Studies on rearing and production of honey bee queens, (*Apis mellifera* L.) Ph.D. Thesis, Fac. of Agric. Zagazyig Univ.
- Schatton, G.K. and Engels, W., (1990). Blood proteins and body weight of newly emerged worker honey bees with different levels of parastization of brood mites (*Varroa jacobsoni*).
- Standifer, L.N.; Caughey, MC; Todd, F.E. and Kemmerer, A.R. (1960): Relative availability levels of various proteins to honeybee. Ann. Entomol. Soc. Amer. 53:618-625.
- Wahl, O. (1963): Comparative investigations on the nutritive value of pollen, yeast, soy bean flour and powdered milk for the honey bees. Z. Bienen Forsch 6(8): 209-260. Apicult. Abstr. 15:873, 1964.
- Winston, M.L. W.T. Chalmers and P.C. Lee (1983). Effects of two pollen substitutes on brood mortality and length of adult life in the honey bee. J. Apicult. Res. 22(1):49-52.

Zaytoon, A.A., Matsuka, M. and Sasaki, M (1988): Feeding efficiency of pollen substitutes in a honey bee colony: effect of feeding site on royal jelly and queen production. Applied Entomology and Zoology. 23(4) : 481-487(AA 1222/90).

تأثير التغذية الصناعي المختلفه على طول عمر شغالات نحل العسل

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أجريت هذه الدراسة في منحل كلية الزراعة - جامعة الأزهر بمسطرد خلال موسمي ٢٠٠٦-٢٠٠٧. وتمت التجربة على عدد ١٥ طائفة متساوية في القوة وقسمت إلى خمسة مجموعات كل مجموعة تحتوي على ثلاث طوائف ، وذلك لبيان تأثير عدد من بدائل ومكملات حبوب اللقاح على طول عمر شغالات نحل العسل.

وشملت بدائل حبوب اللقاح A, B, بينما شملت مكملات حبوب اللقاح C, D, وتم تغذية جميع الطوائف بوضع ١٠٠ جرام من البدائل المختلفة لكل طائفة أسبوعيا. وأخذت عينة من الشغالات الصغيرة الناتجة من كل معاملة عددها ٦٥ شغالة ووضعت هذه الشغالات في أقفاص خاصة بالإضافة إلى غذاية بها محلول سكري مضاف إليها البديل داخل الطوائف المعاملة وذلك لقياس فترة طول عمر الشغالات ، وقد أظهرت النتائج أن البديل D وهو من مكملات حبوب اللقاح أعطى أعلى فترة طول عمر للشغالات حيث بلغت ٢١,٦ يوما يليها بديل حبوب لقاح A بمتوسط ٢٠,٣ يوما وتساوى التأثير السلبي لكل من البديل B لحبوب اللقاح والمكمل C لحبوب اللقاح على متوسط طول عمر الشغالة حيث بلغ ١٨,٨ يوما وعليه ينصح باستخدام بدائل ومكملات حبوب اللقاح للبديل D و A عن استخدام البدائل B , C , وذلك في فترات عدم توافر مصادر حبوب اللقاح.