

CHEMICAL AND TECHNOLOGICAL STUDIES ON USE OF BEE POLLEN IN SOME BAKERY PRODUCTS

Yousef, H.Y.M.

Department of Biochemistry ,Faculty of Agriculture ,Al-Azhar University.

ABSTRACT: In order to demonstrate the health benefits of bee pollen, biscuits sandwich containing bee pollen were fed to anemic and diabetic groups of rats, compare to control group of rat fed on biscuit diet. Blood hemoglobin, blood glucose, cholesterol, triglyceride, kidney and liver functions were carried out . Sensory evaluation indicated the acceptable of bee pollen biscuits compared to control. Results showed pronounced increasing in blood hemoglobin in anemic rats fed on biscuits containing bee pollen compared to control. Blood glucose increased in hyperglycemic rat group, and decreased to almost normal values in diabetic rats fed on bee pollen-biscuits diet.

The same trend was observed with total cholesterol, total lipids , triglycerides, kidney and liver functions were turned to almost normal values in anemic and hyperglycemic rats.

INTRODUCTION

Bee pollen is the food of the young bee Stanly (1994). It is considered one of natures most completely nourishing foods. It contains all the essential components of life. The percentage of rejuvenating elements in bee pollen remarkably exceeds those present in brewers yeast and wheat germ. Bee pollen corrects the deficient or unbalanced nutrition, common in the customs of our present-day civilization of consuming incomplete foods, often with added chemical ingredients, which expose us to physiological problems. Bee pollen contains approximately 40% proteins (about half of its protein is in the form of free amino acids that are ready to be used directly by the body). 4.5% lipids, 15% sugars, alarg amount of vitamins A, pantothenic acid, nicotinic acid, thiamin, riboflavin, ascorbic acid (vitamins C, D, E, and K, minerals calcium, aluminum, magnesium, copper, enzymes and co-enzymes, pigments, xanthophylls, carotene, and sterols (Chen, xiangyou, 1989). Beta-carotene, lycopene, beta-sistosterol have always been present

in analyses of bee pollen (Habib et.al.1990).

Bee Pollen contains an antibiotic similar to penicillin and is able to inhibit the development of some microorganisms such as salmonella .Rugendorff et.al.(1993).

Bee pollen is thought to have the ability to correct body chemistry and eliminate unhealthy condition . It is considered to have the ability to throw off poisons and toxic materials from the body. Radiation and chemical pollutants are know as the most severe stresses to immune system . Side effects of radiation treatment decreases the body's production of blood cells and nutrients in the blood Mysliwec. (1993) . Research studies and clinical tests have demonstrated that bee pollen has an immunizing effect, enhances vitality, and can counteract the effects of radiation toxins, It has been shown to have anti-inflammatory properties. to relax the muscles that surround the urethra, and to inhibit growth of prostate cells. Hordijk et.al. (1998).

Observed that, after a few days , all the people felt better and their blood analysis showed an improvement, especially anemic children. Pollen has been used for curing some ailments of nervous system. After a week, people who take it become less nervous, more optimistic. are more eager to work, and depression disappears. He also reported that, bee pollen used to help relieve diabetic symptoms. In one test, 32g of pollen daily taken for 2. weeks lowered the amount of sugar in 1 liter of urine by 41.8 g . Orzaez et. al.,(2001)declared that, bee pollen is know to be an accelerator of human growth . It regulates the action of the intestinal function, especially in cases of chronic constipation or diarrhea, which have been resistant to antibiotic treatment .(Zhang et. al., 1989)showed that, a study of twenty-five women suffering from urinary cancer .Treated with chemotherapy given bee pollen with their food quickly exhibited a higher concentration of cancer-fighting immune-system cells, increased antibody production, and a markedly improved level of infection fighting and oxygen carrying red blood cells (hemoglobin) .

Aim of this investigation was to study the effect of adding bee pollen to filling of biscuits sandwich on blood hemoglobin, blood glucose, cholesterol, triglycerides and kidney & liver functions of anemic and hyperglycemic rats feed on tested diet, in addition of sensory evaluation of biscuits containing bee pollen .

MATERIALS AND METHODS

Materials:

- Soft wheat flour (72% extraction) were obtained from south Cairo flour mills co., Giza, Egypt .
- Bee pollen was obtained from Emtenan co., Cairo, Egypt .
- Rice grains was milled using laboratory hummer mill to obtained rice flour with particle size near to wheat flour .
- Chocolate was obtained from local market .

Sandwich biscuits preparation :

-Biscuits preparation :

Ingredients: 100 g. of flour blend(90%wheat flour,and10% rice flour),(20g.) butter, (25gm)sugar,(3gm)baking powder and (25-30ml) water, were blended in a dough mixer until smooth dough was obtained. Dough was sheeted to (2mm)thickness and cut into square shape of about 5gm weight, then baking sheets and baked in preheated oven to190°c for about 12 min.

Filling preparation:

Ingredients : 50gm of powdered bee pollen was added to 100gm of chocolate filling and stirred to obtain homogenous from .

- After baking, sandwich was made by filling two biscuits with about two gm of the prepared filling.
- Sensory evaluation (taste, flavor, color, texture and overall acceptability) was carried out according to Faridi and Rubenthaler (1984).

Biological experiment:

Thirty male albino adult rats (weight ranged from 80 to 90 gm) were fed on basal diet according to **A.O.A.C.(1990) including** corn starch, casein (10%protein),corn oil, cellulose, salts mixture and vitamins mixture for one week .Rats were divided into five groups (each six rats). The first group (group1) was fed on the normal diet (considered as normal control),second and third groups were fed on diet without ferrous sulfate (Feso4) for three weeks. To induce anemic croups. after this period one of them (group2) was fed on normal diet up to end of experiment period and other group (group3) was fed on diet containing

bee pollen .Other two groups were fasted overnight and injected by alloxan solution according to (Buko et. al., 1996) to induce hyperglycemia, then fed on basal diet for 72 hr., after this period one of these groups (group 4) was fed on normal diet and the second group (group5) was fed on diet containing bee pollen (tested diet). During the experimental period, rats were weighted every two days with determination of food consumption . Blood samples were collected from all groups, centrifuged to obtain serum, kept in the deep freezer for analysis .

Chemical analysis :

Raw materials were analyzed to their main chemical composition according to AACC(1995).,Blood hemoglobin was measured according to(Wintrobe,1965), blood glucose was determined according to(Tietz,1986),triglycerides according to (Fossati and Prencipe, 1982), total lipids (Knight et.al.,1972),total cholesterol according to (Allain et. al.,1974) serum uric acid and blood urea, were carried out according to (Henry,1974) and Aspartate amino transferases (AST). Alanine amino transferases (ALT) were assayed by the method of Reitman and Frankel (1957).

Statistical analysis :

The results of biological experiment was statistically analyzed according to Snedecor and Cochran (1980) .

RESULTS AND DISCUSSION

Table(1),represents the chemical composition results of flour blended with bee pollen composition reported by Diz et. al.,(2002).Data presented showed that bee pollen contain high values of all determined parameters. Bee pollen contains high amounts of protein. Sugar, carotenoids, iron, calcium, potassium, phosphorus and zinc.

Sensory evaluation results are presented in Table (2) it was observed that biscuits containing bee pollen recoded higher scores than control. Taste scores increased from 25to 29, flavor from 25to 29 and overall acceptability from 84to 96when bee pollen used as a filling material in biscuits sandwich. These results by (Xie and wan, 2000).

Table (1) chemical composition of flour blended and bee pollen

Analysis	Flour blended	Bee pollen *
Moisture %	13.4	22
Protein %	9.74	38
Fat %	0.72	3
Fiber %	.034	2.4
Ash %	.044	4.3
Sugar %	0.6	12
Carotenoids mg #	15	90
Iron mg #	2.43	22
Calcium mg #	4	370
Potassium mg #	0.4	190
Phosphorous mg #	147	200
Zinc mg #	5	45

* Source :Diaz et. al.,(2002).

Per100gm flour blend

Table(2): Sensory evaluation of control biscuits and biscuits containing bee pollen

Properties	Score	Biscuits (control)	Biscuits + bee pollen
Taste	30	25	29
Texture	20	17	19
Flavor	30	25	29
Color	20	17	19
Overall acceptability	100	84	96

Table(3) showed that, decrease in gain body weight and liver weight for all groups, but the percent of decreasing varied from group to other. Anemic rats fed on normal diet (group2), the decrease was low and enhanced in anemic rats fed on biscuits containing bee pollen (group3).Hyperglycemic rats fed on normal diet (group4),decrease was observed due to the effect of alloxan on organs. On the other hand, improvement was occurred when hyperglycemic rats fed on biscuits containing bee pollen (group5). These results were agreement with(Bell et. al.,(1988).

Table(3): Feed intake, body weight gain, food efficiency ratio(FER) and liver weight of rats feed on control biscuits containing bee pollen.

Rats groups	Feed intake(g)	Body weight gain(g)	FER	Liver weight(g)
Group1 (control)	340a	58a	0.17	4.7a
Anemic groups				
Group2	305c	39d	0.13c	4.1c
Group3	322b	51b	0.16b	4.6ab
Hyperglycemic groups				
Group4	288d	28e	0.10d	3.7d
Group5	320b	44c	0.14c	4.4b
LSD	8.41	1.81	0.018	0.204

Values followed by the same letter within the same column were not significantly different(P<0.05).

Data in Table(4) shows that, blood glucose was increased in hyperglycemic rats fed on normal diet (group4),and turned to almost value in hyperglycemic rats fed on biscuits containing bee pollen (group5).The same trends were obtained for serum uric acid and blood urea parameters. Results are in agreement with **Gaber(1993)** who found that alloxan injection caused a highly increase in blood glucose, serum uric acid and blood urea relative to the control. On the other hand, anemic (group2&3)showed almost similar levels of glucose in blood as control (group1).

Table (4):Blood glucose, serum uric acid, and blood urea (mg/100ml) of rats fed on control and biscuits containing bee pollen.

Croups	Blood glucose	Serum uric acid	Blood urea
Group1 (control)	100b	3.96b	12.2a
Anemic groups			
Group2	99b	4.08ab	12.7b
Group3	97b	4.01b	12.4bc
Hyperglycemic groups			
Group4	340a	4.92a	14.8a
Group5	110b	4.12ab	12.5bc
LSD	4.3	0.817	0.304

Values followed by the same letter within the same column were not significantly different(P<0.05).

Illustrated data in Table(5) showed that (HB) parameters were sharply decreased in anemic rats fed on normal diet (group2)when compared with normal control (group1), while markedly increased to normal value in anemic rats fed on biscuits containing bee pollen(group3).AST values showed no variations between(group2and3) and control(group1).The increase in (group4)due to the effect of alloxan solution , but this vale was enhanced in (group5)due to effects of adding bee pollen. The same trends were observed with ALT values. These results were in agreement with(Hordijk et. al., (1998).

Table(5): Hemoglobin HB(g/dl), AST(u/ml), and ALT(u/ml) values of rats fed on control and biscuits containing bee pollen.

Croups	HB	AST	ALT
Group1 (control)	13.00a	26.60d	11.65d
Anemic groups			
Group2	8.41c	26.94c	11.88c
Groub3	12.87a	26.81cd	11.92bc
Hyperglycemic groups			
Group4	10.43b	34.92a	13.94b
Group	12.72a	27.71a	12.11a
LSD	0.834	0.258	0.050

AST= Aspartate amino transferase

ALT=Alanin amino transferase

Values followed by the same letter within the same

column were not significantly different(P<0.05).

Table (6) indicated that total cholesterol in hyperglycemic rats fed on normal diet (group4) was highly increased, and nearest to normal value in hyperglycemic rats fed on biscuits containing bee pollen (group5). No differences observed between (group2 and3) and control(group1). The same trends were showed with total lipids and triglycerides. These results were confirmed with(Barakat et. al., 1989).

Conclusion: Tested diet containing bee pollen had affected both anemic and diabetic rats. It increased blood hemoglobin in anemic rats and decreased blood glucose in hyperglycemic rats with enhanced kidney and liver functions.

Table(6): Total cholesterol(mg/dl), total lipids and triglycerides (mg/dl) of rats fed on control and biscuits containing bee pollen.

Croups	Total cholesterol	Total lipids	Triglycerides
Group1 (control)	140.0c	410.0c	121.5e
Anemic groups			
Group2	149.3c	423.5b	132.3c
Groub3	144.6c	418.0bc	128.0d
Hyperglycemic groups			
Group4	424.5c	672.5a	286.6a
Group	155.6b	421.2b	137.4b
LSD	9.52	8.724	3.288

Values followed by the same letter within the same column were not significantly different($P < 0.05$).

REFERENCES

- AACC(1995):**American Association of Cereal Chemists. Approved methods of the AACC.9th ed.
- Allain, C.C; Poon, LS; Chan, C.S.G. and Richmond, W.P.(1974):** Enzymatic determination of total serum cholesterol. Clin. Chem. 20(4):470-75.
- AOAC.(1990):**Official Methods of Analysis of the Association of Official Analysis. Chemists. 15th ed., Published by the association of Official Analysis Chemists.Arlington Virginia USA .
- AOAC(1998):** Official Methods of Analysis of the Association of Official Analysis Chemists. 16th ed., Published by the association of Official analysis Chemists. Arlington Virginia USA.
- Barakat, M. M., Motavi, T. M. and El-Aser, A. (1989) :** Zink supplement on lipid metabolism in alloxan diabetic rats fed with soy bean. Bull. Fac. Pharm., CairoUniv.27no.1.
- Bell RR, Thornber EJ, Seet JL, Groves MT,HONP, Beel DT, (1988):** Composition and protein quality of honeybee-collected pollen of

- Eucalyptus marginata and Eucalyptus calophylla. J Nutr Dec 113:12 2479-84.
- Buko, V., Lukivskaya, O. Nikiti, V. and Janz, B.(1996):** Hepatic and pancreatic effects of polyenoylphatidyl Colin in rats with alloxan induced diabetes. Cell biochemist. Fnch. 14⑩12) 131-137.
- Chen, Xiangyou, (1989):** Pollen ,trace elements and health. Clin. Chem. 35:2077.
- Diaz Marquina, A.; Serrano, R.; Blazquez, H.; and Abellan, G. (2002):**Program on the nutritional pharmacology of pollen Int J Food Sci Nutr; 53(3):217-224.
- Faridi, H.A., and Rubenthaler, G.L.(1984):** Effect of baking time and temperature on bread quality, starch gelatinization, and staling of balady bread. Cereal chem.61(2): 154.
- Fossati, P. and Prencipe, L.(1982):** Serum triglycerides determined calorimetrically with an enzyme that Produces hydrogen peroxide. Clin. Chem. 28:2077-2080.
- Gabr, F.A. (1993):**Biochemical studies of some wild plants. Ph.D. Thesis, Fac. Of Agric. CairoUniv.
- Habib FK, Ross M, and Buck AC, (1990):** In vitro evaluation of the pollen extract, in the regulation of prostate cell Growth. Journal of Medicine,66:393 -397.
- Henry. R. J.(1974):**Clinical chemistry, principles and Technics, 2nd edition. Harper and Row, p.525.
- Hordijk, GJ, Antvelink JB, and Luwema RA.(1998):** Immunotherapy with a standardized pollen extract; Allergol immunopathol. 26:234-40.
- Knight, J.A.; Shanna Anderson and james M. Rowle (1972):**
Chemical basis of the sulfophosphvanilin reaction for estimating total serum Lipids . Clin. Chen. 18(3):199-202.
- Mysliwicz Z.(1993):**
Effect of pollen extracts on selected biochemical parameters of liver in the course of chronic ammonium poisoning in rats. Ann A cad Med Stet in, 39:71-85.
- Orzaez Villanueva MT, Diaz Marquina A, Bravo Serrano R,Blazquez Abellan G.(2001):** Mineral content of commercial pollen. Int J Food Sci., Nutr;52(3):243-9.

- Reitman, S.M.D. and Frankel, S. (1957):** A colorimetric method or the determination of serum glutamic oxaloacetic And glutamic pyruvic transaminase. AM. J. Clin., 28,56-63.
- Rugendorff E. W, Weidner W, Ebeling L(1993):** Results of treatment with pollen extract in chronic prostatitis and prostatodynia.Br J Urol;71:433-38.
- Snedecor, G.W. and Cochran, W.G.(1980):** Statistical methods. Iowa state Univ. Press Amer. U.S.A.7th Ed.
- Stanly RG,(1994) :** Bee pollen . Proceeding of forth International Congress of Plant Molecular Biology. The Netherlands.
- Tietz, N.W. (1986) :** Tex book of clinical chemistry P.796.
- Wintrobe, M.M.(1965):**Clinical Hematology, 4th ed. Lea & Febiger, Philadelphia.
- Xie Y, and Wan B,LiW,(2000):**Effect of bee pollen on maternal nutrition and fetal growth, C. F. [http/www. Ncbi. Nim. Gov/htpn-post](http://www.Ncbi.Nim.Gov/htpn-post).
- Zhang, Zhengran, Nanjing Daxue, Ziran Kexue (1989):** Evaluation of the nutritive value of pollen based on chemical composition,Clinical chemistry 25(3 ,115-120.

دراسات كيميائية وتكنولوجية على استخدام حبوب لقاح نحل العسل في بعض منتجات المخازن

هاني يوسف محمد يوسف

قسم الكيمياء الحيوية، كلية الزراعة، جامعة الأزهر

الملخص العربي

تعرف حبوب لقاح نحل العسل بأنها المادة الغذائية الوحيدة تقريبا التي تحتوي على معظم متطلبات الحياة الغذائية . حيث أنها تقوم بتصحيح حالات عدم التوازن في المغذيات بالجسم.

تم إعداد بسكويت ساندويتش وهو البسكويت المكون من قطعتين بينهما حشو شيكولاته- وقد أضيفت حبوب اللقاح في مواد الحشو(بعد الخبز). أجريت التحاليل الكيميائية والحسية والبيولوجية وذلك بتغذية مجموعات من حيوانات التجارب المصابة بالأنيميا ،والمصابة بمرض السكر مقارنة بمجموعة مقارنة - وتم تحليل دم حيوانات التجارب للمؤشرات التالية : سكر الدم -نسبة الهيموجلوبين -وظائف الكبد -وظائف الكلى- الكولسترول- الدهون الكلية والثلاثية ،وأوضحت النتائج أن البسكويت المدعم بحبوب لقاح نحل العسل أدى لارتفاع ملحوظ في هيموجلوبين دم حيوانات التجارب المصابة بالأنيميا- كما أدت إلى خفض نسبة السكر والكولسترول والدهون الثلاثية في حيوانات التجارب المصابة بمرض السكر .