Journal of Home Economics

مجلة الاقتصاد المنزلي
مجلد ٢٤- العدد الثالث – ٢٠١٤م

http://homeEcon.menofia.edu.eg ISSN 1110-2578

Technological and Biological Studies on Manufacturing of Economic Geriatric Foods.

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Abstract: The present study was designated to evaluate the effect of bread supplementation with some vegetables powder (carrot, squash and spinach) on the healthy and physiological status of elderly rats. Forty white female Albino rats were divided into 8 groups rats (5 rats each), All groups were fed for 28 days on experimental diet as follows: negative control group was fed on standard basal diet, positive control group was fed on basal diet and 15% regular bread. Other groups were fed on experimental basal diet with 15% bread supplementated with 10% and 15 % of carrot and squash powder, 10% of spinach powder and 15% of mixture of them. At the end of the experiment, blood samples were collected for determining the following parameters: serum glucose, liver enzymes (AST, ALT, and ALP), kidney enzymes (creatinine and urea), and immunological profile test (IgE, IgM, IgA and IgG). Results showed that the best organoleptic evaluation was noticed in case of bread supplemented with carrot and squash at 10% and 15% level. Bread supplemented with 10 and 15% carrot, squash and 15% mix of them showed a significant decrease in blood glucose in rats groups. Liver enzymes showed a significant increase in AST, ALT in treated groups fed on 15% carrot, squash bread powder and mix of them. Also, ALP was improved in groups fed on 10% carrot and squash powder bread. As conclussion all treaded group parameters revealed a significant increase in immunological profile in elderly female rats.

Key words: *Elderly rats, live rand kidney functions, carrot, squash bread.*

Introduction :

Increasing number of elderly people is leading to an increased demand on health care. Aged individuals are: often vulnerable to many illnesses, they are frail, and they have disabilities in self-care tasks (Fried *et al.*, 2004). The role of nutrition in the maintenance of aged individuals' health, management of chronic conditions, treatment of serious illnesses, and rehabilitation of functional limitations has risen to the top of the agenda for public interest and research during the last decades (Fried *et al.*, 2004 and Vellas *et al.*, 2006).

The word geriatrics is derived from the Greek word 'gerios' meaning old age and 'eatron' meaning medicine. The British geriatrics society defines geriatrics as "that branch of general medicine concerned with the clinical, preventive, medical and social aspects of illness in the elderly (Potty, 1996).

Good nutrition helps in maintaining functional status and prevents the onset of disability. Conversely, nutritional deficiency has been associated with numerous health problems in the elderly involving anemia, anorexia and weight loss, constipation, dehydration, gastric atrophy, cancer, vision disorders, coronary heart disease, diabetes, obesity, osteoporosis, frailty, pedal edema, infections and adverse drug reaction. There is good scope for geriatrics foods as a baby eats or baby food for only about 2 years whereas an oldster could be a consumer of the new product for 15 year or more (Puranik, 1999).

Nutritional treatment when carried out early enough seems to have a positive effect on energy and nutrient intake in frail elderly people (Milne *et al.* 2006). It can produce weight gain and increase physical activity (Morley, 2003). Studies with enriched food have also had positive outcomes in the energy intake of elderly hospital patients (Barton *et al.*, 2000 and Christenson *et al.*, 2001).

Carrots are a popular vegetable worldwide, ItscontainS carotene, a precursor for vitamin A, which is responsible for their orange color. Carrots contain the highest amount of beta-carotene (Pearson, 1982). Vitamin A is a potent antioxidant, and it is widely believed to be able to shield the cells from oxidative damage and reducing the risks of chronic diseases (Rao *et al.* 1999).

Squash can provide the body with unique amounts of antioxidant nutrients, including the carotenoids lutein and zeaxanthin. While

summer squash contains very little overall fat (only 1/2 gram per cup), the fat in summer squash (mostly stored in its edible seeds) is unique in composition and includes omega-3s (in the form of alpha-linolenic acid), monounsaturates (in the form of oleic acid), and also medium chain fats (in the form of lauric and myristic acids). Summer squash is an excellent source of copper and manganese. It is a very good source of vitamin C, magnesium, dietary fiber, phosphorus, potassium, folate, vitamin B6, and vitamin K. Additionally, it is a good source of vitamin B1, zinc, omega-3 fatty acids, niacin, vitamin B2, pantothenic acid, calcium, iron, choline, and protein (Priyadarshani and Chandrika, 2007).

Spinach is an excellent source of vitamin K, vitamin A (in the form of carotenoids),vitamin B1,vitamin B2, vitamin B6, vitamin Eand vitamin C manganese, folate, magnesium, iron, copper, , calcium, potassium,. It is a very good source of dietary fiber, protein, and choline. Additionally, spinach is a good source of omega-3 fatty acids, niacin, pantothenic acid, and selenium. While this mixture of conventional nutrients gives spinach a unique status in the antioxidant and anti-inflammatory department, it is the unusual mixture of phytonutrients in spinach that "seals the deal" in terms of its antioxidant and anti-inflammatory components. In terms of flavonoids, spinach is a unique source of methylenedioxyflavonolglucuronides, and in terms of carotenoids, its difficult to find a more helpful source of lutein and zeaxanthin. The epoxyxanthophyll carotenoids neoxanthin and violaxanthin are also welcomed constituents of spinach leaves (Tang *et al.* 2005) .

This study was designed to evaluate the effect of supplemented bread with different levels of carrot, squash and spinach powder on the healthy status of geriatrics female rats.

Material and methods:

1. Materials:

Carrot, squash and spinach were purchased from local market at Shebin El-kom city . Casein was obtained from Morgan Company, Cairo, Egypt. Vitamins mixture, salt mixture and chemical kits were purchased from El – Gomhoria Company., Cairo, Egypt. Geriatrics female white albino rats were obtained from Research Institute of Ophthalmology, Medical Analysis Department, Giza, Egypt. The Females rate (initial body weight was 250 ± 5 g were approximately of

the same age, they were housed in galvanized iron cages measuring 40 × 24 × 20 cm (5 rats to each cage).

2. Methods:

2.1. Preparation of dired vegetable samples:

Carrot, squash and spinach were cleaned and washed for removing dust and impurities, then cut and dried at 50˚C using a fan oven. Then, milled by a precession mill to give powder. A grinder mill and sieves were used to obtain a powder particle size of less than 0.2mm as reported by Fernandez *et al*. (2004).

2.2.Bread making:

The 100 g straight dough method will be used throughout the study by using the method of AACC (1984). The basic formula included 100 g of flour (12%) , 2 g of compressed baker's yeast, 1 g of sucrose , 2 g of salt, 1 g of shortening , water as needed and different concentrations of carrot, squash (10 , 15 %), Spinach 10% powder and 15% mix of them by flour replacement basis. The dough was fermented for 60 min. at 30 °C followed proof period for 15 min. Breads were baked at 230 °C for 25 min.

2.2.1-Sensory evaluation:

Sensory characteristics were evaluated as described by Kramer and Twigg, (1962).

2.3. Rats

Forty white female albino rats, Sprague Dawley strain, old age, weighting (250 ± 5g) were used. Rats were housed in wire cages with wire bottoms and kept under normal healthy condition. All rats fed on normal diet for one week before starting the experiment for acclimatization.

2.4- Basal diet:

The basal diet in the experiment consisted of casein (12%), corn oil (10%), vitamin mixture (1%), salt mixture (4%), cellulose (5%), and the remained is starch (68%) according to (AIN, 1993).

2.4. Experimental Design:

Grouping of rats: All biological experimental were done at the Research Institute of Ophthalmology, Medical Analysis Department, Giza, Egypt. Rats (n = 40 rats) were housed individually in wire cages in a room maintained at 25 + 2^{o} C and kept under normal healthy

conditions. All rats were fed on basal diet for one week before starting the experiment for acclimatization. After one week, rats were divided into 8 groups female rats (5 rats each), all groups were fed for 28 days on experimental diet as follows:

Group(1): Rats were fed on standard diet (negative control).

Group(2): Rats were fed on standard diet plus 15% of bread powder (positive control).

Group(3): Rats were fed on standard diet plus 10% of carrot bread powder .

Group(4): Rats were fed on standard diet plus 15% of carrot bread powder.

Group(5): Rats were fed on standard diet plus 10% of squash bread powder.

Group(6): Rats were fed on standard diet plus 15% of squash bread powder.

Group(7): Rats were fed on standard diet plus 10% of Spinach bread powder.

Group(8): Rats were fed on standard diet plus 15% of mixing bread powder (5% of each).

2.5.Blood sampling:

In all experimental groups, blood samples were collected after 12 hours fasting at the end of each experiment, using the reto orbital method by means of micro capacity glass haparinized tubes. Blood samples were collected into dry clean centrifuge tubes and left to clot in water both (37^{o} C.) for half an hour. The blood was centrifuged for 10 minutes at 3000 pm to separate the serum, serum was carefully aspirated into clean cuvette tube and stored frozen at – 20^{o} C for analysis as described by (Schermer, 1967).

2.6. Biochemical Analysis:

Serum glucose was determined by the method of (Trinder, 1969), using Stanbio enzymatic glucose procedure. Colorimetric method used to determine AST and ALT according to Reitman and Frankel, (1957), whereas, determination of ALP activity according to Haussament, (1977). Colorimetric method used to determine creatinine according to Henry, (1974). Patton and Crouch, (1977) used enzymatic method for

determination of urea.IgE, IgM, IgA and IgGwere determined in serum according to methods of Zive and Minineph, (1984).

2.7. Statistical analysis:

The data were analyzed using a completely randomized factorial design SAS (1985) when a significant main effect was detected; the mean were separated with the Student – New Man – Keuls Test. Differences between treatments ($P < 0.5$) were considered. Significant using Costatprogram. Biological results were analyzed by One Way Classification ANOVA.

Results and discussion:

1-Organoleptic evaluation of bread supplemented with different levof vegetables powder and mix of them.

Data presented in table (1) it could be noticed that addition of carrot and squash to tested bread improved bread odor, color and flavor with significant differences between the control bread and tested bread in all organoleptic properties at the level 15% of dried carrot , squash , mixture of tested plants and all levels of spinach. Whereas, adding 5 and 10% of carrot and squash color, odor and flavor were improved with non significant differences with control samples. Similar results were reported by Rao *et al.* (1999) and Tang *et al. (* 2005) they showed that adding carrot and squash to food improved the characteristics studied and the color and the flavored were more accepted than control samples .

Table(1):Organoleptic evaluation of bread supplemented with different levels of vegetables and mix of them.

Organoleptic Properties	Control	Bread with carrot%			Bread with squash%			Bread with spinach%			Mix of them
		5 %	10%	15%	5 %	10%	15%	5 %	10%	15%	15 %
Color	9^a	9^a	9^a	8^b	9^a	9^a	8^b	8^b	7.7^b	6^d	7^c
Odor	9^a	9^a	9^a	8^b	9^a	9^a	9^a	8^b	7^c	6^d	8^b
Flavor	9^a	9^a	9^a	8^b	9^a	9^a	8^b	8^b	7^c	6^d	7^c
Texture	9^a	9^a	9^a	8^b	9^a	8^b	8^b	8^b	7^c	6^d	8^b
Overall acceptability	9^a	9^a	9^a	8^b	9^a	8^b	8^b	8^b	7^c	6^d	7^c

2- Effect of feeding on different level of supplemented bread on blood glucose in elderly rats.

Carrot, squash and spinach have important role in glucose metabolism, the effect of treated elderly rats with balady bread supplemented with different levels of above plants on level of serum blood glucose were presented in table (2). Serum blood glucose was 141.8 ± 2.67 mg/dl for negative control group and 176.1 ± 1.23 mg/dl for positive control group which fed on basal diet and 15% balady bread . This level of blood glucose decreased significantly at ($P<0.05$)for groups fed on all tested levels of supplemented plants as compared to positive control group and negative control except 15% Carrot bread (10% carrot) . The levels reached to (163.2 ± 2.61, 122.1 ± 3.54, 131.9 ± 2.3, 111.6 ± 4.7, 108.9 ± 2.3 and

122.6 ± 3.17 mg/dl) for 10 and 15% carrot , squash, 10% spinach and mixture of tested plants respectively. The present data for serum blood glucose were in general comparable with that of Barton *et al. (* 2000) and Christenson *et al.* (2001). The group fed on 15% spinach bread (10% spinach) had the lowest level of serum blood glucose. These results were harmony with the observation of high levels of dietary fiber and vitamins which important component in these plants may prevent diabetes (Tang*et al.,* 2005). Davidson *et al.* (2011) showed that the normal blood glucose level (tested while fasting) for non-diabetics, should be between 70 and 100 mg/dL. The mean normal blood glucose level in humans is about 100 mg/dL. however, this level fluctuates throughout the day. Blood sugar levels for those without diabetes and who are not fasting should be below 125 mg/dL. The blood glucose target range for diabetics, according to the American Diabetes Association (2006) should be 90–130 mg/dL before meals, and less than 180 mg/dL after meals. Maruyama *et al.* (2013) found that consumption of a regular-sized dish of spinach significantly ($p \leq 0.05$) decreased blood glucose.

Table (2): Effect of feeding on different level of supplemented bread on blood glucose in elderly rats.

Parameter / Groups	Glucose (mg/dl)
Negative control	$141.8^{c} \pm 2.67$
15% control	$176.1^{a} \pm 1.23$
15% Carrot bread (10% carrot)	$163.2^{b} \pm 2.61$
15% Carrot bread (15% carrot)	$122.1^{e} \pm 3.54$
15% squash bread (10% squash)	$131.9^{d} \pm 2.3$
15% Carrot bread (15% squash)	$111.6^{f} \pm 4.7$
15% spinach bread (10% spinach)	$108.9^{f} \pm 2.3$
15% mixed bread (5+5+5% carrot+ spinach + squash)	$122.6^{g} \pm 3.17$

Values are expressed as the Mean ± SD

Different letters on the numbers in the same column means a significant differences at $P<0.05$

3- Effect of feeding on different level of supplemented bread on serum levels of liver function enzymes in elderly rats .

Data of table (3) show the transferase enzymes activites (GPT,GOT and ALP) of negative control, positive control and bread supplemented groups. It could be observed that feeding on 15% carrot and 10% spinach led to activate the liver enzymes in normal range which were between 25- 50(U/L) for GPT and GOT(Gew *et al.,* 2004) . Taking into consideration that the level of ALP for 15% carrot (though significant was lower than that of negative control. Spinach bread at the level 10% showed markedly good results compared to both control .These effect of spinach followed carrot, squash and mixture of them were also indicated by Rao *et al.*(1999); Lauque*et al. (*2004) and Tang *et al.* (2005) who found that these plants are good sources of vitamin K, vitamin A (in the form of carotenoids), manganese, folate, magnesium, iron, copper, vitamin B2, vitamin B6, vitamin E, calcium, potassium, and vitamin C. Also, they are very good source of dietary fiber, phosphorus, vitamin B1, zinc, protein, and choline which have good effect on the liver enzymes and protect from many chronic disease as fatty liver and enzymes disturbances. Rezaei-Moghadam (2012) indicated that diet contained carrot can improve serum levels of alanine aminotransferase, aspartate aminotransferase and alkaline phosphatase by inhibiting peroxidation activity in the liver tissue.

Table (3): Effect of feeding on different level of supplemented bread on serum levels of liver function enzymes in elderly rats .

Parameter / Groups	GOT (U/L)	GPT(U/L)	ALP(U/L)
Negative control	28.7 ^{c} ± 2.52	23.67 ^{d}± 4.81	169 ^{b} ± 4.81
15% regular bread controlpositive	21 ^{e} ±4.76	27.80 ^{c} ± 4.43	276 ^{a} ± 4.43
15% Carrot bread (10% carrot)	24.7 ^{d} ±1.00	25.67 ^{c} ± 2.51	174 ^{b} ± 2.51
15% Carrot bread (15% carrot)	34.9 ^{a} ±3.91	35.75 ^{a}± 1.89	166 ^{b} ± 1.89
15% squash bread (10% squash)	23 ^{d} ±3.89	29.60 ^{b} ± 2.51	170 ^{b} ± 2.51
15% squash bread (15% squash)	33.33 ^{b} ± 5.50	36.00 ^{a} ± 2.65	159 ^{c} ± 2.65
15% spinach bread (10% spinach)	36.00 ^{a} ± 1.01	36.01 ^{a} ± 1.01	143 ^{d} ± 1.01
15% mixed bread (5+5+5% carrot+ spinach + squash)	34.20 ^{b} ± 2.39	36.80 ^{a} ± 1.64	134 ^{f} ± 1.64

Values are expressed as the Mean ± SD

Different letters on the numbers in the same column means a significant differences at P<0.05

4- Effect of feeding on different level of supplemented bread on kidney functions in elderly rats.

Data presented in table (4) show the effect of feeding with different levels of bread supplemented on kidney functions in elderly rats. Results showed different values of serum creatinine in different groups. It is evident that elderly period (both control) was associated with certain disorder of kidney functions parameters raising significantly the serum levels of creatinine, urea and uric acid compared to levels of groups fed on bread supplemented. Feeding with carrot, squash, spinach and mixture of them corrected the changes of kidney function parameters, provided that the best treatment for creatinine was 15% squash bread and for urea, 10% spinach (15% bread as adding) .It is worth to mention that

the differences between15% Carrot bread (15% carrot) , 15% squash bread (15% squash), 15% spinach bread (10% spinach) and 15% mixed bread (5+5+5% carrot+ spinach + squash) were nonsignificant indicating that the treatment 15% mixed bread (5+5+5% carrot+ spinach + squash) may be selected as excellent treatment of correcting the kidney function parameters. Improvement of kidney functions when consuming carrot, spinach and squash were mentioned before by Rezaei-Moghadam (2012) who reported that these vegetables were diuretic and showing antimicrobial action by containing vitamin C, A and phenols compound.

Table (4): Effect of feeding on different level of supplemented bread on kidney functions in elderly rats.

Parameter / Groups	Creatinine(mg/100ml)	Urea (mg/100ml)
Negative control	$1.02^{b} \pm 0.01$	$36^{b} \pm 0.05$
15% regular bread positive control	$1.24^{a} \pm 0.21$	$48^{a} \pm 0.02$
15% Carrot bread (10% carrot)	$0.82^{c} \pm 0.17$	$22^{c} \pm 1.00$
15% Carrot bread (15% carrot)	$0.67^{d} \pm 0.12$	$18^{d} \pm 0.11$
15% squash bread (10% squash)	$0.87^{c} \pm 0.21$	$19^{d} \pm 1.5$
15% squash bread (15% squash)	$0.63^{d} \pm 0.04$	$16^{e} \pm 0.2$
15% spinach bread (10% spinach)	$0.67^{d} \pm 0.21$	$13^{f} \pm 2.5$
15% mixed bread (5+5+5% carrot+ spinach + squash)	$0.63^{d} \pm 0.14$	$14^{f} \pm 1.01$

Values are expressed as the Mean ± SD

Different letters on the numbers in the same column means a significant differences at $P<0.05$

5- Effect of feeding on different level of supplemented bread on immunological profile.

Data presented in table (5) show the immunological production as estimated for negative, positive controls and groups received supplemented bread. It could be seen that mixed vegetables bread at the level 15% corrected better all immunoglobulin fraction levels, while other supplemented vegetables bread (each one alone) corrected better the levels of IgE, IgM and IgA . At the same time these treatment showed significant differences when compared to both control. While, in case of IgG showed significant compared to best treatment for this parameter. Accordingly, the treatment 5+5+5% of carrot, squash and spinach may be selected as aexcellent treatment for elderly rats, when

considering serum immunoglobin fraction deteriorated by eldery (both controls). The data of table (5) were in line with that of Rosales-Mendoza *et al.,* (2008) indicated that carrot in meals increase immunoglobulin G (IgG) and immunoglobulin (IgA) in serum. Morover, Rao *et al.,* (1999) reported that Vitamin A is a potent antioxidant, and believed to be able to shield the cells from oxidative damage.

Table (5): Effect of feeding on different level of supplemented bread on immunological profile.

Parameter / Groups	IgE mg/dl	IgM mg/dl	IgA mg/dl	IgG mg/dl
Negative control	$57.5^{b} \pm 0.2$	$61.65^{c} \pm 0.65$	$75.5^{c} \pm 0.5$	$748^{f} \pm 2.01$
15% regular bread positive control	$54.17^{b} \pm 0.05$	$78.2^{b} \pm 0.005$	$87.1^{b} \pm 0.1$	$900.05^{d} \pm 0.05$
15% Carrot bread (10% carrot)	$64.87^{a} \pm 1$	$109.33^{a} \pm 3.5$	$111.5^{a} \pm 1.5$	$970.66^{c} \pm 25.16$
15% Carrot bread (15% carrot)	$64.54^{a} \pm 1.05$	$111.33^{a} \pm 10.96$	$111.33^{a} \pm 2.08$	$1050.36^{b} \pm 20.85$
15% squash bread (10% squash)	$64.76^{a} \pm 0.05$	$108.66^{a} \pm 9.6$	$111.5^{a} \pm 1.5$	$975^{c} \pm 15$
15% squash bread (15% squash)	$64.99^{a} \pm 1.11$	$108.16^{a} \pm 2.5$	$111.66^{a} \pm 6.02$	$1010.66^{b} \pm 60.27$
15% spinach bread (10% spinach)	$65.23^{a} \pm 1.11$	$108.66^{a} \pm 2.5$	$91.66^{b} \pm 6.02$	$1060.66^{b} \pm 60.27$
15% mixed bread (5+5+5% carrot+ spinach + squash)	$64.19^{a} \pm 1.11$	$108.96^{a} \pm 2.5$	$109.96^{a} \pm 6.02$	$1116.66^{a} \pm 60.27$

Values are expressed as the Mean ± SD

Different letters on the numbers in the same column means a significant differences at $P<0.05$

In conclusion, vegetables as carrot, squash and spinach are essential to good health especially in elderly stage. Bread has been consuming by several times. Unfortunately, bread contains very low amount of fiber, vitamins as A or C and important mineral for good health. Consequently supplementation of such bread with these plants demonstrated good organoleptic score. So, it is recommended to include supplemented bread with these plants may prevent people from different diseases as low immunity, diabetic and liver diseases.

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مجلة الاقتصاد المنزلي - مجلد ٢٤- العدد الثالث – ٢٠١٤م

دراسات تكنولوجية وبيولوجية على إنتاج أغذية اقتصادية تفى بالاحتياجات الغذائية للمسنين

شريف صبرى رجب، نهاد رشاد الطحان، أسماء مصطفى الغراب
قسم التغذية وعلوم الأطعمة - كلية الاقتصاد المنزلى – جامعة المنوفية.

الملخص:

تهدف هذه الدراسة إلى دراسه تأثير انتاج الخبر المدعم ببعض الخضروات (الجزر- الكوسه – السبانخ ومخلوطهم معا)على الحاله الصحيه والفسيولوجيه للفئران المسنه. تم استخدام اربعون فأرا من الاناث فى التجربه وتقسيمهم الى ثمانى مجموعات كالتالى(خمسه فى كل مجموعه): تم تغذيه المجموعه الضابطه السلبيه على الوجبه الضابطه، اما بالنسبه للمجموعه الضابطه الايجابيه فتم تغذيتها على النظام الغذائى الاساسى مضافا اليه ١٥% من الخبر الغير مدعم، وبالنسبه لباقى المجموعات فتم تغذيتها على الوجبه الضابطه المضاف اليه ١٥% من الخبر المدعم ب١٠و١٥% من مطحون الجزر والكوسه، ١٠% من مطحون السبانخ و١٥% خليط منهم . فى نهايه التجربه تم تجميع عينات الدم وذلك لتقدير نسبه السكر فى الدم، وظائف الكبد (إنزيم الفوسفاتيز القلوي، إنزيم ألانين أمينو ترانسفيراز وإنزيم اسبرتات أمينو ترانسفيراز)، وظائف الكلى (الكرياتنين واليوريا) والاجسام المناعيه. (أ, م, ج, ه). وقد أظهرت النتائج افضل تقييم حسى على الخبر المدعم ب١٠و١٥% جزر وكوسه، اما بالنسبه لاختبارات نسبه السكر فى الدم فقد اظهرت انخفاض فى المجموعات التى تغذت على ١٠و١٥% من الخبز المدعم بمسحوق الجزر والكوسه و١٥% من الخليط ، بالنسبه لوظائف الكبد فقد لوحظ ارتفاع فى قيمه (إنزيم ألانين أمينو ترانسفيراز و وإنزيم اسبرتات أمينو ترانسفيراز) فى المجموعات التى تغذت على ١٥% من الخبز المدعم بالجزر والكوسه و١٥% من الخليط وذلك بالمقارنه بالمجموعه الضابطه. وكذلك لوحظ تحسن فى قيمة إنزيم إنزيم الفوسفاتيز القلوي فى المجموعات التى أضيف لها ١٠% من الخبز المدعم بالجزر والكوسه.اما بالنسبه للاختبارات المناعيه فلوحظ ارتفاع فى قيمه الاجسام المناعيه (أ, م, ج, ه) فى جميع المجموعات المختبره.

الكلمات الكاشفة: الفئران المسنه - وظائف الكبد والكلى - الجزر- الكوسه - السبانخ.