Effect of feeding probiotics and/ or *Ocimum basilicum* seeds on some productive and physiological traits in the local male rabbits

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Abstract

This study aimed to find out the effect of feeding probiotics or/and *Ocimum basilicum* seeds on productivity and physiological traits. Twenty local male rabbits aged 2.0 –4.0 months, with average body weight 1700g. Animals fed on a concentrate pellets diet and green grasses and tap water offered. Rabbits were randomly and equally divided into four groups. All groups were daily fed on a concentrate pellets diet (2%) of body weight, first group (C) as control group, second group (P) fed on the same concentrate pellets and water containing 5mg/kg body weight of probiotics, third group (B) was gives 2% of *Ocimum bacillicum* seeds (basil seeds) while forth group (PB) was gives 2% of *Ocimum bacillicum* seeds and water containing 5mg/kg body weight of probiotics. The results revealed that body weight was progressively increased in all groups, but the treated groups showed significantly ($p<0.05$) better values than the control group. Also the treated groups conducted significantly ($p<0.05$) higher total gain compared with the control group. Hemoglobin concentration increased with time progress in all groups, significantly ($P<0.05$) higher values than the control group along most studied periods. While serum glucose levels reduced in all groups, but the treated groups showed significantly ($P<0.05$) lower values than the control group in late experimental periods. With time progress, serum cholesterol and triglyceride percentages were reduced in all groups, but the control group recorded significantly ($p<0.05$) higher values than the treated groups, and B and PB groups recorded the lower values than P group. AST enzyme activity in all groups were decreased with time, while the treated groups recorded significantly ($P<0.05$) lower values compared with the control group along most studied period.

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Keywords: *Ocimum basilicum* seeds, *probiotics*, weight gain, rabbits.

تأثير إضافة البروبايوتيك و/أو بذور الريحان على بعض الصفات الإنتاجية والفيسيولوجية في ذكور الأرانب المحلية

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الخلاصة

تهدف هذه الدراسة إلى معرفة تأثير إضافة البروبايوتيك أو/و بذور الريحان على بعض الصفات الإنتاجية والفيسيولوجية في ذكور الأرانب. استخدمت عشرين أرنباً ذكر محلي تم شرائها بمعدل عمري بين شهرين وأربعة اشهر. مع معدل وزن جسم 1700غم. تم تغذية جميع الحيوانات على العلف المركز والعلف الأخضر والماء. الأرانب قسمت عشوائيا وبالتساوي إلى اربع مجاميع كالاتي المجموعة الأولى (C) غذيت يوميا على العليقة المركزة (2% من وزن الجسم) واعدت كمجموعة سيطرة. المجموعة الثانية (P): غذيت يوميا على العليقة المركزة (2% من وزن الجسم) وجهزت بماء يحتوي على 5 ملغ/كغم من وزن الجسم من البروبايوتيك. المجموعة الثالثة (B): غذيت يوميا على العليقة المركزة (2% من وزن الجسم) حاوية على 2% بذور الريحان. أما المجموعة الرابعة (PB) غذيت يوميا على العليقة المركزة (2% من وزن الجسم) حاوية على 2% بذور الريحان، وماء يحتوي على

5 ملغ/كغم من وزن الجسم من البروبايوتيك. النتائج أظهرت ان وزن الجسم ازداد تدريجيا في جميع المجاميع، لكن المجاميع المعاملة أظهرت فروق معنوية ($P<0.05$) افضل من مجموعة السيطرة. كذلك المجاميع المعاملة أظهرت فروق معنوية في الزيادة الوزنية مقارنة مع مجموعة السيطرة. تركيز الهيموغلوبين ازداد بتقدم الوقت في جميع المعاملات معنويا ($P<0.05$) اعلى من مجموعة السيطرة على طول مدة التجربة. مستوى سكر الدم قل بتقدم الوقت في جميع المجاميع معنويا ($P<0.05$) مقارنة مع مجموعة السيطرة في الفترة الأخيرة ومع تقدم الوقت نسبة الكولسترول والدهون الثلاثية قلت في كل المجاميع، لكن مجموعة السيطرة سجلت قيم اعلى معنويا ($P<0.05$) مقارنة مع المجاميع المعاملة. فعالية إنزيم الكبد AST في جميع المعاملات قلت مع تقدم الوقت، بينما المجاميع المعاملة سجلت معنويا قيم اقل مقارنة مع مجموعة السيطرة.

الكلمات المفتاحية: بذور الريحان، بروبايوتك، الزيادة الوزنية، الأرانب.

Introduction

Rabbit represent farm animal that eligible to plays an important role in this context, because of its features make it valid to be white meat animal production, also it has the characteristics make it able to benefit from both green fodder and concentrated fodder (1). The rabbit farming is emerging as an important enterprise in many countries of the world, has great potentials in the economy of different countries (2). Rabbit meat has high biological value, it has high protein percentage 21%, good quality white meat with low percentage of cholesterol and sodium (3). The ban of using antibiotic as a growth promoters in many countries poses a serious challenge for rabbit meat producers, because of the very complex and peculiar digestion of rabbit (caecotrophy, microbial fermentation), this species is susceptible to enteric diseases, particularly after weaning. Accordingly, there have been several studies with alternatives, i.e. natural feed additives to replace dietary antibiotics (4). For several decades, antibiotics and chemotherapeutics in prophylactic have been used in animals, however there are increasing concerns about the risk of developing cross-resistance and multiple antibiotic resistance in pathogenic bacteria in both human and livestock. Rai *et al*. (5) one alternative to reduce these problems is the use of some growth promoters like probiotics which have positive effect on animal's growth performance and improve of digestive tract conditions by action on beneficial microbiota also enhance the sanitary and physiologic status of the animal (5). Collins and Gibson (6) mentioned that probiotic is a live microbial feed supplement which beneficially affects the host animal by improving its intestinal balance. Probiotic represent important co-factor, have been reported to produce a variety of beneficial production responses. These include growth rate, feed intake, feed efficiency, milk composition, egg production and reproduction in farm animals (7). In the last decade plants and herbs are commonly used in the treatment of many diseases hence the call Medical herbs (8). These herbs have been used for centuries and have become part of complementary medicine worldwide because of their potential health benefits (9). Plants are one of the most important sources of medicines, basil (*Ocimum basilicum* Linn.) is one such plant which symbolizes all that is wondrous in nature because, the whole plant has been used as traditional medicine against various ailments from antiquity (10). Basil (*Ocimum basilicum* L.) is an annual aromatic plant, native to the tropical and subtropical regions of Asia, Africa and South America (11). Since antiquity the herb has been used for chest infections, digestive problems, migraines, and culinary purposes (12, 13). Today, it is widely used for its therapeutic properties (14). There is little available literature about the use of probiotic and/or *Ocimum bacilicum* on the performance of rabbit. This experiment was initiated to observe the effect of feeding probiotic or/and *Ocimum bacilicum* on the productivity (body weight and weight gain) and some physiological and productive performance traits.

Materials and Methods

This experiment was carried out at the animal house, College of Veterinary Medicine, University of Baghdad from (20/1/2015-20/4/2015). Twenty healthy local male rabbits were bought at age of about 2.0-4.0 months, with average body weight (1700 gm) animal where kept in cages of animal house of Veterinary College, Baghdad University. All animals where fed on the concentrate diet as the table (1) and green grass and tap water were offered of preliminary period for 2 weeks. Animals were divided randomly and equally into four groups contain (5 rabbits each) body weight was considered and kept in cages specialized for rabbit and closed tightly. First group daily fed on concentrate diet of pellet (2%) of body weight and kept as control group. The second group daily fed on the same concentrate diet and water containing (5 mg/ kg) of Probiotics/ animal and given by drenching method. Third group was daily fed on the same concentrate diet containing (2%) of the *Ocimum bacilicum* seeds. While fourth group daily fed on the same concentrate diet containing (2%) of *Ocimum basilicum* seeds and water containing (5 mg/ kg) of the probiotics. The quantity of concentrate diet offered for each group were biweekly adjusted according to the body weight changes in order to insure that the intake would be about 2% of recorder live body weight.

Table (1) component of concentrate diet

Nutritional substances	Percentage (%)
Wheat bran	20
Corn	30
Barley	27.5
Wheat	10
Soybeans	10
Calcium carbonate	1
Salt	1
Dicalcium	0.5
Total (%)	100

- **The samples and parameters included in this study:**

1. Body weights of all animals were taken biweekly interval to determine the changes in body weight and to find out the total gain during the experimental period.
2. Blood samples were taken biweekly to study some blood character and included:

a- Blood Hemoglobin
b- Serum cholesterol, triglycerides and glucose concentration.
c- Aspartate amino transferase enzyme activity.

- **Parameters and measurements included in this study:** Blood samples were taken from heart by using disposable sterilized syringes (heart puncture). The region was sterilized. Three ml of blood samples were taken and divided into two parts, the first part one ml of blood samples was kept in specific tubes containing anticoagulants EDTA to estimate haemoglobin (Hb) by using spectrophotometric method according to John and Lewis (15), blood glucose where estimated according to Trinder (16). The other part of blood samples (Two ml) was left in sterilized tube free of anticoagulant substances, was kept in the refrigerator at a slant position until the estimating of cholesterol according to Allain *et al.* (17), Triglycerides measured according to Richmon (18) method Aspartate Amino Transfers (AST) activity estimated by colorimetric method which adapted by Reittman and Frankel (19).The statistical analysis using Complete Randomized Design (one way) to find the differences among different groups for each period. Least Significant Differences (LSD) was applied to detect the significant differences among different mean groups at 5% level (20).

Results and Discussion

- **Body weight:** Body weight increased in all different groups with time and age progress, but there were significant (P<0.05) differences in their means of different rabbits groups with time progress (Table 2). The rabbits weight in the mixed and basil groups showed significantly (P<0.05) higher values in their body weight compared with control group from the 4th period up to the end of the experiment, while the probiotic group recorded significantly (P<0.05) higher values than the control group from the 5th period up to the end of the experiment.

Table (2) Effect of probiotic and/or *Ocimum bacillicum* on body weight and total body weight gain of local male rabbits (gm). (Means ±SE).

Group / Period Biweekly	C	P	B	PB
1	1756.0±54.52	1808±52.09	1821.0±72.30	1777.0± 5.65
2	1824.0±59.40	1925.0±44.72	1958.0± 73.03	1901.0±74.10
3	1918.0±51.0	2035.0±66.89	2060.0± 63.36	2041.60±65.31
4	1972±47.63 B	2137.0±71.02 AB	2152.0± 55.69 A	2176.20±68.90 A
5	2026.0±44.02 B	2317.0±56.47 A	230.0± 43.97 A	2306.0± 65.79 A
6	2075±55.70 B	2443.0±50.48 A	2425.0± 48.27 A	2386.0± 61.20 A
Total weight gain mean	319.00±23.41 B	645.0± 33.91 A	604.0± 56.75 A	609.0± 48.79 A

The different capital letters refer to significant differences among different groups at (P<0.05).

The total gains of all groups recorded were 645.0±33.91, 604.0±56.75 and 609.0±48.75 gm for the probiotic, basil and mixed groups respectively (Table 2). The treated groups showed significantly (P<0.05) higher total gain values compared with control group. The significantly (P<0.05) increase in the body weight of the P, B and PB in the (4, 5, 6) period and weight gain could be attributed to the fact that basil seeds ingredients may contain an active compounds such as an essential amino acids (arginine, leucine, lysine, valine, histidine methionine, phenylalanine, tryptophan, and threonine), Also these high ratios of protein inhibit stress factors due to oxidation as flavonoides, apigenin and volatile fatty acids (21, 22). While the carbohydrates in the basil seeds include the monosaccharides and is a good source of fibre, including the mucilage, cellulose, hemicelluloses, pectin (23). Sooksai and Noitang (23) showed that basil seeds are rich in linalool (24) which used as a carminative and on digestive disturbance (25). Also it may related to its effects as antioxidants which can improve the health and then increase body weight (22). Such results were in agreement with (26). Who show that basilicum seeds can improve feed conversion ratio, improve carcass quality and improving general performance. Ali *et al.* (27) found that the addition of basil seeds by (1.5%) increase energy utilization from low energy food to (10%) of rabbits and improve the growth performance. In another aspect, an additive is provided to improve body weight, feed conversion and weight gain in productive animals and has positive effects on the health of both productive animals, these results are in agreement with (28). Kustos *et al.* (29) found that administration of probiotics in rabbits had improved growth performance and this may due to probiotic promote intestinal colonization by competitive growth against harmful microorganisms, lowering intestinal pH with production of lactic acid and increasing digestion by producing enzymes and vitamins (3). On other hand; Huber (30) showed that the effects of feeding probiotic to calves cause increase feed intake and improved body weight and decreasing diarrhea.

- **Blood hemoglobin (Hb):** Table (3) showed that the level of Hb of different rabbit groups slightly and gradually increased significantly (P<0.05) with time and age progress, but all the treated groups showed significantly (P<0.05) higher values than the control group at the third period of experiment up to the end period. The gradual increase in Hb for all groups could be attributed to that those animals had a good diet and management during the studied period, but there was a significant (P<0.05) improvement in the first studied period, this might be due to an increase in the absorption of nutrients in the intestine due to the effect of probiotic or increase feed intake as a result of an increase in the appetite.

Table (3) Effect of probiotic and/or *Ocimum bacillicum* on blood hemoglobin (Hb) concentration (g/ dl) of local male rabbits. (Means ±SE).

Groups / Period biweekly	C	P	B	PB
1	11.21±1.08 b	11.41±1.08 d	12.09±0.64 c	11.39±0.91 e
2	12.41±0.59 ab	13.17±0.96 d	14.39±0.75 b	13.68±1.04 d
3	13.53±.078 B a	15.33±1.08 AB cd	15.86±0.70 A b	16.13±0.77 A c
4	14.14±1.19 B a	16.98±0.70 A bc	18.20±0.75 A a	18.43±0.71 A b
5	14.08±0.70 B a	18.89±0.69 A ab	18.36±0.62 A a	19.08±0.69 A ab
6	14.56±0.47 B a	20.57±0.69 A a	20.06±0.76 A a	21.21±1.10 A a

The different lowercase letters refer to significant differences among periods at (P<0.05).
The different capital letters refer to significant differences among different groups at (P<0.05).

Jeba (31) Found that administrated *Ocimum basilicum* to wister albino rat with different dose play necessary roles for increase in Hb of blood in rats and this increasing may be attributed to that Basil plant stimulate red blood cells or increased liver enzyme, climbing from the percentage or amount of Hb. Also Onwurah *et al.* (32) determined in study the impact of adding different levels of the seeds of basil (0.5, 1, 1.5 and 2) g/ kg feed in the experiment for broiler chickens, up to three weeks, the results showed improved feed conversion efficiency and the proportion of Hb and PCV, RBC count in the group treatment of basil seeds feed compared to control group and researchers concluded that the use of basil at levels of 0.5 or 1 g/ kg feed led to an improvement immune traits, and increased significantly the number of Red blood cells compared to the control group (33). Yadav *et al.* (34) who studied the effect of probiotic on the blood hemoglobin value which was increased significantly after 8 week of feeding; compare with control group. Also the results agree with Dahiya *et al.* (35) who found that the effect of probiotics on four haematological parameters viz., level of haemoglobin, total erythrocyte count, total leucocytes count packed cell volume showed significant increase in the blood of fish treated with probiotics alone versus control.

- **Serum Glucose:** Serum glucose level of all groups were decreased significantly (P<0.05) differences during the all period of the study. Also table (4) showed that significant differences existed among different groups and all treated group showed significant differences from the control group up to the end of the experiment.

Table (4) Effect of probiotic and/or *Ocimum bacillicum* on serum glucose (mg / dl) of local male rabbits. (Means ±SE)

Groups / Period biweekly	C	P	B	PB
1	113±5.81 b	106.8±3.48 a	110±3.86 a	111.6±4.26 a
2	148.6±6.69 Ab	109.4±2.33 Ba	109.2±2.17 Ba	104.8±4.46 Bab
3	111.4±3.28 Ab	106.8±4.97 ABa	99±1.58 Bb	99.2±3.92 Bbc
4	106.8±2.70 Ab	98.4±2.15 ABab	93.2±0.96 Bbc	94.4±2.94 Bcd
5	104.6±4.31 Ab	93.2±2.70 Bb	90.2±1.77 Bcd	90±3.40 Bde
6	102.6±2.11 Ab	95.2±2.69 ABb	83.0±2.91 Bd	86.4±2.29 Be

The different lowercase letters refer to significant differences among periods at (P<0.05).
The different capital letters refer to significant differences among different groups at (P<0.05)

- **Serum Cholestrol:** Table (5) showed that blood cholesterol level settled in all treated groups but the C group showed gradually increased with time and age progress and recorded significantly (P<0.05) higher values than the treated groups during late periods, and established 95.31±7.84, 66.21±4.74, 49.85±3.37 and 50.08±3.59 mg/dl for C, P, B and PB groups respectively at the end of experiment.

Table (5) Effect of probiotic and/or *Ocimum bacillicum* on blood cholesterol (mg/dl) of local male rabbits. (Means ±SE).

Groups / Period biweekly	C	P	B	PB
1	85.76±6.27 A	81.16±9.73 ABa	70.62±6.54 Ba	80.14±5.55 Ba
2	89.21±7.33 A	80.82±8.99 ABab	70.47±5.25 Ba	79.96±6.29 Ba
3	90.23±7.23 A	82.36±8.90 Aa	63.26±5.12 Bab	80.29±4.56 Ba
4	90.26±3.95 A	71.60±5.80 Bab	57.73±3.92 Bab	66.67±2.24 Bb
5	93.59±4.66 A	72.10±5.22 Bab	50.91±3.86 Cb	51.33±1.61 Cc
6	95.31±7.84 A	66.21±4.74 Bb	49.85±3.37 Cb	50.08±3.59 Cc

The different lowercase letters refer to significant differences among periods at (P<0.05).
The different capital letters refer to significant differences among different groups at (P<0.05).

- **Triglyceride (TAG) concentration:** Triglyceride levels were significantly (P≤0.05) reduced in all groups with study progress to the end of experiment. Table (6) showed the same trend in serum triglyceride as in serum cholesterol, however, P, B and PB were significantly (P≤0.05) than control at the end of the experiment.

Table (6) Effect of probiotic and/or *Ocimum bacillicum* on serum triglyceride (mg/dl) of local male rabbits. (Means ±SE).

Groups / Period biweekly	C	P	B	PB
1	140.27±18.71 Aa	114.17±11.32 Ba	140.71±20.47 Aa	110.19±10.09 Ba
2	128.83±15.64 Aab	100.78±7.89 Bab	103.12±15.01 Bb	98.13±7.63 Bab
3	117.43±17.99 Aab	89.54±5.33 Bab	94.69±12.14 Bbc	91.93±7.17 Bab
4	108.92±4.48 Ab	81.07±5.28 Bbc	74.44±14.40 Bc	83.60±8.16 Bb
5	97.74±4.66 Ab	78.48±1.79 Bbc	49.12±4.95 Bd	64.57±6.55 bc
6	92.47±5.78 Ab	64.97±3.65 Bc	39.39±3.12 Bd	49.00±5.46 Bc

The different lowercase letters refer to significant differences among periods at (P<0.05).
The different capital letters refer to significant differences among different groups at (P<0.05).

The result showed significant (P<0.05) reduction in blood cholesterol in the treated rabbits compared with the control group with time progress could be due to that basil seed cause an activation on fat metabolism of rats and cholesterol which cause a decrease in the blood fat (36). However, Bariyah *et al.* (37) reported the effect of basil seed therapeutically as antihyperglycemic, hypolipidemic and antitoxic. Tahri *et al.,* (38) studied the effect of probiotic (*Lactobacillus* species) possess anticholesterolemic and antilipidemic factors, which aid in cholesterol reduction. Fuller found the People that consume probiotics have experienced lowered cholesterol (39). Probiotics has a protein-sparing effect (lacto-bacillus) primarily use carbohydrates as a growth medium, therefore more protein is made available for assimilation and less glucose concentration (39). Prasad *et al*. (40) observed by adding medical plant to the diet to the diabetic patient led to decrease blood sugar and cholesterol levels due to inhibition of carbohydrates degradation enzymes and prevention carbohydrates absorption then become hypoglycemic. Amrani *et al.* (41) notice that basil feeding groups showed a reduction in cholesterol blood level in rate compared with control group. Treated groups showed significantly (P≤0.05) lower in TAG than control group. The results reflected the interaction between lower TAG concentrations was observed with feeding probioticl and basil.

- **AST- Enzyme activity:** The enzyme activity of rabbits in all groups gradually was decreased with time progress (Table 7). However, the treated groups recorded significantly (P<0.05) lower values than the control group especially at 6th period of the experimental study.

Table (7) Effect of probiotic and/or *Ocimum bacillicum* on serum enzyme activity AST (IU/I) of local male rabbits. (Means ±SE).

Groups / Period biweekly	C	P	B	PB
1	24.19±0.78 a	26.97±2.09 a	25.74±1.64 a	26.37±3.49 a
2	21.0±1.34 Bab	25.37±1.68 Aa	20.49±1.26 Bb	21.14±1.0 Bb
3	20.06±1.16 Ab	21.57±2.03 Ab	17.02±1.17 Bc	16.84±1.08 Bc
4	18.95±1.31 Abc	19.09±2.08 Ab	15.62±0.67 Bcd	16.05±0.94 Bc
5	17.85±0.69 Abc	18.01±2.52 Ab	12.20±0.49 Bd	12.83±0.58 Bd
6	16.32±0.70 Ac	14.42±1.61 ABc	12.04±0.55 Bd	10.06±0.46 Bd

The different lowercase letters refer to significant differences among periods at (P<0.05).
The different capital letters refer to significant differences among different groups at (P<0.05).

The reduction in AST enzyme activity in the serum of the treated groups could be attributed that basil seeds play a role as antioxidant defense system and prevent the oxidative damage and give hepato protective, as a result of their contents from flavonoides and vitamin E. and apigenine and the results were agreed with Yacout *et al.* (42) who studied the effect of oral dose of 200 mg/kg b.w basil extract on rats were treated with phenobarbital and CCl4 for 6 weeks. On other hand these results were agreed with Aller *et al.* (43). Studied the effect of probiotics on the fatty liver disease and concluded that probiotic improved liver function in the patient.

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