Effect of adding ascorbic acid and /or vitamin B complex on some productive and physiological traits on local male rabbits

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Abstract

This study was conducted to examine the effect of using vitamin C and/ or vitamin B complex on some productive traits on the local male rabbits. Twenty eight local male rabbits aged between 2-3 months were divided randomly into four equal groups(7 rabbits each) housed in experimental cages. all animals were fed 100 g of concentrate pellets diet/ animal and green alfalfa and tap water offered. The first group (G_1) was offered drinking water free of vitamins as control group, second group (G_2) was supplied with water containing vitamin C (0.25 g/ l), third group (G_3) was supplied with water containing vitamin B complex (5 ml/ l) and fourth group (G_4) was water supplied containing ascorbic acid (0.25 g /l) and (5 ml /l) vitamin B complex. Body weight and blood samples were recorded biweekly for the change in the body weight and blood glucose and cholesterol, also digestibility were measured. The results showed that, body weight increased in all animals of all groups with time and age progress, all treated groups G_2, G_3 and G_4 showed significantly ($p< 0.05$) higher body weight compared with control group. Digestibility percentages of dry matter, crude protein and crude fiber were significantly ($p<0.05$) higher in all treated groups compared with the control group. Blood glucose and cholesterol concentration showed significant reduction in all treated groups compared with the control group.

Keyword: Ascorbic acid, B complex, productive and physiological traits, Rabbits.
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تأثير إضافة فيتامين ج و/أو فيتامين ب المركب على بعض الصفات الإنتاجية والفسيولوجية على ذكور الأرانب المحلية

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الخلاصة

أجريت هذه الدراسة للتحقق من تأثير إضافة فيتامين ج و/أو فيتامين ب المركب على بعض الصفات الإنتاجية على ذكور الأرانب المحلية. تم تقسيم ثمانية وعشرون ذكور الأرانب تتراوح أعمارهم بين 2–3 اشهر عشوائيا إلى أربع مجاميع متساوية (سبعة أرانب لكل منها) في أقفاص تجريبية. غذيت جميع الحيوانات على 100غم من العلف المركز لكل أرنب والبرسيم الأخضر ومياه الشرب. زودت المجموعة الأولى بمياه الشرب خالية من الفيتامينات كمجموعة سيطرة (G_1) أما المجموعة الثانية (G_2) فقد زودت بمياه حاوية على فيتامين ج بجرعة (0.25 غم/لتر ماء)، في حين المجموعة الثالثة (G_3) زودت بمياه شرب حاوية على فيتامين ب المركب بجرعة (5 مل/ لتر ماء) أما المجموعة الرابعة (G_4) فقد زودت بمياه شرب تحتوي على فيتامين ج بجرعة (0.25 غم/ لتر ماء) وفيتامين ب المركب بجرعة (5 مل/ لتر ماء). حسب وزن الجسم وتم اخذ عينات الدم كل أسبوعين من اجل الكشف عن التغيير في وزن الجسم وسكر الدم والكوليستيرول، كما تم قياس قابلية الهضم. أظهرت النتائج زيادة وزنية في جميع الحيوانات مع تقدم العمر والوقت. أظهرت جميع المجاميع المعاملة (G_2,G_3 andG_4) زيادة معنوية ($p< 0.05$) في وزن الجسم مقارنة مع مجموعة السيطرة (G_1). أظهرت نسب معامل الهضم للمادة الجافة والبروتين والألياف الخام زيادة معنوية ($p<0.05$) في جميع المجاميع المعاملة مقارنة مع مجموعة السيطرة. لوحظ انخفاض معنوي ($p<0.05$) في تركيز سكر الدم والكوليستيرول في جميع المجاميع المعاملة مقارنة مع مجموعة السيطرة.

الكلمات المفتاحية: فيتامين ج، فيتامين ب المركب، الصفات الإنتاجية والفسيولوجية، الأرانب.

Introduction

The rapid increase in the number of world's population makes problems of food security of great importance, especially in developing countries (1). In recent years, the domestic rabbits have been recommended as a good alternative source of protein due to the increasing of human population in developing countries (2). Rabbit meat is high in protein, low in calories and low in fat and cholesterol contents, being considered as a delicacy and a healthy food product, easy to digest (3). Vitamin C **(**ascorbic acid or ascorbate) is an organic chemical made up of six-carbon lactone and a water soluble micronutrient required for multiple biological functions (4). Hassan (5) found that supplementation of 500 mg ascorbic acid/L to heat-stressed rabbits drinking water improved final live body weight, body weight gain, daily water consumption, feed conversion ratio, performance index and economical efficiency. Experimental works published in the second part of 20th century have demonstrated that fast growing rabbits may have positive response to some vitamin B dietary additions, such as vitamin B_1 and B_6 (1-2 ppm), B_2 (6 ppm) and niacin addition (30-60 ppm). If a rabbit suffer from digestive disorders, production and ingestion of soft feceses are stopped. In this case, vitamins are synthesised by digestive flora are less available to the rabbit. for this reason, these rabbits are more susceptible to water soluble vitamin deficiency than healthy ones (6).

Materials and Methods

This work was carried out at the animal house, College of veterinary Medicine, University of Baghdad from (24/11/2016, up to 31/1/2017). Twenty eight male local rabbits at age of about 2-3 months, with average body weight of (1400 gm). The animals were fed on concentrate diet (pellets) 100 gm (Table 1) and green alfaalfa for two weeks as preliminary period with tap water was offered, then rabbits was divided randomly into four equal groups (7 each) according to their body weight and kept in cages as follows: First group (G_1) as control group and gave water free of vitamins. Second group (G_2) was given water contain vitamin C (0.25 gm/ l). Third group (G_3) was given water contain vitamin B complex (5 ml/l). Fourth group (G_4) was given water containing vitamin C (0.25 gm/l) and vitamin B complex (5 ml/l). Body weight was measured biweekly and Blood samples were taken biweekly for blood glucose according to (7) and serum cholesterol was analyzed according to (8). Also digestibility were measured at the end of the study(9). Data was analyzed of two ways Anova (4 treatment), Least significant differences (LSD) was applied to detect the significant differences among different group means at the level ($p<0.05$) (10).

Table (1) component of concentrate diet

Nutritional ingredient	%
Wheat bran	20
Corn grain	30
Barley grain	27.5
Wheat grain	10
Soybeans meal	10
Calcium carbonate	1
Salt	1
Dicalcium phosphate	0.5
Total (%)	100

Results and Discussion

- **Body weight:** Body weight increased in all animals for all groups with time and age progress (Table 2). The animals in groups G_2, G_3 and G_4 showed significantly ($p<0.05$) higher body weight compared with control group during the 5th and 6th periods of the study.

Table (2) Effect of adding Ascorbic acid and/or vit. B complex on body weight of local male rabbits (gm). (Means ±SE).

Group / Period Biweekly	G_1	G_2	G_3	G_4
1	1.40±0.17 B	1.42±0.28 B	1.49±0.22 B	1.38±0.28 B
2	1.38±0.14 B	1.49±0.25 B	1.51±0.22 B	1.39±0.21 B
3	1.56±0.28 AB	1.52±0.28 B	1.53±0.22 B	1.53±0.19 A
4	1.60±0.34 AB	1.59±0.26 AB	1.62±0.27 AB	1.63±0.22 A
5	1.38±0.28 AB b	1.68±0.32 AB ab	1.69±0.33 AB a	1.64±0.21 A ab
6	1.59 ±0.21 A b	1.82±0.33 A a	1.90±0.19 A a	1.88 ±0.23 A a

Lowercase letters refer to significant differences between groups at (P<0.05).
Uppercase letters refer to significant differences among periods at (P<0.05).

The increase in body weight of all animals indicated that those animals were at growth stage, also these results may be related to the effect of vitamin C that increased the feed intake (11). However, Osman *et al*. (12) refers that herbs contain vitamin C work is by feed utilization through facilitating absorption of calorigenic nutrients across the gut wall by increasing it's absorption capacity. Flachowsky (13) who showed that oral administration of vitamin B resulted in increased microbial protein synthesis and higher weight gain in growing animals.

- **The digestibility traits:** The percentage of dry matter digestibility were significantly (P<0.05) higher for rabbits in group G_3 (81.55%) than those of group G_2 and G_4 (78.79 and 78.32)% respectively. The rabbit of group G_3 and G_2 recorded highest (P<0.05) digestibility of crude fiber (90.49 and 89.47)% respectively as compared with control group (G_1) (83.95%) group. No significant difference were shown between treated group in ether extract digestibility and ash digestibility.

Table (3) Effect of adding Ascorbic acid and/or vit. B complex on the Digestibility (%) of local male rabbits. (Means ±SE).

Digestibility / Group	Dry mat.%	CP%	CF%	EE%	Ash%
G_1	65.40±1.04 b	81.39±0.33 b	83.95±1.27 b	78.64±0.66	60.16±2.07
G_2	78.79±1.92 a	89.83±1.33 a	87.62±0.63 a	81.90±6.07	52.66±3.23
G_3	81.55±2.07 a	88.70±0.21 a	90.49±1.36 a	85.71±2.34	59.45±17.98
G_4	78.32±3.74 a	88.70±1.07 a	89.47±0.63 a	89.17±0.70	79.65±3.33

Ali *et al*.(14) who found an improved value of OM, CP, CF, EE and NFE digestibility, which may due the improvement in digestive environment due to herbal (basil herb) content of biological such as antioxidants (14). Horner *et al*. (15) reported increased NDF digestibility in dairy cattle supplemented with 6 gm niacin/day. They attributed this to a shift in the microbial population resulting in greater digestion of NDF.

- **Serum glucose concentration**: Serum glucose level of all treated groups in the first period of the experiment were decrease significantly (P<0.05) compared with the control group (Table 4),While the results showed that the mixed group (G_4) were significantly (P<0.05) lower than other groups (G_1, G_2, G_3) in the 3rd and 4th period of the study. The results also showed in the 5th and 6th period decrease glucose concentration in all treated groups compared to the control group.

Table (4) Effect of adding Ascorbic acid and/or vit. B complex on serum glucose (g/ dl) of local male rabbits. (Means ±SE).

Group / Biweekly period	G_1	G_2	G_3	G_4
1	154.71±5.13 A a	114.00±8.30 A b	114.28±11.40 A b	117.00±8.46 A b
2	113.28±2.91 B	97.57±4.97 AB	108.00±8.23 A	107.28±8.58 A
3	111.28±4.15 B a	95.42±4.04 AB a	102.71±3.82 AB a	80.14±3.83 B b
4	103.14±3.27 B a	92.85±3.02 BC a	98.57±2.41 AB a	84.00±2.11 B b
5	101.71±1.23 B a	86.00±2.90 BC b	89.00±11.47 BC b	76.00±5.11 B b
6	99.71±2.70 B a	81.28±2.07 C b	83.14±1.92 C b	58.85±6.78 C c

Lowercase letters refer to significant differences between groups at (P<0.05).
Uppercase letters refer to significant differences among periods at (P<0.05).

The reduction in the glucose concentration may be due to vitamin C structurally similar to glucose and can replace it in many chemical reaction and thus is effective for prevention of non enzymatic glycosylation of protein (16), also vitamin C decrease the glucose through it improvement of glycemic control initiated by beneficial effect of this antioxidant on B cell (17). On other hand Ye *et al.*(18) found niacin has been shown to stimulate β cell regeneration in partially pancreatectomized rats and improve insulin secretion from patients at high risk of developing type 1 diabetes. It was demonstrated that a 2 week administration of vitamin B_1 in a high dose (0.2% thiamin in drinking water) prevents diabetes induced cardiac fibrosis without reducing the blood glucose level in male diabetic rats (19).

- **Serum cholesterol concentration:** The serum cholesterol concentration (Table 5) showed significant (P<0.05) decrease in the mixed group (G_4) compared with the other groups in first, second and third periods of the study. While all the treated groups for the G_2, G_3 and G_4 groups respectively showed significant reduction compared with the control group (90.87±1.50) in the fourth period of the experiment.

Table (5) Effect of adding Ascorbic acid and/ or vit. B complex on serum blood cholesterol (mg/ dl) of local male rabbits. (Means ±SE).

Group / Biweekly period	G_1	G_2	G_3	G_4
1	90.04±5.60 A	81.51±6.81 A ab	94.24±5.80 A a	74.11±5.37 A b
2	92.57±4.57 A	82.35±6.80 A ab	90.89±4.57 A a	73.61±3.90 A b
3	92.75±3.93 A	84.51±7.65 A a	83.72±4.35 A a	70.61±3.27 AB b
4	90.87±1.50 A	75.03±4.74 AB b	62.48±4.44 AB b	69.11±2.16 B b
5	94.13±3.93 A	74.50±3.39 AB b	57.55±5.70 B c	53.76±2.19 C c
6	93.50±4.70 A	67.00±2.88 B b	57.24±4.37 B b	55.24±3.65 C b

Lowercase letters refer to significant differences between groups at (P<0.05).
Uppercase letters refer to significant differences among periods at (P<0.05).

The ascorbic acid effect on cholesterol prevents low density lipoprotein-cholesterol from oxidative damage and aid in degradation of cholesterol (20). Pamela *et al.*(21) who found that ascorbic acid is also necessary for the transformation of cholesterol to bile acids as it modulates the cholesterol 7 α-hydroxylase, the rate limiting enzyme in reaction of cholesterol catabolism in liver (converts the cholesterol to the cholic acid as one of the bile acids). Ekaidem *et al.*(22) showed vitamin B_{12} supplement was beneficial as it lowers the levels of cholesterol, triglycerides and low density lipoprotein cholesterol to normal values.

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