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EFFECT OF USING BLCK SEED ON GROWTH PERFORMANCE AND ECONOMICAL EFFICIENCY OF RABBITS.

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ABSTRACT

A total number of 18 growing males of New Zealand White rabbits aged 5 weeks were randomly divided into 3 experimental groups to study the effects of using different forms of *Nigella sativa* as a replacement of soybean meal protein on growth performance, and economical efficiency of NZM rabbits. The rabbits of the control group was fed diet free from NS, replacement soybean meal protein by NSM protein was used at levels of 25% in the group (2) and *Nigella sativa* seed (4kg/tn) used in group (3). The experiment lasted for 60-70 day. The growth performance of the experimental rabbits was studied in terms of average weight gain through out the experimental period, also economical efficiency was calculated for all the rabbits groups studied. The obtained results indicated that the highest values of body weight, body weight gain, and economical efficiency were observed for groups fed *Nigella sativa* meal and seed at the end of the experiment, followed by control group. The results showed that NSM protein can be used in rabbits diets up to 25 % of soybean meal protein during growing period without any adverse effect on performance.
Keywords: Rabbits, black seed, growth performance, economical efficiency

INTRODUCTION

Interest in medicinal plants has burgeoned due to increased efficiency of new plant-derived drugs and the growing interest in natural products. The use of plants as medicines dates from the earliest years of man's evolution (Dattner 2003 and Fong 2002). A larger number of these plants and their isolated constituents have shown beneficial therapeutic effects, including anti-oxidant, anti-inflammatory, anti-cancer, anti-microbial, and immunomodulatory effects (Dattner 2003 and Huffman 2003).

Black seed or black cumin (*Nigella sativa*) is a spicy plant that is widely used in North Africa and the Middle East. Its seeds are mostly used for edible purposes such as for seasoning of many kinds of bread, yoghurt and cookies. Nigella seeds are good source of oil and protein, containing significant amounts of sterols. The oil is rich in β-sitosterol that inhibits the absorption of dietary cholesterol (Atta, 2003). *Nigella sativa* seeds was also found to be very effective against intestinal cestodes (Akhtar, *et al.*, 1991). Moreover, Hanafy and Hatem (1993) reported the antimicrobial activity of *N. sativa* against pathogenic bacteria and yeasts.

Seeds of *N. sativa* are the source of the active ingredients of this plant. It is the black seed referred to by the prophet Mohammed as having healing powers(Goreja, 2003). Seeds of *N. sativa*, known as *black seed*, *black cumin* have long been used in folk medicine in the Middle and Far East as a traditional medicine for a wide range of illnesses, including bronchial asthma, headache, dysentery ,infections, obesity, back pain, hypertension and gastrointestinal problems (Al-Rowais 2002). Abd El-hakim, *et al.* (2004) used different forms of black seed in rabbit diets and showed significant increase

on live body weight and body weight gain. Zeweil, *et al.* (2008) showed that rabbits fed 12% Nigella sativa meal had significantly the best values of total weight gain, being higher by 7.7% than control.Therefore, the main objective of this study was to determine the influence of using two forms of *Nigella sativa* on growth performance of New Zealand White (NZW) rabbits.

MATERIALS AND METHODES

Animals:

A total of 18 growing New Zealand White (NZW) male rabbits at 8 weeks of age were used in this study. They were divided into 3 similar groups (6 in each) according to body weight. The 3 groups were assigned at random according to 3 experimental dietary treatments, including control, Nigella sativa meal and nigella sativa seed. The initial live body weight for control, *NSM* and *NSS* groups were 1.07, 0.97 and 1.03 kg, respectively. The experimental period was 60-70 days. Rabbits were individually weighed every 10 days in the morning before feeding.

Housing and management:

Male rabbits used in this study were individually housed in double flat galvanized wire cages (40x50x60 cm). Each cage have a feeder and stainless nipple for drinking water. The batteries were arranged in rows in a windowed house and feeds and water were available all time, through the provision of feed twice a day. Rabbits of all groups were kept individually under the same managerial conditions.

Experimental diets:

Three experimental diets were formulated to cover the nutrient requirements for breeding and mature rabbits according to NRC (1977), as presented in table 1 and 2.

The control diet was without *N. sativa*, while the 2nd contained 13.5 kg/t NSM, to replace 25% of crude protein level of the control diet, 3rd diet contained 4 kg/t *NSS* supplemented to the control diet. All experimental diets were in pelleted form.

Table 1: Formulation of the experimental diets:

Ingredient	Experimental diet		
	Control	NS Meal	MS Seeds
Barley grain	21	20.15	21
Wheat bran	25	22.6	25
Berseem hay (3rd cut)	30	30	30
Soybean meal	19	8.75	19
Nigella sativa meal	-	13.5	4kg(seeds)/t
Molasses	3	3	3
Salt	0.5	0.5	0.5
Limestone	1.2	1.2	1.2
Premix	0.3	0.3	0.3
Total	100	100	100

Premix : One kilogram of premix contain: vit. A 12000 000 IU, vit. D3 2200 00 IU, vit. E 1000 mg, vit. K_3 2000 mg, vit. B_1 1000 mg, vit. B_2 4000, vit. B_6 100 mg, vit. B_{12} 10 mg, pantothenic acid 3.33 g, biotin 33 mg, folic acid 0.83 g, cholin chloride 200 g, Zn 11.79 g, Mn 5 g, Fe 12.5 g, Cu 0.5 g, I 33.3 mg, Se 16.6 mg and Mg 66.7 g.

Table 2: Chemical analysis of different experimental diets.

Ingredient	NSM	Experimental diet		
		Control	NS. meal	NS. Seeds
Dry matter (DM)	93.60	90.0	91.2	89.9
Chemical analysis (% as DM basis):				
Organic matter (OM)	91.43	89.7	90.7	89.0
Crude protein (CP)	30.22	18.1	18.8	18.2
Crude fiber (CF)	7.9	13.2	14.15	13.5
Ether extract (EE)	11.4	2.8	3.12	3.22
N-free extract (NFE)	41.32	55.4	54.63	55.60
Ash	8.57	10.3	9.3	9.7
TDN	68.32	61.99	61.27	61.09
Gross energy, MJ/kg DM	2777	17.5	17.7	17.9

* DE (Kcal/kg DM) = 4253 – 32.6 (CF %) – 144.4 (Ash %) according to Fekete and Gippert (1986)

*NFE calculated by differences [NFE = 100-(CP + EE + CF + Ash)].

Statistical Analysis: Data were analyzed using the one-way ANOVA procedure of SAS (2001) for analysis of variance. Significant difference among treatments were identified at 5% level by Duncan (1955) multiple range tests.

RESULTS AND DISCUSSION

Rabbit growth performance:

Live body weight:

Average body weight and body weight gain values of rabbits during the experimental period are presented in Table 3.

Generally, the differences in body weight during different sampling times of the experimental period (5-15 week of age) were not statistically significant. At the beginning of the experiment (5 weeks of age), the initial body weight of the experimental rabbits were 1.078 kg, 0.97 kg and 1.030 kg for the control (no *Nigella sativa*), NSM and NSS, respectively, indicating the random distribution of individuals among the treatment groups. Also, 20 days later, there was no significant differences in body weight, while rabbits fed *NSS* had the highest body weight compared to NSM and control groups. After one month, group 2 (*Nigella sativa meal*) and group 3 (*Nigella Sativa seed*) had higher body weight than that of control group. After that the present results showed the same trend of body weight increasing in 2nd and 3rd groups compared with control group during the experimental period at 30th to 70th day.

The obtained results are in agreement with data reported by Abdel-Azeem, *et al.* (1999), who concluded that the supplementation of *Nigella sativa* seeds to the diets of NZW rabbits at levels of 0.5, 1.0, 1.5 and 2% improved significantly live body weight.. Abd El-Hakim, *et al.* (2004) used different forms of *black seed* on rabbit diets (one whole *black seed* (WBS)/kg diet, one g crushed *black seed* (CBS)/kg diet and 1/3 g *black seed* oil (BSO)/kg diet), showed significant ($P<0.01$) increase on body weight and

body weight gain. Abdullah, *et al.* (2010) added 5%and 10% *Nigella sativa meal* to the concentrated rations of the 2nd and 3rd experimental groups as replacement of 36 and 72% of the soybean meal (SBM) protein respectively, with no significant differences were found. In broilers, El-Bagir, *et al.* (2006) showed that dietary black cumin at the level of 1 or 3% significantly ($P<0.01$) increased final Body weight. Also,in broilers, Hermes, *et al.* (2009) found that using any form of *black seed* on broilers diets (10% NSM, 1.0%NSS or 0.5%NSO) improved body weight. Erener, *et al.* (2010) found that the supplementation of *Nigella Sativa* seeds to the diets of broilers (Ross 308) at level of 10g/kg diet improved significantly live body weight.

On the other hand, in the Laying Hen, Aydin, *et al.* (2008) reported that Diets supplemented with 1, 2, or 3% *black cumin* had no significant effects on body weight.

The results obtained in this study are disagreement with El-Adawy (2004), who found that live body weight, daily weight gain and feed conversion of rabbits fed control diet were significantly higher than those fed with substitution (25, 50,75 & 100% *black cumin* meal) of CP supplied by soybean meal in control diet. Moreover, in male rabbits, El-Nattat, *et al.* (2007) who found that replacement of SBM by NSM at the rate of 50% caused significant decrease ($p<0.01$) by 20% compared to the control diet. The reduction may be due to lower feed intake, decreasing digestibility of almost nutrients and imbalance of essential amino acids profile with *black cumin meal* inclusion in the diets.

Table 3: Live body weight of growing NZW rabbits as affected by feeding the experimental diets at different sampling times.

Sampling time (day)	Treatment		
	Control	NS meal	N.S. Seed
0	1.08±0.21	0.97±0.09	1.04±0.23
10	1.34±0.14	1.27±0.18	1.33±0.17
20	1.67±0.25	1.65±0.27	1.78±0.18
30	1.93±0.31	1.97±0.33	2.11±0.25
40	2.16±0.34	2.22±0.38	2.36±0.21
50	2.34±0.31	2.42±0.38	2.53±0.23
60	2.48±0.30	2.63±0.38	2.74±0.25

2-Changes on body weight gain:

Mean of body weight gain per rabbits for the three experimental groups (control, NSM and NSS groups) is presented in Table 4.

In general, the changes in body weight gain during the experimental period (5-15 week of age) were not statistically significant. At the beginning of the experiment (5th week of age) body weight gain increased in 2nd and 3rd groups compared with control group. However 20 days later rabbits fed *Nigella sativa seeds* had the highest body weight gain compared to the two experimental groups. After one month group 2 (*Nigella sativa meal*) and group 3 (*Nigella Sativa seed*) had higher body weight than that of control group. The present results showed the same trend of body weight gain increasing in 2nd and 3rd groups compared with control group during the experimental period from 30th to 70th day.

The obtained results are in agreement with data obtained by Abdel-Azeem, *et al.* (1999), who concluded that the supplementation of *Nigella sativa* seeds to the diets of NZW rabbits at levels of 0.5, 1.0, 1.5 and 2% improved significantly live body weight gain. Also, Abd El-Hakim, *et al.* (2004) used different forms of *black seed* on rabbit diets (one whole *black seed* (WBS)/kg diet, one g crushed *black seed* (CBS)/kg diet and 1/3 g *black seed* oil (BSO)/kg diet), showed significant ($P<0.01$) increase on body weight and body weight gain. Zeweil, *et al.* (2008) showed that the group of rabbits fed 12% NSM had significantly the best values of total weight gain, by 7.7% from control. In broilers Hermes, *et al.* (2009) found that using any form of *black seed* on broilers diets (10% NSM, 1.0% NSS or 0.5% NSO) improved body weight gain. Also, in broilers, Erener, *et al.* (2010) found that the supplementation of NS seeds to the diets of broilers (Ross 308) at level of 10g/kg diet improved significantly body weight gain,

The improvement in body weight and body weight gain of rabbits in NSM groups attributed to some active compounds present in essential oil of *N. Sativa* such as P.cymene and thymoquinone (EL-Alfy, *et al.* 1975). These trend of results are in agreement with Radwan, (2003) who showed that *black seeds* contain 0.3-0.6 % essential oil which has 60-78 % nigelone this compound have been shown to possess antimicrobial and antifungal activities that cause depression in growth rate (Mahmoud, *et al.* 1992 and Ibrahim, 1999). Also, *Nigella sativa* contain fat soluble unidentified factors and mixture of essential fatty acids including lioleic, lionlenic and arachidonic acids, which have been essential factors for growth (Murray, *et al.* 1991) and/or due to that NSM contained macro-elements like Ca, P and Mg, which are needed for the optimal bone formation and growth throughout the growing period. Also, NSM contained a lot of essential microelements, which has been known as a growth elements and has an important role in this phenomenon such as Cu, Zn and Fe (William, 1999) and essential vitamins (thiamine, riboflavin, pyridoxine, niacin and folacin) which had roles in improving growth through their effects on fat, protein, nucleic acid (folic acid), vitamins (B6) and minerals metabolism (McDowell, 1989).

Also, The improvement in total body weight and body weight gain, in favor of the group of rabbits fed on diet containing NSM and NSS compared with the control group may be attributed to a beneficial effect exerted by NS composition. It was reported that *Nigella sativa* control and buffer the condition of the stomach and intestine (Projapati, *et al.* 2003). The *black cumin* seeds contain thymoquinine that has antibacterial, diuretic and immuno potentiating activities via increasing neuterophil of the body against infection (Kanter, *et al.* 2005). *Black cumin* oil and its derivatives inhibit eicosanoid generation in leukocytes and membrane lipid peroxidation (El-Dakhakhny, *et al.* 2002). Besides, the seeds contain eight essential amino acids that improve natural immune system activity (Omar, *et al.,* 1999).

On the other hand, Vahdati-Mashhadian, *et al.* (2005) reported that the methanol extracts of *Nigella sativa* seeds in all orally doses (0.6, 0.9 and 2.1%) and chloroform extract in the dose of 2.1% only, significantly decreased mice weight. Also, they reported the possibility of hepatic damage of aqueous extract in the daily dose of 0.6% of body weight. May be these

toxic factors could be responsible of the lower performance observed with high level of NSM (24%). An amino acids imbalance could be also responsible of the low performance.

Table 4: Live body weight gain of growing NZW rabbits as affected by feeding the experimental diets at different internals.

Weighting time (day) at	Experimental diets		
	Control	NS. meal	NS. Seed
10	0.26±0.17	0.30±0.16	0.30±0.15
20	0.37±0.21	0.38±0.22	0.43±0.13
30	0.26±0.26	0.32±0.21	0.33±0.19
40	0.23±0.15	0.25±0.21	0.25±0.19
50	0.18±0.20	0.20±0.15	0.16±0.17
60	0.13±0.20	0.21±0.22	0.21±0.25
70	1.40±0.36	1.66±0.38	1.71±0.27

Economical efficiency:

Data of economic evaluation of replacing NSM for SBM (group2) and addition NS seed (group 3) at the end of experiment period are given in Table 5.

The economical efficiency values at the end of experiment period were higher for rabbits fed NSM and NSS diets compared with control group. These results are in agreement with the results of Nasr and Attia (1998), who found that level of 4, 8 and 12 g NSS/kg diet fed to growing rabbits showed higher economical efficiency at 12 weeks of age by about 12.4, 16.9 and 46.7%, respectively, compared to control group. Also, Abdel-Azeem, *et al.* (1999) found that the highest economical efficiency was observed with rabbits fed 0.5 % black seeds ration compared with other treatments (1.0, 1.5 and 2 % of black seed). Also This is in full agreement with the results obtained by Abd El-Ghani (2003), who reported that black cumin seed meal had best economical efficiency for growing lambs and can be replaced from protein of concentrate mixture in diets of sheep.

Table (5): Economical efficiency of growing NZW rabbits as affected by feeding the experimental diets at the end of lactation period.

Item	Experimental group		
	Contro	NS meal	N.S. Seed
Average feed intake (kg/buck)	9.275	9.100	9.300
Price/ kg feed (LE)*	1.69	1.61	1.70
Total feed cost (LE)	15.58	14.65	15.81
Average weight gain (kg/doe)	1.397	1.624	1.595
Price /kg live body (LE)			
Price of weight gain (LE)	27.94	32.48	31.90
Net revenue (LE)	12.36	17.83	16.09
Economic efficiency (%)	**79.31**	**121.69**	**101.77**

*** Price of tested diets was 1677, 1609 and 1701 L.E. per ton for 0, 25% NSM- protein and NSS, respectively.**

**** The market price was 20 LE/kg live body weight at the time of experiment (2010).**

***** Price of NS meal was 2000 L.E. per ton .**

Recommended:

It could be recommended to use Nigella sativa (seed or meal) in NZW rabbit diets as a non-traditional source of plant protein up to 25% without harmful effects on the growth performance.

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تأثير استخدام حبة البركة على كفاءة النمو و الكفاءة الاقتصادية في الأرانب

أحمد زكى محرز ، مصطفى عبد الحليم الحرايرى و محمد مبروك محمود سلامة
قسم الإنتاج الحيواني – كلية الزراعة – جامعة المنصورة.

. استخدم في هذه التجربة ١٨٠ من ذكور الأرانب النيوزلندي الأبيض في عمر ٥ أسابيع (بعد الفطام) قسمت على ثلاث مجموعات بمعدل ستة أرانب لكل مجموعة، وكان متوسط الـوزن ١.٠٧، ١.٠١، ١.٠٣ كجم في المجموعات الثلاثة على التوالي، وذلك لدراسة تأثير استبدال كسب حبة البركة كمصدر بروتيني في علائق الأرانب النامية عبارة عن ٢٥% بجزء من بروتين فول الصويا في العلـف المـصنع وذلـك فـي المجموعة الثانية، أما المجموعة الثالثة فتم إضافة ٤كجم/طن من العلف المصنع بالإضافة إلـى المجموعـة القياسية بدون إحلال لبروتين فول الصويا بالعليقة، وذلك لدراسة تأثير هذه المعاملات على النمو و الكفـاءة الاقتصادية وذلك خلال فترة ما قبل التسويق (٦٠-٧٠ يوم) هي فترة التجربة. وخلال فترة التجربة كان يتم وزن الحيوانات كل ١٠ أيام وذلك في الصباح قبل تقديم العلف لها، أما فيما يخص الكفاءة الاقتصادية فانـه تم حساب سعر الكيلو جرام حسب سعر السوق المحلى وفى نهاية فتره التجربة تم وزن الحيوانات قبل الذبح (الوزن النهائي). أظهرت النتائج تحسن في الزيادة في الوزن وكذلك الزيادة اليومية في المجاميع المحتويـة على حبة البركة (المجموعة الثانية والثالثة) بالمقارنة بالمجموعة الكنترول، كذلك فان مـن حيـث الكفـاءة الاقتصادية هناك تفوق للمجاميع المحتوية على حبة البركة سواء الكسب أو الحبة على الكنترول والتي كانت ٧٩.٣١، ١٢١.٦٩، ١٠١.٧٧على الترتيب. من النتائج السابقة يتضح أنه يمكن استخدام كسب حبة البركة و بنجاح في علائق الأرانب والذي أدى إلى زيادة معدلات النمو وخفض تكاليف الإنتاج.

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