J. Agric. Sci. Mansoura Univ., 33 (9): 6323 - 6334, 2008

EFFECT OF SUBSTITUTION *Nigella sativa* MEAL WITH SOYBEAN MEAL ON REPRODUCTIVE PREFORMANCE OF MALE RABBIT.

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ABSTRACT

The present study was conducted at a rabbit private farm in Dakhleia province. Three experimental diets were formulated to be isonitrogenous (18.5% CP) and isocalroic (2.65 kcal DE/g DM) containing 0, 13.5 and 27% Nigella Sativa meal (NSM) to replace part or all dietary soybean meal. A total of 27 New Zealand white (NZW) male rabbits at 16 weeks old were used to determine the optimal NSM level to replace soybean meal and its effect on semen quality and some blood parameters of rabbit's bucks. The results could be summarized as following; all studied semen characteristics were positively affected by dietary treatments and age advanced. Generally, rabbits of the third group that fed diet containing 50 % NSM-Protein had the best semen quality specially percent of motile sperm cells, live sperm, abnormal sperm and sperm cell concentration ($p<0.05$) compared with control and 25% NSM-Protein groups.

Concentration of total proteins and its fractions were not significant affected by experimental diets. Blood plasma (T3 and T4) content increased significantly ($P<0.05$). However, concentration of plasma cholesterol, total lipids and triglyesrids decreased significantly ($P<0.01$) by using diet containing NSM-protein.

It could be concluded that partially substituting (up to 50%) of Nigella Sativa meal with soybean meal could be successfully used in rations of male rabbits to improve semen quality.

Keywords: Nigella Sativa meal, soybean meal, substituting, semen quality and rabbit.

INTRODUCTION

Nigella Sativa is one of major oilseed crops, its cake or meal is generally used in ruminant feed (Awadalla, 1997; El-Ayek *et al.*, 1998; Gabr, 1998 and Gabr *et al.*, 1998), and Seems to have little used as a protein source in poultry diets (Khalifah, 1995; Zeweil, 1996 and El-Ghamry *et al.*, 1997).

Nigella Sativa meal (NSM) is one of the untraditional feeds of high protein content of about 30% (Khalifah, 1995 and Zeweil, 1996), and most of the essential amino acids as well as the remaining oil after extracting of about 15% (Abdel-All and Attia, 1993). The NSM could be used as a flexible diet because of its relatively high CP and energy contents. Moreover, NSM can be used to replace a part of the concentrate feed mixture protein (CFM-protein) economically in diet of poultry, (Khalifah, 1995 and El- Ghamry *et al.*, 1997), fish (Mohamed, 1997) and sheep (Gabr *et al.* 1998; El-Ayek *et al.*, 1999). In rabbits *Niglella Sativa* was utilized in form of seeds (Nasr *et al.* 1996), crashed seeds (Daghash *et al.* 1999 and Abd El-Hakim *et al.* 2002) and meal (Saad 2001).

It is generally known that reproductive performance of males are affected by level and source of nutrients in their diets as well as other factors including breeding and management of the herd. So, nutrition is considered to be the most important factor affecting the reproductive performance of different farm animals. In this respect, Varvikko (1986) found that both quality and quantity of proteins in rations greatly affect productive and reproductive performance of farm animals.

Therefore, the aim of the present study was to determine the optimal NSM level to replace soybean meal and its effect on Reproductive performance of male rabbits.

MATERIALS AND METHODS

The present study was conducted at a rabbit private farm in Dakhleia province during the period from April to September 2007.

Three experimental diets were formulated to be isonitrogenous (18.5% CP) and isocalroic (2.65 kcal DE/g DM) containing 0, 13.5 and 27% *Nigella Sativa* meal (NSM) to replace part or all dietary soybean meal. Table (1) Composition and chemical analysis of experimental tested diets. Vitamin and mineral mixture was added to cover the requirements recommended by de Blas (1986). Chemical analysis was carried out for diets, according to methods of AOAC (1995) for DM, Ash, CP, CF and EE. Gross energy was (GE) calculated according to MAFF (1975) as

GE MJ/ kg DM = 0.0226 CP+ 0.0407 EE+ 0.0192 CF + 0.0177 NFE.

Rabbits were housed individually in double flat galvanized wire batteries (30×50×40 cm). Each cage have a stainless steel nipple for drinking and a feeder allowing to record feed intake for each rabbit.

The batteries were arranged in rows in a windowed house. Feed and water were available all time (*ad libitum*).

A total of 27 New Zealand white (NZW) male rabbits at 16 weeks old were used. Rabbit were fed on the tested formulated diets for 10 days as preliminary period.

At the start of study, rabbits were randomly allotted into three equal groups (9 each). The average initial live body weight of rabbits in all groups were (2.180), (2.110) and (2.150) kg for the 1st (control), the 2nd and 3rd group, respectively. Semen was individually collected using an artificial vagina from the bucks. Semen characteristics were determined according to El-Gaafary (1987).

Blood samples were taken from rabbit bucks from each group and analyzed for Total protein, Albumin, Globulin, (AST and ALT), Total lipids , Triglyceride, total cholesterol , HDL, (T3 and T4) and Glucose using the commercial kits (Max-Planck-Ring 21-D-65205, Wiesbabdenm Germany).

Data were analyzed according SAS program SAS, (1990). The application of the least of means significance tested for the differences among the different treatments were done according to Duncan (1955) completely randomized design performed to estimate the frequencies associated with mortality rate and performance index according to Snedecor and Cochran (1971).

Table (1): Composition and chemical analysis of experimental tested diets.

Ingredients	Level of NSM (%)		
	0% NSM-Protein	25% NSM-Protein	50% NSM-Protein
Barley grain	21	20.15	20
Wheat bran	25	22.6	16
Berseem hay 3rd cut	30	30	30
Soybean meal	19	8.75	2
Nigella Sativa meal	-	13.5	27
Mollasses	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
Dry matter (DM)	90.0	91.2	89.9
Chemical analysis (% as DM basis):			
Organic matter (OM)	89.7	90.7	91.0
Crude protein (CP)	18.1	18.8	18.2
Crude fiber (CF)	13.2	14.15	14.0
Ether extract (EE)	2.8	3.12	3.22
N-free extract (NFE)	55.4	54.63	55.60
Ash	10.3	9.3	9.0
Gross energy (GE) , MJ/kg DM	17.5	17.7	17.9

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

The following model was used: **$Y_{ij} = M + T_i + e_{ij}$**

Where:

Y_{ij} =an observations

M = overall means

T_i = Effect of using different levels of (NSM) (i= 0, 13.5 and 27)

e_{ij} = Random error

RESULTS AND DESCUSSION

Semen characteristics:

Data of semen quality of buck rabbits fed different levels of NSM in their diets are presented in Table (2)

1. Ejaculate volume (ml):

Semen volume per ejaculate increased by 68% , 58% and 53 % more than that at 5 month in control group T1 , T2 groups , respectively . overall mean of ejaculate volume of control group , T1 and T2 were 0.86 , 1.03 1.14 ml , respectively and differences between tested groups were significantly ($P < 0.05$).

These findings are in agreement with that reportedly daghash , (1999) who found that the ejaculate volume increased (P< 0.05) with rabbit buck fed N.S seed by about 43.2 % compared with those fed the control diet .

The highest significant (P<0.05) value of ejaculate volume of rabbit the beneficial effects of protein source on the accessory sex glands (seminal vesicles and prostate) to produce large volume of the seminal plasma or / and may attributed to the significant (P<0.05) increase in testosterone level in blood plasma of rabbit bucks fed NSM diet the accessory glands are functionally controlled by testosterone (Hafez, 2000). testosterone stimulates accessory sex glands (Massoud *et al* ., 1991) .

2. Percent of motile sperm cells:

Percent motile sperm cells were gradually increased from 44.9 % to 84.3 % as age advanced up to 7 months, then after this age values created a plateau, whereas percentage of motile sperm cells reached maximum (84.3 to 88.5).

Nasr (1998) found that feeding crushed NS seeds improved significantly (P < 0.05) motility from 51.65 % to 76.24 % in tested group

3. Percentage of live sperm cells:

Live sperm percentage in the three tested groups was 68.8, 73.2 and 75.5%, respectively and differences between tested groups were not significant.

Changes in percer.t of live sperm cells were suggested to be due to the continuous development and interaction of testicular tissue and epididymal duct during the early stage of sexual development.

The results obtained herein concerning the live sperm percentage are agreement with the results of Daghash (1999) who reported that addition of NS seed increased live sperm percentage from 59.2 to 80.16%.

4. Percentage of abnormal sperm cells:

Abnormal sperm were 14.09, 10.15 and 9.11% in the three tested groups control, 25 and 50% NSM-protein, respectively. Differences between tested groups were significant (P<0.05) table (2).The range of abnormal sperm in the present study (5.74 to 12.34) from the 5^{th} to 9^{th} months of age lies within the range of abnormal sperm (range 7.5 - 13.17) reported by many authors with different breeds (El-Ashry *et al.* 2000 ; El-Harairy *et al.*, 2002 and El-Shamaa 2002).

Decrease in percent of abnormal sperm cells was suggested to be due to the development and maturation of testicular tissues and epididymal duct. Also, the increase in testosterone hormone level, known to be necessary for normal spermatogenesis, is believed to play a part in reducing the percent of abnormal sperm cells (Mann and Clutwak, 1981).

5. Sperm cell concentration (x 10^9/ml):

Sperm cell concentration started low (46.3 x 10^9 sperm/ml semen) at the 5^{th} month of age, gradually and significantly increased to (668.7 x 10^9 sperm/ml) at 9 months of age table (3).

The results obtained concerning the sperm cell concentration are in agreement with the results of Daghash *et al.* (1999) found that improvement in sperm cell concentration with using diet containing crushed NS seed.

Table (3): Semen characteristics for rabbit bucks as affected by the experimental diets at different ages.

Character,	Groups			± SE
	0	25%	50%	
Ejaculate volume (ml)	6.86	1.03	1.14	± 0.33
Sperm motility (%)	70.53 ^{b}	77.91 ^{a}	80.46 ^{a}	± 2.05
Live sperm (%)	68.77	73.15	75.51	± 0.08
Abnormal sperm (%)	14.09 ^{a}	10.15 ^{b}	09.11 ^{b}	± 0.42
Sperm concentration (x106/ml)	364.81 ^{b}	422.78 ^{a}	440.35 ^{a}	± 3.42
Sperm output (x106/ejac.)	344.53 ^{b}	474.45 ^{a}	541.41 ^{a}	± 14.3
Live normal sperm output (x106/ejac.)	239.99 ^{b}	362.34 ^{a}	421.13 ^{a}	± 10.6

a, b Means within the same raw with different superscripts are significantly different at P<0.05

6. Total sperm output (x 10^9 sperm /ejaculate):

Sperm output started as very low 37.55 x 10^9 sperm / ejaculate at age of 5 months (puberty), then significantly increased to 853.9 x 10^9 sperm / ejaculate at age of 9 months table (3).

Rabbit bucks fed NSM at level 50% NSM-protein (group 3) showed significantly (P<0.05) higher maximum values at 9 months of age (967.9 x 10^9 sperm/ejaculate), followed by those fed on 25% NSM (880.7 x 10^9 sperm/ejaculate), while the control semen showed the lowest values (704.2 x 10^9 sperm/ejaculate, respectively).

These findings are in agreement with that reported by **Daghash *et al.* (1999)** reported that feeding a ration supplemented with NS seeds improved total sperm output in rabbit bucks

7. Live normal sperm output (x10^9 sperm/ejaculate):

Live normal sperm output progressively increased as animal age advanced, started very low 13.92 x 10^9 sperm/ejaculate at age 5 months (puberty), then significantly increased to 657.4 x 10^9 sperm/ejaculate at age of 9 months, the end of experimental period table (3).

When spermatogenesis is affected by source of dietary protein and was evaluated in terms of total live normal sperm output, rabbit bucks fed NSM-protein at level of 50% (group 3) showed significantly higher maximum values at 9 months of age (773.8 x10^9 sperm/ejaculate), followed by those fed diet containing 25% NSM-protein (691.3 x 10^9 sperm/ ejaculate, respectively), while the control group showed the lowest values (507.08 x 10^9 sperm / ejaculate, respectively). This may indicate the beneficial effect of NSM-protein on live normal sperm output. The present study is in agreement with the result of Nasr (1998) he showed that total live sperm output improved by diet containing 10 and 20% NSM (163.8 and 210 x 10^9 sperm/ ejaculate, respectively) compared with control group (97.1 x 10^9 sperm/ ejaculate).

The high significant value of live normal sperm output in the rabbit bucks fed NSM-protein at the level of 50% (group 3) may be due to the fact that NSS and meal have a protective function against oxidant damage of spermatogonia and spermatocytes membranes through the reduction of endogenously formed hydroperoxides of unsaturated fatty acids (Fujii *et al.*, 1984). Also, NSS was found to have inhibiting effect on the accumulation of

toxic products and the harmfull agents (non-enzymatic oxidation) (Houghton *et al.*, 1995), which are responsible for damage of the cell and DNA as well as brings to irreversible loss of sperm motility due to loss of cytosolic enzyme, adenine and pyridine nucleotidose (White, 1993).

Using different levels of protected protein in diets of Friesian bulls (Abdel-Khalek *et al.*, 1999) or NSS in diet of rabbit bucks (Daghash *et al.*, 1999), similar improvement in semen quality to that obtained in this study was observed. In addition, NSM is containing high content of unsaturated fatty acids e.g. palmitic, oleic and linoleic acids (Al-Gaby, 1992). This may led to acceleration of the metabolic rate of animals fed NSM diets expressed in higher concentration of total lipids as crucial component in energy metabolism (Daghash *et al.*, 1993 ; Youssef *et al.*, 1998 and Daghash *et al.*, 1999).

Al-Gaby (1992) referred to presence of linoleic and oleic acid (about 60 and 21%, respectively) in Egyptian *Nigella sativa L.* oil. These acids may be have an important role in cell membrane lipid formation, linoleic acids which is accepted as vitamin E and is the percursor of arachidonic acid which has an important role in the synthesis of prostaglandins having various biological activities and existing nearly in all of the organs in the organism and also activities of prostaglandins which leads to fast maturity age (Sener *et al.*, 1985).

Table (4): Semen characteristics for rabbit bucks as affected by the experimental diets at different ages.

Character, groups	Age (Month)				
	5	6	7	8	9
Ejaculate volume (ml)	$0.79^{D} \pm 0.03$	$0.93^{CD} \pm 0.06$	$0.99^{BC} \pm 0.08$	$1.08^{B} \pm 0.07$	$1.27^{A} \pm 0.03$
Sperm motility (%)	$44.19^{D} \pm 3.13$	$74.38^{C} \pm 3.82$	$84.3^{B} \pm 6.24$	$89.41^{A} \pm 0.66$	$88.47^{A} \pm 1.13$
Live sperm (%)	$46.94^{C} \pm 2.55$	$74.17^{B} \pm 2.53$	$79.24^{A} \pm 1.04$	$80.86^{A} \pm 0.77$	$81.16^{A} \pm 0.92$
Abnormal sperm (%)	$24.46^{A} \pm 0.82$	$12.34^{B} \pm 1.24$	$7.47^{C} \pm 0.66$	$5.57^{D} \pm 0.39$	$5.74^{D} \pm 0.36$
Sperm concentration (x106/ml)	$46.31^{E} \pm 2.41$	$200.25^{D} \pm 5.88$	$492.81^{C} \pm 5.07$	$638.41^{B} \pm 8.09$	$668.78^{A} \pm 3.89$
Sperm output (x106/ejac.)	$37.55^{E} \pm 2.92$	$188.78^{D} \pm 8.11$	$491.11^{C} \pm 9.15$	$695.96^{B} \pm 7.95$	$853.92^{A} \pm 7.51$
Live normal sperm output (x106/ejac.)	$13.92^{E} \pm 1.28$	$133.06^{D} \pm 9.17$	$364.72^{C} \pm 7.88$	$536.66^{B} \pm 6.75$	$654.41^{A} \pm 7.19$

A, B, C, D and E Means within the same raw with different superscripts are significantly different at P<0.01

Blood constituents:

Blood plasma of rabbits as affected by experimental diets and different time intervals are presented in table (4)

1. Concentration of serum total protein and their fractions:

Concentration of total proteins and fractions were not significant affected by experimental diets, although there was tendency of higher protein

concentration and albumin in serum of rabbits fed NSM at 25 and 50% than the control.

Blood plasma total proteins and albumin content increased by about 15.9 and 20.2%, 20.3 and 26.8% respectively with diet 2 and 3 respectively, compared with the control group. Blood plasma globulin increase by about 15.1 and 17.3% in the diet 2 and 3, respectively in comparison with the control group. There were no significant differences between groups in globulin concentration.

Abd El-Hakim *et al.* (2002), Omar (2003) and Ismail *at al* (2003) they reported that using any form of the black seed in rabbits diet whole black seed (WBS), crashed black seed (CBS), black seed oil (BSO) and black seed meal (NSM) had significant increase of plasma total protein, albumin and globulin compared with the diet of the control group.

Increasing plasma total proteins and their fraction (Albumin and Globulin) within the normal range may reflect an increase in the hepatic function when animals were fed on NSM-protein. These findings suggest that NSM may increase the metabolic rate. It is known that the change in albumin level reflects the change in liver function and the presence of the fatty acids in BC may affect muscle protein synthesis and protein deposition through a prostaglandin depend mechanism as reported by (Palmer, 1993). Jones and Bark (1979) reported that the liver is the site of albumin synthesis. However, lymphatic tissues form globulin. A/G ratio gives a decrease in production of albumin by the liver reflecting malhepatic function.

2. Concentration of transaminases (AST and ALT):

ALT and ALT exhibited significantly higher ($P<0.01$) for rabbits fed diets 2 and 3, respectively than the control one. This increase in ALT was by about 27 and 34.5 % and 9.2 and 15.3% in AST with diets 2 and 3, respectively.

Abou El-Wafa (2002), Omar (2003) and Ismail *et al* (2003) noticed that AST and ALTT, were increased in liver enzyme activities due to treatments.

These changes in AST and ALT activity in serum of rabbits fed NSM-protein diets may be related to somewhat alteration in quality and quantity of amino acids observed in small intestine of rabbits fed NSM-protein rather than the control rabbits . Abdel-Khalek (1995) found that activity of AST and ALT was affected by quality and quantity of dietary protein. In this field, Cantarow and Trumper (1962) reported that the endocrine system play an important role in controlling the levels of ALT enzyme. Also, Davidson (1994) reported that the function of ALT enzyme is the transfer of amino group from amino acid to synthesis another one and plays an important role in gluconeogenesis. Olbrich *et al.* (1972) stated that an increase in ALT level is a response to an increase needed for gluconeogeneis.

3. Concentration of total lipids, cholesterol, triglyesrids and HDL:

Plasma cholesterol, total lipids and triglyesrids decreased significantly ($P<0.01$). They decrease by about 4.4 and 13.3 %, 8.6 and 14.7 % and 18.9 and 28.3% respectively, in diets containing 25 and 50 % NSM-protein compared with the control one, respectively.

Khodary, *et al.*. (1996) attributed the decreased cholesterol and triglyseride levels in diets containing high levels of NSS to unsaturated fatty acids, which may stimulate the cholesterol excretion into the intestine, and the oxidation of cholesterol to bile acids. Also, the role of minerals found in BS, DG and DO in reducing the total lipids and cholesterol cannot be ignored. Similar results were reported by El-Ghamry *et al.* (1997) in hens and Ghazalah and Ibrahim (1996) in ducks. Such result may be attributed to that NS seeds may stimulate the thyroid gland (Lee and Knowles, 1965). Thyroid hormones (T3) and (T4) increased the rate of cholesterol catabolism by the liver (Kaneko, 1989). Also, Parshad and Singh (1979) found that hyperthyroidism associated with hypocholestermia.

In this work, the increasing level of NSM-protein increases High density lipoprotein (HDL). The level of HDL increased by about 4.9 and 20% in diets containing 25 and 50 % NSM-protein respectively compared to the control diet.

4. Concentration of serum T3 and T4:

Blood plasma (T3 and T4) content increased significantly ($P<0.05$) by about 56.7 and 20% , 89 and 84.5% respectively, in diets 2 and 3 respectively. The differences between diets 2 and 3 were not significant.

This results are agreement with Meral et al (2003) who reported that using NS oil in rabbit diets thyroid hormones significantly ($P<0.05$) from 37.43 to 49.32 ng/dl in T3 and from 2.39 to 2.51ng/dl in T4. Also, Abou El-Wafa (2002) show the same results when used Ns seed in rabbit diets. The T4 increased significantly from 1.33to 1.42 ng/dl.

Thyroid hormones play a major role in growth and development and almost in close contact with stimulates protein synthesis and its calorigenic action may be secondary to the energy-requiring protein synthesis. Thyroxin is case of increase use of carbohydrates and increase protein metabolism. In addition, normal function of the control nervous system is very dependent on normal output of T4. Therefore, reduced thyroid secretion will ultimately results in reduced metabolism of such nutrients (Trenkle, 1978 and Hart *et al.*, 1981).

Lee and Knowles (1965) mentioned that NS seeds might stimulate the thyroid gland directly and/or through the pituitary gland to secrete the thyroid hormones (T3 & T4). Thyroid hormones increased metabolic rate (Hadley, 1984), which lead to increasing in the production of both gamma globulin and total protein (More *et al.*, 1980). Furthermore, thryoid hormones accelerate cellular reactions in most organs and tissues of the body, including the liver in which total protein and globulin are formed (Smith *et al.*, 1983).

In this field, Abdel-Azim (1996) and Hedaya (1996) showed that supplementation of NSS extract caused an increase in the immunity of the body through increasing the lymphocytes % and globulins. It was found that, the intake of NS may enhance T-cell mediated immunity through improvement of T4: T3 ratio (El-Khadi *et al.*, 1987) and significantly increase in the C3-complement concentration as well as in % of Nk-cells to total lymphocytes (Mahdy, 1993).

5. Blood plasma Glucose:

In this study using NSM in rabbit diets decreased the serum glucose concentration by about 13.9 and 18.5% in 25 and 50 % NSM-protein respectively.

In the same way Meral *et al* (2004) and Amber *et al* (2001) shown that N sativa L. treatment decreased the glucose concentration significantly ($P<0.05$) in treated rabbits. This may be due to changing the source of starch in the diet (Lerer *et al*, 1996).

Table (5): Blood serum parameters of bucks and does fed the experimental diets.

Item	Experimental groups			± SE
	Control	T 1	T 2	
Total protein (g / dl)	7.9	8	8.3	0.271
Albumin (g / dl)	3.75	4.03	4.25	0.604
Globulin (g / dl)	3.45	3.97	4.05	0.226
A / G ratio	1.08	1.02	1.04	0.515
GOT (AST) (IU / dl)	30.60	33.33	35.46	3.696
GPT (ALT) (IU / dl)	11.93 ^{b}	15.14 ^{a}	15.91 ^{a}	1.711
GOT / GPT ratio	2.56	2.21	2.23	0.271
Total lipids (mg / dl)	540 ^{a}	495 ^{b}	462 ^{b}	34.614
Triglyceride (mg / dl)	103.7 ^{a}	84 ^{b}	74.3 ^{b}	3.795
Total cholesterol (mg / dl)	105.7	101	92.7	3.939
HDL (mg / dl)	38 ^{b}	38.7 ^{b}	45.6 ^{a}	0.720
Glucose (mg / dl)	113.3 ^{b}	129 ^{ab}	134.3 ^{a}	5.779
T 3	42.3 ^{b}	66.3 ^{a}	50.8 ^{ab}	10.733
T 4	1.48 ^{b}	2.8 ^{a}	2.73 ^{a}	0.685

a, b Means within the same raw with different superscripts are significantly different at $P<0.05$

Conclusion

In conclusion, according of the results of the present study, NSM inclusion in rabbits diets can improve the semen quality through increasing the percentage of total sperm per ejaculate and percentage of live sperm output and decreasing the percentage of sperm abnormalities as well as increasing conception rate. The stimulating effect of NSM on reproductive performance of treated animals may attributed to the composition NSM fatty acids. In addition, the NAM relatively accelerate the metabolic rate of treated rabbits as a reflection of increasing the thyroid hormone. Blood plasma transferas (AST and ALT), as a dynamic enzymes capable of responding rapidly to physiological challenges, were also increased in treated animals. Therefore, NSM could be used to replace a part of con concentrate mixture successfully in rations of rabbits as a cheap source enriched with energy and protein. Also, it can improve the fertility in farms suffering from poor conception rate.

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تأثير احلال كسب حبة البركه بدلا من كسب فول الصويا فى علائق الارانب علـــى الاداء التناسلى فى ذكور الارانب

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استخدم فى هذه الدراسه ٢٧ من ذكور الارانب النيوزيلاندى الابيض بعمر ٦ شهور و متوسط وزن ٢,٧٥٠كجم و قسمت الارانب الى ٣ مجموعات متساويه ٩ فى كل مجموعه و اعطيت المجموعات الثلاثـــه علائق متساويه فى كل من الطاقه (٢,٨٥٠ كيلو كالورى – طاقه مهضومه – جم وزن جاف) و البـــروتين (١٨% بروتين خام) بحيث تحتوى على صفر ، ١٣,٥% و ٢٧% كسب حبة البركه لتحل محل جزء مـــن فول الصويا و تم دراسة تأثير هذه العلائق على كل من صفات السائل المنوى و بعض قياسات الدم و كانت اهم النتئج المتحصل عليها هى:

أظهرت النتائج ان حجم القذفه زاد فى المجموعتين التجريبيتين ٢ و ٣ مقارنة بالمجموعه الكونترول و لم تكن الفروق معنويه بالنسبه للحيويه فقد زادت معنويا فى المجموعتين ٢ و٣ مقارنه بالكونترول و كانت الحيويه (٧٧,٩٠ و ٨٠,٤٦%) مقارنه بالمجموعه الكونترول (٧٠,٥) ، نسبة الحيوانات المنويه الحيه زادت معنويا ($p>0.05$) فى المجموعتين التجريبيتين ٢ و ٣ مقارنه بالمجموعه الاولى الكونترول و كانت النسب (٧٣,٣ و ٧٥,٥% مقارنة ب ٦٨,٨%).

- نسبة الحيوانات المنويه الشاذه انخفضت معنويا عند مستوى معنويه ($p<0.05$) فى المجمـــوعتين ٢ و ٣ مقارنة بالكونترول (١٠,١٥ و ٩,١١% مقارنة ب ١٤,٩%).
- تركيز الحيوانات المنويه لكل ١/مل مقابل (٣٦٤,٨ × 10^6/مل)
- مجموع الحيوانات المنويه فى القذفه كان مرتفعا معنويا فى المجاميع التجريبيـــه مقارنـــة بـــالكنترول (٣٦٢,٤ و ٤٢١,١ مقابل ٢٣٩,٩× 10^6/ القذفه)
- الحيوانات المنويه الحيه فى القذفه ارتفعت معنويا فى المجموعتين التجـــريبيتين مقارنـــة بـــالكونترول (٣٦٢,٤ و ٤٢١,١ مقابل ٢٣٩,٩ × 10^6/ القذفه).
- تركيز البروتينات الكليه و مكوناتها (الالبومين و الجلوبيولين) لم تتاثر معنويـــا بالمعاملـــه بـــالعلائق التجريبيه.
- تركيز (الليبدات الكليه و الجلسريدات الثلاثيه و الكوليسترول) فـــى بلازمـــا الـــدم انخفـــض معنويـــا ($p<0.05$) فى المجموعتين التجريبيتين ٢ و ٣ مقارنة بالكونترول.
- الدهون عالية الكثافه الجلوكوز لم تتاثر معنويا فى المجموعه ٢ و لكن زادت معنويا فى المجموعـــه ٣ عند مستوى معنويه ($p<0.05$).
- نشاط انزيمات الكبد Alt كان مرتفع معنويا فى المجموعتين ٢ و ٣ و لكل Ast و النسبه لـــم تتـــاثر معنويا بالمعامله.
- تركيز T3 فى بلازما الدم بمقدار (٥٦,٧ و ٢٠%) مقارنة بالكونترول T4 زاد معنويا بمقدار (٨٩ و ٨٤%) فى المجموعتين ٢ و ٣ مقارنة بالكونترول.

الخلاصه

وجود كسب حبة البركه فى علائق الارانب بنسب احلال مختلفه حسب خـــواص الـــسائل المنـــوى لذكور الارانب و ذلك من خلال تحسين نسب الحيويه و عدد الحيوانات المنويه فى القذفه و تركيز الحيوانات المنويه الحيه و تقليل نسبة الشواذ.

و لذلك يمكن القول بانه يمكن احلال حتى نسبة ٥٠% من بروتين العلف المركز و ذلـــك بمـــصدر بروتينى رخيص و عالى فى محتوى الطاقه و البروتين مثل كسب حبة البركه.