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**EFFECT OF USING FENUGREEK AND ANISE SEEDS AS  
FEED ADDITIVES ON SOME REPRODUCTIVE  
PERFORMANCE OF NEW ZEALAND WHITE RABBITS**

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**ABSTRACT:**

Twenty New Zealand white rabbit does and four bucks aged 6 months were used to determine the effect of using fenugreek and anise seeds as natural feed additives on some reproductive performance of the rabbits. Rabbit does were randomly distributed into four treatment groups. The 1<sup>st</sup> group was fed a control diet (18.4% crude protein, 2650 ME and 7.8% crude fiber) while, the 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> groups were fed control diet supplemented with 6% fenugreek seeds, 6% anise seeds and mixture of 3% fenugreek plus 3% anise seeds(w/w), respectively. Feed consumption of each doe during pregnancy and lactating periods was calculated. Litter size and litter weight (g) at birth and weaning (35 days of age) were recorded and pre-weaning mortality was calculated. Also, milk production was estimated at 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> weeks after kindling. Results obtained indicated that the effect of using dietary fenugreek and anise seeds on number of services per conception, does feed consumption during pregnancy and suckling periods was not significant ( $p \geq 0.05$ ). Also, litter size and litter weight at birth and weaning and pre-weaning mortality were not significant ( $p \geq 0.05$ ) by using fenugreek and anise seeds as feed supplementation for rabbit does diet. Total milk yield and milk production at the 2<sup>nd</sup>, 3<sup>rd</sup> weeks of lactation in rabbit does fed diets supplemented with 6% fenugreek or mixture of 3% fenugreek plus 3% anise seeds were significantly higher ( $p \leq 0.05$  and  $p \leq 0.01$ ) compared with other dietary treatment groups.

**Key words:** Rabbits, fenugreek, anise, reproductive, performance

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## INTRODUCTION

Rabbit production is a veritable way of alleviating animal protein deficiency in Egypt. Recently, rabbit production in Egypt has rapidly developed, most notably to meet an increased demand of fresh meat for human consumption as well as a source of extra income for families or small farmers in Upper Egypt (Abdel-Wareth *et al.*, 2015). Rabbit has immense potentials and good attributes which includes high growth rate, high efficiency in converting forage to meat, short gestation period, high prolificacy, relatively low cost of production and high nutritional quality of rabbit meat which includes low fat, sodium and cholesterol levels.

Attempts to use the natural materials such as medicinal plants could be widely accepted as feed additives to improve the efficiency of feed utilization and productive performance (Zeweil *et al.*, 2013). Using natural growth promoters to enhance growth rate and to improve feed efficiency aiming to reduce the productive cost of the meat (Abbas and Ahmed, 2010). Most supplements were used as alternatives to antibiotics growth promoters had effects on gut microflora, either directly or indirectly (Garcia *et al.*, 2007). Alcicek *et al.*, 2003 and Abdulmanan *et al.*, 2012) concluded that herbs can stimulate feed intake, the endogenous secretion, or may

have antibacterial, anticoccidial activities.

Fenugreek seeds are rich in protein, fat, total carbohydrates, phosphorus, iron, zinc and magnesium (Gupta *et al.*, 1996), fatty acids predominantly linoleic, linolenic, oleic and palmitic (Schryver, 2002). Fenugreek contains active alkaloids, flavonoids, steroids, saponins (Kor and Zadeh, 2013) and phenolic and flavonoid compounds which help to enhance antioxidant capacity (Srinivasan, 2006). Also, fenugreek have benefits to the digestive system (Sahalian, 2004).

Anise contains essential fatty acids, the main component of the essential oils is anethol and the biological properties are inhibiting bacterial (Sagdic and Ozcan, 2003) and fungal (Soliman and Badea, 2002) stimulating secretion of digestive enzyme and appetizing (Seleem, 2008).

Addition of fenugreek and anise seeds to rabbit diets improved litter size at birth (El-Hammady and Abdel-Kareem, 2015), increased litter size at weaning (Sayed *et al.* (1998), increased milk yield (Rekik and Bergaoui, 2013), decreased does feed consumption and pre-weaning mortality rate (Rashwan, 1998).

The objective of this study was to investigate the effect of using fenugreek and anise seeds as natural feed supplementation

on some reproductive treats of New Zealand White rabbits.

## MATERIALS AND METHODS

This study was carried out at the Poultry Farm, Animal Production Department, Faculty of Agriculture, Minia University during the period from December, 2014 to May, 2015 to study the effect of fenugreek and anise seeds dietary supplementation on some reproductive treats of New Zealand White rabbit does.

Does were housed separately in individual wired cages (45 x 45 x 38 cm) in a windowed house. Nest boxes (30 x 25 x 30 cm) were attached to the cages five days before kindling. All cages were equipped with galvanized steel sheets feeders and automatic drinkers (nipples). Feed and water were available *ad-libitum* during all experimental period. Rabbits in all treatment groups were kept under similar managerial system and environmental conditions and four bucks.

Twenty New Zealand White rabbit does of age six months were randomly divided into four experimental groups, the first group was fed control diet while, the 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> groups were fed control diets supplemented with 6% fenugreek, 6% anise and mixture of 3% fenugreek plus 3% anise seeds(w/w), respectively. The basal diet was formulated to contain adequate levels of nutrients for New Zealand White rabbits doe was recommended by the National Research Council, (NRC, 2004). Fenugreek and anise seeds were purchased from commercial market of El-Minia Governorate,

Egypt, grinded and added to the experimental diets. The ingredients and chemical composition of basal diet are shown in Table (1). Chemical analysis of ingredients and diets were determined according to (AOAC, 2000).

Table (1): The composition and the calculated chemical analysis of control diet for NZW rabbit does.

Ingredients	%
Ground yellow corn	52.0
Soya bean meal	25.0
Wheat bran	20.0
Lime stone	0.5
Dicalcium phosphate	2.0
Salt	0.5
Total	100
<u>Calculated chemical analysis (%)</u>	
Crude protein,	18.4
ME (Kcal/ kg)	2650
Crude fiber,	7.8
Calcium	1.00
Available phosphorus	0.81
Methionine+ cysteine,	0.55
Lysine,	0.95

Mating was randomly carried out between does and bucks and each doe was transferred to the buck's cage to be mated and returned back to its cage after mating. Each doe was palpated 10 days thereafter to detect pregnancy. Those, which failed to conceive, were returned to mating-buck at the same day of test.

Litter size, litter weight (g) at birth and weaning (5 weeks of age) were recorded as mass product per doe. Feed consumption was weekly recorded for each doe and was calculated during pregnancy and suckling periods by difference

between certain amount of feed and remainder and scattered of feed. Pre-weaning mortality was calculated by dividing the number of litter size at weaning over litter size at birth multiplying by 100. Milk yield was weekly estimated at 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> week of lactation by the difference in doe weight before and after suckling that occurred once every test week. The decrease in mother weight was considered as the milk yield.

The general liner model (GLM) was applied to test the differences among the four experimental groups (SAS, 2003). The statistical analysis was performed using the following model:

$$Y_{ijk} = \mu + T_i + R_j + E_{ijk}$$

Where:

$Y_{ijk}$  = Experiment observations.

$\mu$  = The overall mean.

$T_i$  = The effect of treatment (i= 1, -, 4)

$R_j$  = The effect of replicate, (j= 1, -, 5)

$E_{ijk}$  = The experimental error.

Duncan's test was used to examine the significance degrees among means (Duncan, 1955).

## RESULTS AND DISCUSSION

### 1. Number of services per conception:

Data presented in Table (2) indicated that the best insignificant ( $p \geq 0.05$ ) number of services per conception (1.2) for NZW rabbit does was recorded in does received diets containing mixture of 3% fenugreek plus 3% anise seeds compared with other treatment. The slightly improvement may be due to increased secretion of estrogen hormone and the activated mammary glands, which stimulated the milk secretion and increased its production (El-Hammady and Abdel-Kareem, 2015). Rashwan (1998) and El-Hammady and Abdel-Kareem (2014 and 2015), they concluded that number of mating per conception and conception rate in rabbits fed diet supplemented fenugreek seeds was significantly improved compared to those received the control diet.

Table (2): Effect of dietary feed additives on number of services per conception and feed consumption(g/doe) of NZW rabbit does.

Treatments	Number of services per conception	Doe feed consumption during pregnancy	Doe feed consumption during suckling
Control	1.40	5116	6307
6% fenugreek	1.60	4841	5921
6% anise	1.80	4921	6097
3% fenugreek +3% anise	1.20	5062	6215
S.E	0.27	147	116
Sig.	NS	NS	NS

NS=Not significant. ( $p \geq 0.05$ ).

## 2 Doe feed consumption:

Results presented in Table (2) showed that addition of fenugreek, anise and their mixture of rabbit doe diets recorded numerically decreased ( $p \geq 0.05$ ) feed consumption during pregnancy and suckling periods compared to others fed control diet. These results are agreement with those obtained by Rashwan (1998) and Eiben *et al* (2004), they indicated that feeding rabbit does on diets supplemented with fenugreek and anise seeds consumed lower feed than that of the control group. The decrease in feed consumption of rabbit does fed diets containing fenugreek and anise seeds in this study may be due to that the levels of feed additives used were numerically higher.

## 3. Litter size at birth:

Averages of litter size at birth of NZW rabbit does received diets containing 6% fenugreek, 6% anise and mixture of 3%

fenugreek plus 3% anise seeds are presented in Table (3). The results showed that the effect of feed additives on litter size at birth was not significant ( $p \geq 0.05$ ). Similar results were obtained by Rashwan (1998), who found that litter size at birth in New Zealand White rabbit does was not significantly affected by addition fenugreek seeds to the diets. The present results indicated that litter size at birth in rabbits fed diets containing 6% fenugreek, 6% anise and mixture of 3% fenugreek plus 3% anise seeds was insignificantly lower than that in the control group. Similar results were reported by Eiben *et al* (2004), they found that litter size at 17 days of age tended to be smaller in rabbit does fed diet supplemented with 6 g fenugreek + 6 g anise seed/kg diet than that in the control does.

Table (3): Effect of dietary feed additives on litter size at birth, at weaning and pre-weaning mortality.

Treatments	Litter size at		Pre-weaning mortality (%)
	Birth	Weaning	
Control	7.56±0.58	4.56±0.68	38.42±9.91
Fenugreek	6.50±0.58	4.75±0.690	31.51±11.92
Anise	6.35±0.88	4.03±0.82	35.52±11.92
Mix	6.40±0.50	5.40±0.59	21.75±12.01
Sig.	NS	NS	NS

NS=Not significant ( $p \geq 0.05$ ).

## 4

## Litter size at weaning:

Averages of litter size at weaning of NZW rabbit does received diets containing 6% fenugreek, 6% anise and mixture of 3% fenugreek plus 3% anise

seeds are presented in Table (3). These results showed that the effect of feed additives on litter size at weaning was not significant ( $p \geq 0.05$ ). Similar results were obtained by Rashwan

(1998) and Eiben *et al.* (2004), they concluded that litter size at weaning in New Zealand White rabbit does was not significantly affected by addition of fenugreek seeds to the diets. The present results indicated that litter size at weaning of rabbits fed diets containing mixture of 3% fenugreek plus 3% anise seeds was numerically higher ( $p \geq 0.05$ ) than that in the control group and other treatments. In agreement with the present results, Sayed *et al.*, (1998) and El-Hammady and Abdel-Kareem (2015) reported that feeding rabbit does on diet containing fenugreek or anise seeds significantly improved litter size at 8 weeks of age.

#### **5. Pre-weaning mortality (%):**

Averages of pre-weaning mortality of NZW rabbit does received diets containing 6% fenugreek, 6% anise and mixture of 3% fenugreek plus 3% anise seeds are presented in Table (3). The results showed that the effect of dietary feed additives on pre-weaning mortality was not significant ( $p \geq 0.05$ ). The present results indicated that pre-weaning mortality in rabbits fed diets supplemented with fenugreek, anise and mixture of fenugreek plus anise seeds was numerically lower ( $p \geq 0.05$ ) than that in the control group. Similar results were obtained by El-Hammady and Abdel-Kareem (2014), they found that the average of pre-weaning mortality in Bouscat rabbit does was insignificantly

improved when diets supplemented with both of herbana capsules and dried herbal seed pellets (50% fenugreek, 30% caraway, 10% fennel and 10% dill) compared to that of control group. Moreover, Rashwan (1998); Eiben *et al.* (2006) and El-Hammady and Abdel-Kareem (2015) concluded that addition of fenugreek seeds to rabbit diet reduced the pre-weaning mortality in NZW rabbits during the period from birth to 21 days of age.

#### **6. Litter weight at birth:**

Averages of litter weight at birth of NZW rabbit does received diets containing 6% fenugreek, 6% anise and mixture of 3% fenugreek plus 3% anise seeds are presented in Table (4). The results showed that the effect of dietary feed additives on litter weight at birth was not significant ( $p \geq 0.05$ ). Similar results were obtained by Eiben *et al.* (2004), they concluded that litter weight at birth in New Zealand White rabbit does was not significantly affected by addition of fenugreek seeds to the diets. However, the present results indicated that litter weight at birth in rabbits fed diets containing 6% anise seeds and control diet was numerically heavier ( $p \geq 0.05$ ) than those in rabbits fed diets supplemented with 6% fenugreek or mixture of 3% fenugreek plus 3% anise seeds. These results could be attributed to that litter size at birth in control group was higher than the other dietary treatments (Table, 3).

Table (4): Effect of dietary feed additives on litter weight at birth and at weaning of NZW rabbits.

Treatments	Litter weight (g) at:	
	Birth	Weaning
Control	450±41	4043±552
Fenugreek	364±46	3894±552
Anise	424±53	3350±638
Mix	359±41	5142±493
Sig.	NS	NS

NS=Not significant ( $p \geq 0.05$ ).

### 7. Litter weight at weaning:

Averages of litter weight at weaning of NZW rabbit does received diets containing 6% fenugreek, 6% anise and mixture of 3% fenugreek plus 3% anise seeds are presented in Table (4). The results showed that the effect of feed additives on litter weight at weaning was not significant ( $p \geq 0.05$ ). The present results indicated that the heaviest litterweight at weaning was recorded for rabbits fed diets containing mixture of 3% fenugreek plus 3% anise seeds. Rashwan (1998); Sayed *et al* (1998) and Eiben *et al* (2006) concluded that inclusion of anise or fenugreek seeds in rabbit diets significantly improved litter weight at weaning. The heaviest litter at weaning in does fed diet supplemented with mixture of 3% fenugreek plus 3% anise seeds could be attributed to the high litter size at weaning (Table 3) and lower mortality rate (table 3).

### 8. Milk production:

Averages of milk yield during the 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> weeks and total milk yield of NZW rabbit does received diets containing 6% fenugreek, 6% anise and mixture

of 3% fenugreek plus 3% anise seeds are presented in Table (5). The results showed that the effect of feed additives on milk yield was significant at the 2<sup>nd</sup> ( $p \leq 0.05$ ), the 3<sup>rd</sup> ( $p \leq 0.01$ ) weeks and total milk. The present results indicated that milk yield during the 2<sup>nd</sup>, 3<sup>rd</sup> and total milk in rabbits fed diets supplemented with 6% fenugreek and mixture of 3% fenugreek plus 3% anise seeds was significantly higher than those fed control or diet supplemented with 6% anise seeds. Similar results were obtained by Rashwan (1998); Rekik and Bergaoui (2013) and Abdel-Rahman (2016), they concluded that adding fenugreek seeds to rabbit does ration remarkably increased milk yield at 21<sup>th</sup> day of lactation period.

The improved in milk yield in rabbit does fed diet supplemented with fenugreek seeds could be attributed to the pronounced efficiency of the lactogenic promoting factors found in the fat of fenugreek seeds, which stimulates the mammary glands to secrete and produce more milk yield (El-Hammady and Abdel-Kareem, 2015).

Table (5): Effect of dietary feed additives on milk yield of NZW rabbits.

Treatments	Milk yield (g)			
	1 <sup>st</sup> week	2 <sup>nd</sup> week	3 <sup>rd</sup> week	Total
Control	396±74	504±158 <sup>ab</sup>	214±102 <sup>b</sup>	1114±264 <sup>b</sup>
6% fenugreek	515±74	756±158 <sup>a</sup>	243±102 <sup>b</sup>	1514±264 <sup>ab</sup>
6% anise	518±86	385±182 <sup>b</sup>	128±118 <sup>b</sup>	1031±304 <sup>b</sup>
3% fenugreek + 3% anise	566±67	752±141 <sup>a</sup>	669±92 <sup>a</sup>	1987±236 <sup>a</sup>
Sig.	NS	*	**	**

a,b means within each column having different subscripts (s) are significantly different (P<0.05). NS=Not significant \* = Significant (p<0.05), \*\* = Highly Significant (p<0.01)

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### تأثير استخدام بذور الحلبة واليانسون على الأداء التناسلي للأرانب النيوزلندي الأبيض

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استخدم في هذه الدراسة 20 أم و4 ذكور أرانب نيوزيلندي أبيض في عمر النضج الجنس 6 شهور وذلك لدراسة تأثير استخدام بذور الحلبة واليانسون على الأداء التناسلي للأرانب وزعت الامهات عشوائيا إلي أربع مجموعات. المجموعة الأولى غذيت على عليقة كمنترول (عليقة مركزة بها 18.4 بروتين خام، 7.8 الياف خام، الطاقة الممتلئة 2650). بينما غذيت المجموعة الثانية والثالثة والرابعة على عليقة كمنترول مضاف إليها 6% حلبة و6% يانسون وخليط من 3% حلبة و3% يانسون (وزن/وزن) على الترتيب. تم حساب استهلاك العلف كـ(جم/كل) أم خلال فترة الحمل والرضاعة وكذلك حجم ووزن (جم) الخلفات عند الميلاد وعند الفطام ونسبة النفوق (%) من الميلاد وحتى الفطام. تم تقدير إنتاج اللبن (جم) خلال الأسبوع الأول والثاني والثالث وحساب إنتاج اللبن الكلي. ومن أهم النتائج أن استخدام بذور الحلبة واليانسون لم يكن له تأثيرا معنويا على نسبة الخصوبة واستهلاك العلف وحجم ووزن الخلفات عند الميلاد وعند الفطام ونسبة النفوق قبل الفطام بينما كان التأثير معنويا على إنتاج اللبن. سجلت الأرانب التي غذيت على العليقة المضاف إليها 6% حلبة أو خليط من 3% حلبة و3% يانسون زيادة معنوية في إنتاج اللبن خلال الأسبوع الثاني والثالث وإنتاج اللبن الكلي مقارنة بالكنترول.