

SOME PERFORMANCE ASPECTS OF DOE RABBITS FED DIETS SUPPLEMENTED WITH FENUGREEK AND ANISEED.

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ABSTRACT:

A seven-treatment experiment was carried out to study the effect of dietary supplementation with 0.0, 0.5 or 1.0 % fenugreek or aniseed or their mixture (1:1) at 0.5 or 1.0 % on some performance aspects of Bouscat doe-rabbits and their offspring (up to 8th week of age) through three parities. Results obtained reveal that:

- Litter size at birth (LSB), litter weight at birth (LWB), litter size at weaning (LSW), litter weight at weaning (LWW), and average doe feed intake were not significantly differ between treatments. However, improved litter size ($P<0.05$) and litter weight ($P<0.01$) at 8 weeks of age were detected due to the tried additives.

- Throughout four weeks lactation period, no statistical differences in milk yield between studied treatments were recorded for the first two weeks. While, the second two weeks and the average of the total period were significantly affected by additives evaluated.

- Serum total protein, albumin, globulin, albumin/globulin ratio, GPT and GOT prior to pregnancy were not significantly affected by treatments. At 7-14 days of pregnancy, total protein ($P<0.01$), albumin ($P<0.05$), globulin ($P<0.05$), GPT ($P<0.01$) and GOT ($P<0.01$), all were significantly differed between studied treatments. At 21-28 days of pregnancy, only GOT and GPT ($P<0.01$) were affected by treatments.

- Progesterone (P_4 ; $P<0.05$) and estradiol (E_2 ; $P<0.01$), prior to pregnancy, triiodothyronine (T_3 ; $P<0.05$), and E_2 ($P<0.01$), at 7-14 days of pregnancy, and again E_2 ($P<0.01$), and P_4 ($P<0.01$) at 21-28 days of age were significantly affected by studied treatments.

It is recommended to improve litter size and litter weight at 8 week after parturition to supplement the diet of Bouscat-doe and their offspring with a mixture of fenugreek and aniseed at the level of 0.5%

INTRODUCTION

There is an increasing interest for using the natural biological feed additives from whole or extracts of some herbs and edible plants as safe supplements instead of chemically produced compounds. Some results are encouraging and much is needed to correctly judge the effect of these natural additives upon performance of different livestock species.

Fenugreek seeds (*Trigonella foenum gracum* L) has been used to increase milk production since biblical times. The herb contains phytoestrogens, which are plant chemicals similar to the female sex hormone estrogen. A key compound, diosgenin, has been shown experimentally to increase milk flow (Mothernature, 2005a). Also, fenugreek seeds contain alkaloids (mainly trigonelline) and protein high in lysine and L-tryptophan. Its steroidal saponins (diosgenin, yamogenin, tigogenin, and neotigogenin) and mucilaginous fiber are thought to account for many of the beneficial effects of fenugreek (Mothernature, 2005b). Indeed, Mazur et al., (1998) reported that fenugreek has daidzein, genistein and secoisolaric, all are phytoestrogens that have favorable effect through increasing milk production. The steroidal saponins are thought to inhibit cholesterol absorption and synthesis, while the fiber may help to lower blood sugar levels.

Aniseed (*Pimpinella anisum* L) contains 1.5-4% volatile oil (about 80% anethole), coumarins, glycosides, fixed oils, 30% fatty oils, choline. The volatile oil in aniseed provides the basis for its internal use to ease griping, intestinal colic and flatulence. Aniseed's mild oestrogenic effects, thought to be due to the presence of diantheole and photoantheole, explain the use of this plant in folk medicine to increase milk secretion, facilitate birth and increase libido (BHMA, 1983). Also, Albert-Puleo (1980) reported an estrogenic effect for anise, due to dianethole and photoanetholes, thus it can participate to increase milk secretion.

Rashwan (1998) working with doe rabbits, reported that milk production, and litter gain upon weaning were improved, while, pre-weaning mortality was decreased as a results to supplementing doe diet with 12 g fenugreek or aniseed/kg diet. later, on contrary, Eiben *et al.*, (2004) found that daily milk yield and feed intake of doe rabbits were relatively lower when fed on diet supplemented with 6 g fenugreek + 6 g aniseed/kg diet. This study was performed to evaluate

the effect of fenugreek or aniseed or their mixture at different levels on some performance traits of doe-rabbits and their offspring up to 8th week of age along three parities.

MATERIALS AND METHODS

Twenty-eight, 5-6 months doe Bouscat rabbits, weighing 3-3.25 kg were equally divided into 7 experimental treatments to study the response of doe rabbits and their litters to dietary supplementation with fenugreek, aniseed or their mixture in the following order:

Treatment 1: Control.

Treatment 2: Control + 0.5% fenugreek seed.

Treatment 3: Control + 1.0% fenugreek seed.

Treatment 4: Control + 0.5% aniseed.

Treatment 5: Control + 1.0% aniseed.

Treatment 6: Control + 0.25% aniseed + 0.25% fenugreek.

Treatment 7: Control + 0.5% aniseed + 0.50% fenugreek.

Doe rabbits were individually caged and fed on pelleted diets to meet at least the NRC (1977) requirements of doe-rabbits during pregnancy and lactation (18% CP, 12% CF, 2600 DE/kg diet). Each doe was transferred to the buck's cage and served twice. Palpation was made at the 14th day *post-partum* to detect pregnancy. Remating interval was 14 days after parturition. Blood serum samples were withdrawn from ear vein at three phases; 1) before mating, 2) at 7-14 day of pregnancy and 3) at 21-28 day of pregnancy. The following reproductive and productive traits were recorded and tabulated as an average for the studied three parities; litter size at birth (LSB), litter weight at birth (LWB), average milk production, litter size at weaning (LSW), litter weight at weaning (LWW), feed intake/doe (FI). Also, the following blood serum metabolites and hormones were detected; Total protein, albumin, GOT, GPT, Triiodotyronine (T3), Estradiol (E2), and Progesterone (P4), while, globulin was calculated as a difference between total protein and albumin. Data from all response variables were subjected to one way analysis using SAS (1990). Variables having significant differences were compared using Duncan's Multiple Range Test (Steel and Torrie, 1960).

RESULTS AND DISCUSSION

Reproductive and productive performance

Reproductive and productive performance of doe rabbits and their litters as affected by studied feed additives are displayed in Table 1. Results show that litter size at birth (LSB), litter weight at birth (LWB), litter size at weaning (LSW) and litter weight at weaning (LWW) and average doe-feed intake during pregnancy were not significantly affected by studied feed additives. Improved litter size ($P<0.05$) and litter weight ($P<0.01$) at 8 weeks of age were detected due to the additives tried, especially with 0.25% aniseed + 0.25% fenugreek, followed by 0.50% aniseed + 0.50% fenugreek. These results, partially agree with those reported by Rashwan (1998) agree that LSB, LWB and LSW were not significantly improved by fenugreek and aniseed supplementation. The increase in litter weight at 8 weeks of age in this study may be a reflection of the increase ($P<0.05$) in litter size either at weaning or at 8 weeks of age, indicating that these additives exert a growth promoting effect.

Milk production

Milk production (g) as affected by studied feed additives is shown in Table 2. Throughout four weeks lactation period, no statistical differences in milk yield between studied treatments were recorded for the first and second weeks of lactation, while, yield for the third and fourth weeks and the average of the total period were significantly affected by treatments evaluated. High level of

fenugreek supplementation (1%) markedly decreased milk production at the second period of lactation. Similar results were obtained by Eiben *et al.*, (2004) who found that daily milk yield of doe rabbits were relatively lower when fed on diet supplemented with 6 g fenugreek + 6 g aniseed/kg diet. However, Rashwan (1998) reported that milk production was improved as a result to supplementing doe diet with 12 g fenugreek or aniseed/kg diet. The fluctuating results indicate that the appropriate to maximize milk production through adding these additives is questionable.

Serum measurements

Studied blood serum metabolites and hormones during pregnancy periods (prior to mating, at 7-14 day and 21-28 day of pregnancy) as affected by studied feed additives are presented in Tables 3 and 4. Total protein, albumin, globulin, albumin/globulin ratio, GPT and GOT prior to pregnancy were not significantly affected by treatments under study. At 7-14 days of pregnancy, total protein ($P<0.01$), albumin ($P<0.05$), globulin ($P<0.05$), GPT ($P<0.01$) and GOT ($P<0.01$), all were significantly differed between studied treatments. At 21-28 days of pregnancy, both GOT and GPT ($P<0.01$), were the only serum parameters to be significantly affected by treatments. Results with studied hormones indicate that progesterone (P_4 ; $P<0.05$) and estradiol (E_2 ; $P<0.01$), prior to pregnancy, triiodothyronine (T_3 ; $P<0.05$), and E_2 ($P<0.01$) at 7-14 days of pregnancy, and again E_2 ($P<0.01$), and P_4 ($P<0.01$) at 21-28 days of age were significantly affected by studied treatments. No clear effects due to studied feed additives on serum hormones may be approached. The physiological state of the doe rabbit may be of more interest. Azoz (2001) and Ahmed *et al.*, (2004) reported that the highest concentration of estradiol was observed at day 1 of pregnancy and decreased with the progress in pregnancy, while, the highest concentration of circulating progesterone was detected around days 12-14 of pregnancy, followed by a gradual decline between mid pregnancy and parturition.

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Table 1: Reproductive and productive performance.

	LSB	LWB	LSW	LWW	LS 8 wks	LW 8 wks	FI Doe
Control	5.75±0.54	414±39	3.42±0.47	1503±190	2.91 ^b ±0.31	3162 ^a ±364	181±1.4
0.5% Fenugreek	6.75±0.73	428±27	4.75±0.42	2115±214	3.42 ^b ±0.36	4290 ^{cd} ±438	178±1.5
1.0% Fenugreek	6.00±0.44	378±15	4.25±0.39	1948±166	3.17 ^b ±0.30	3969 ^{cd} ±299	185±1.6
0.5% Anise	6.67±0.58	417±26	4.08±0.42	1892±148	3.75 ^{ab} ±0.35	5215 ^{abc} ±399	178±1.9
1.0% Anise	6.67±0.89	394±38	3.91±0.48	1745±182	3.58 ^{ab} ±0.42	4837 ^{bcd} ±436	176±4.6
0.25%Fenugreek + 0.25% Anise	7.08±0.65	423±29	4.92±0.53	2042±271	4.58 ^a ±0.45	6367 ^a ±625	176±2.1
0.50%Fenugreek + 0.50% Anise	7.17±0.64	480±35	4.08±0.38	1897±175	4.00 ^{ab} ±0.39	5803 ^{ab} ±498	180±1.6
Sig	NS	NS	NS	NS	*	**	NS

a-c means within columns with no common superscripts are differ significantly. NS: not significant, *: P<0.05, **: P<0.01. LSB=litter size at birth, LWB= litter weight at birth, LSW=litter size at weaning, LWW= litter weight at weaning, FI= feed intake

Table 2: Milk production (g) as affected by studied feed additives.

	1 st week	2 nd week	3 rd week	4 th week	Total
Control	67 ± 1.7	80 ± 2.4	99 ^a ± 1.3	78 ^a ± 2.8	324 ^a ± 6.0
0.5% Fenugreek	63 ± 1.7	76 ± 1.8	96 ^{ab} ± 2.3	70 ^{abc} ± 3.7	305 ^{abc} ± 6.9
1.0% Fenugreek	60 ± 2.4	73 ± 2.9	88 ^c ± 2.8	62 ^c ± 1.5	283 ^c ± 8.0
0.5% Anise	63 ± 2.4	76 ± 2.4	96 ^{ab} ± 2.8	77 ^a ± 3.7	312 ^{ab} ± 10.7
1.0% Anise	64 ± 2.4	76 ± 2.4	97 ^{ab} ± 2.2	72 ^{ab} ± 2.3	309 ^{ab} ± 7.7
0.25%Fenugreek + 0.25% Anise	68 ± 2.2	82 ± 2.8	96 ^{ab} ± 2.4	73 ^a ± 4.1	319 ^a ± 9.5
0.50%Fenugreek + 0.50% Anise	63 ± 1.7	76 ± 1.8	91 ^{bc} ± 2.6	63 ^{bc} ± 1.7	293 ^{bc} ± 6.2
Sig	NS	NS	*	**	**

a-c means within columns with no common superscripts are differ significantly. NS: not significant, *:P<0.05, **:P<0.01.

Table 3: Serum parameters as affected by studied feed additives.

	Total protein (g/dl)			albumin			globulin			Albumin/globulin ratio		
	pregnancy											
	Prior to	7-14 day	21-28 day	Prior to	7-14 day	21-28 day	Prior to	7-14 day	21-28 day	Prior to	7-14 day	21-28 day
Control	7.83 ±1.19	6.07 ^{cd} ±0.86	5.93 ±1.12	5.27 ±0.39	4.75 ^{ab} ±0.28	4.91 ±0.22	2.56 ±0.30	1.32 ^b ±0.19	1.02 ±0.74	2.06 ±0.03	2.63 ±0.15	4.81 ±1.44
0.5% Fenugreek	7.66 ±0.79	7.84 ^{abc} ±1.14	7.30 ±0.54	5.09 ±0.30	4.21 ^{bc} ±0.04	4.53 ±0.17	2.57 ±0.41	3.63 ^a ±1.11	2.78 ±0.56	1.98 ±0.31	1.15 ±0.49	1.63 ±0.32
1.0% Fenugreek	7.41 ±0.74	8.22 ^{ab} ±0.78	6.90 ±0.32	7.54 ±0.20	4.55 ^{abc} ±0.29	4.43 ±0.24	2.84 ±0.53	3.67 ^a ±0.66	2.47 ±0.56	1.61 ±0.33	1.23 ±0.24	1.79 ±0.70
0.5% Anise	9.28 ±0.15	6.17 ^{bcd} ±0.46	8.26 ±1.67	5.06 ±0.32	4.51 ^{abc} ±0.23	4.48 ±0.26	4.22 ±0.46	1.66 ^{ab} ±0.49	3.77 ±1.51	1.20 ±0.24	2.72 ±0.64	1.19 ±0.95
1.0% Anise	7.79 ±0.03	4.98 ^b ±0.02	5.90 ±0.12	5.84 ±0.07	3.55 ^c ±0.30	4.86 ±0.06	1.95 ±0.04	1.44 ^b ±0.28	1.04 ±0.07	3.00 ±0.10	2.46 ±0.76	4.67 ±0.25
0.25%Fenugreek +0.25% Anise	8.42 ±0.46	8.85 ^a ±0.14	7.92 ±0.23	5.44 ±0.13	5.22 ^a ±0.21	4.41 ±0.18	2.98 ±0.58	3.63 ^a ±0.33	3.51 ±0.35	1.83 ±0.43	1.44 ±0.19	1.26 ±0.19
0.50%Fenugreek +0.50% Anise	8.02 ±1.14	6.64 ^{bcd} ±0.11	5.80 ±0.30	5.30 ±0.53	4.19 ^{bc} ±0.51	4.62 ±0.13	2.72 ±0.74	2.45 ^a ±0.39	1.18 ±0.14	1.95 ±0.73	1.78 ±0.52	3.92 ±0.44
Significance	NS	**	NS	NS	*	NS	NS	*	NS	NS	NS	NS

a-d means within columns with no common superscripts are differ significantly. NS: Not significant, *: P<0.05, **: P<0.01.

Table 4: some liver and hormonal parameters during pregnancy periods as affected by studied feed additives.

	GOT			GPT			Triiodotyronine (T ₃)			Estradiol (E ₂)			Progesterone (P ₄)		
	Pre-	7-14 day	21-28 day	Pre-	7-14 day	21-28 day	Pre-	7-14 day	21-28 day	Pre-	7-14 day	21-28 day	Pre-	7-14 day	21-28 day
Control	56.7 ±12.8	42.3 ^{bc} ±8.5	65.0 ^b ±5.5	14.3 ±5.5	8.7 ^{bc} ±2.3	22.0 ^b ±3.5	0.99 ±0.08	0.81 ^{bc} ±0.19	1.05 ±0.48	56.6 ^c ±6.8	31.8 ^c ±4.2	33.4 ^b ±2.9	0.31 ^c ±0.01	6.96 ±0.32	1.35 ^c ±0.38
0.5% Fenugreek	46.3 ±3.2	65.0 ^{ab} ±10.5	57.0 ^{bc} ±7.5	10.3 ±1.3	20.7 ^a ±3.3	19.0 ^b ±3.0	0.95 ±0.17	1.42 ^a ±0.29	1.14 ±0.2	54.7 ^c ±8.8	32.9 ^{bc} ±4.18	47.9 ^{ab} ±6.7	0.61 ^{bc} ±0.14	7.89 ±0.53	3.09 ^{bc} ±0.59
1.0% Fenugreek	50.0 ±10.9	52.7 ^{abc} ±13.3	45.7 ^{cd} ±4.2	24.7 ±7.8	4.7 ^c ±0.3	16.3 ^{bc} ±2.7	1.27 ±0.18	0.70 ^c ±0.18	1.22 ±0.12	93.7 ^a ±3.8	73.7 ^a ±9.4	59.8 ^a ±8.4	0.48 ^{bc} ±0.08	8.47 ±1.14	6.27 ^a ±1.25
0.5% Anise	29.0 ±0.6	29.0 ^c ±4.4	45.0 ^{cd} ±5.8	17.7 ±1.5	9.0 ^{bc} ±1.0	9.0 ^c ±0.6	1.12 ±0.12	1.36 ^a ±0.06	1.25 ±0.03	65.3 ^{bc} ±12.3	52.6 ^b ±7.96	63.9 ^a ±2.8	1.56 ^{ab} ±0.48	10.57 ±1.75	2.22 ^{bc} ±0.73
1.0% Anise	25.7 ±0.9	26.7 ^c ±3.8	38.7 ^d ±1.5	11.0 ±2.0	7.3 ^{bc} ±2.0	16.7 ^{bc} ±2.3	1.09 ±0.05	1.12 ^{abc} ±0.18	1.13 ±0.07	52.2 ^c ±7.1	47.4 ^{bc} ±7.44	48.2 ^{ab} ±2.9	0.51 ^{bc} ±0.19	10.40 ±1.71	1.71 ^{bc} ±0.93
0.25% Fenugreek +0.25% Anise	35.0 ±1.2	72.0 ^a ±1.2	82.0 ^a ±6.0	7.7 ±0.7	14.0 ^{ab} ±1.7	30.7 ^a ±1.3	0.96 ±0.01	1.14 ^{abc} ±0.03	0.91 ±0.03	73.2 ^{abc} ±7.24	38.1 ^{bc} ±1.64	29.9 ^b ±0.3	1.10 ^{abc} ±0.08	8.39 ±0.34	2.16 ^{bc} ±0.17
0.50% Fenugreek +0.50% Anise	50.7 ±11.5	60.3 ^{ab} ±11.7	39.7 ^d ±3.8	11.7 ±1.7	14.7 ^{ab} ±3.8	14.0 ^{bc} ±2.3	1.26 ±0.21	1.32 ^{ab} ±0.04	1.14 ±0.01	86.1 ^{ab} ±7.9	34.4 ^{bc} ±2.22	57.7 ^a ±9.0	2.09 ^a ±0.75	7.50 ±0.25	3.94 ^b ±0.38
Significance	NS	**	**	NS	**	**	NS	*	NS	**	**	**	*	NS	**

a-d means within columns with no common superscripts are differ significantly. NS: not significant,

*:P<0.05, **:P<0.01.