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Effect of aniseed *(Pimpinella anisum* L.) supplementation on milk composition, blood biochemical profile and productive performance of Damani goats

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Abstract

Natural feed additives have been a topic of interest as an alternative source in feed supplementation and results healthy animal products and improved performance at less cost as compared to synthetic feed additives. In this regard, an experiment was conducted to study the effects of a various level of supplementary dietary source aniseed (*Pimpinella anisum* L.*)* on the productive performance, milk composition and blood biochemical profile of *Damani* goats. Aniseed supplementation significantly (P<0.05) affected feed intake, body weight gain, milk yield and its composition. Regarding milk composition, significant increase in milk protein, lactose and solid not fat while decrease in milk fat% was observed. Increasing aniseed supplementation significantly increased blood glucose and protein level, while decreased blood cholesterol and triglyceride level. It is concluded that using aniseed as additives in the dairy goats' diets tend to improve nutrient digestion coefficient and also increase milk quantity and quality.

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Introduction

Aniseed *(Pimpinella anisum* L.*)* belongs to family Apiaceae has been reported as multidimensional herb used extensively by researchers to enhance the immunological and productive performance of animals (Afifi *et al.,* 1994; Bhatti *et al.,* 1996; Cubak *et al.,* 2003). As a medicinal plant, aniseed has been used as growth promoters, immune stimulator and increased dry matter intake (Sajjad and Durrani, 2007) stimulating digestive enzymes and antiparasitic (Cubak *et al.,* 2003), antibacterial (Singh *et al.,* 2002), antifungal (Soliman and Badea, 2002) and antipyretic (Afifi *et al.,* 1994).Aniseed effect is mainly contributed by anethole content, having the same structure like catecholamine which results in sympathomimetic-type effects (Albert, 1980). Anethole resulted anthelmintic effects on eggs and larvae of sheep gastrointestinal parasite, *Heamonchus contortus* (Camruca *et al.,* 2007). Aniseed is also used in colic, sedative and digestive problems in children (Ceres *et al*., 1984). Due to multidimensional properties of aniseed, domestic goats were subjected to study their overall performance. Goat milk consumption has become an upper edge for the humans afflicted with peptic ulcers, allergy and various gastrointestinal disorders which usually develop from intolerance to cow milk (Haenlein, 2004). Goat milk has also been found to be useful for diabetic patients in Japan (Nagura, 2004). This fact also favor goats for dairying and can prove an ideal preposition especially for developing world where majority of goat population is found with people having low economic status. Major constraints appeared in goat sector development is layman farmers whose traditional feeding and management practices reduce not only production of these goats but also threatens the genetic potential of some highly milk producing goats. Furthermore, extensive helminthes infestation and their conventional therapy prone these goats to various diseases (Tariq *et al.,* 1995). A multidimensional and effective medication are necessary to control not only helminthes but also promotes animal health by increasing its immunity against particular infections. Therefore, the present study was conducted to study the effect of aniseed (*Pimpinella anisum* L.*)* at three levels 1.00, 2.00 and 3.00 g/kg body weight during early lactation period of Damani goats on productive performances, blood biochemical profile, milk yield and composition.

Materials and methods

Experimental animals and management protocols

Twenty early lactating Damani goats (18±days of parturition) divided into four groups (each having five goats) on the basis of homogeneous characteristics, i.e. weight, age and body condition score, were selected for the experiment. Aniseed was given in raw (grounded with 1mm sieve size) form as a supplement diet mixed with concentrated at the rate of $1gkg^{-1}$, $2gkg^{-1}$ and $3gkg^{-1}$ body weight to group B, C and D, respectively. While one group (A) was kept as a control group without aniseed supplementation. All animals were vaccinated and dewormed prior to opening the experiment and provided uniform common available concentrate (added with $0.5gkg^{-1}$ of aniseed) and fodders for adaptation of rumenal flora. All the animals were having free access to water round the clock.

Feed analysis

Feed samples were analyzed according to Association of Official Analytical Chemists

AOAC (2007) method for dry matter (DM), crude protein (CP), crude fiber (CF), ether extract (EE), and nitrogen free extract (NFE) and ash content. Nutrient composition of feed analyzed during experiment is detailed in Table 1.

Productive parameters

Feed intake (FI) was calculated by conventional method i.e. - weighed feed offered – feed refused and weighed. Gentle full hand milking was practiced for milking of goats twice a day. Standard procedure of milking was guaranteed for quality milk production. Milk yield (MY) was calculated on daily basis with the help of digital balance. First few strips of milk were discarded in collection of milk samples for milk composition analysis by method as described by AOAC (1990). On weekly interval, body weight (BW) of each goat was recorded in triplicates three times a

day. Average BW of each goat measured was subtracted from previous week data and recorded as body weight gain (BWG).

Blood sampling and blood biochemical profile analysis

Blood samples for biochemical analysis were collected from the jugular vein at day 1st, 28th and 56th of experimental period. All the standard precautionary measures were followed while collecting blood samples. The collected blood samples were stored in clean sterile glass tubes and centrifuged at 2000 rpm for 10 minutes. The serum was separated and kept in a clean dried glass tube and was stored at −20°C till further biochemical analysis. The blood glucose, triglycerides, protein and cholesterol level was determined by the enzymatic colorimetric method using commercial kit (Cromatest Linear chemicals, Spain).

Statistical analysis

The data was statistically analyzed by the standard procedure of analysis of variance (ANOVA) using completely randomized design (CRD) and means were compared by least significant difference (LSD) (Steel and Torrie, 1981). The statistical package *SAS*. (1997) was used to perform the data analysis.

Statistical model: $Yij = \mu + \alpha j + Eij$

Where

Yij= yield or response variable subjected to the goats and jth treatment, yield comprises weight gain, feed intake, milk composition and blood biochemical profile

μ= Population mean, Common to all observations.

αj= Treatment effect.

Treatment comprises supplementation of 1,2 and 3 g/kg body weight aniseed

Eij is normally distributed with zero mean and constant variance. δ^2i.eEij ~N (0- δ^2).

Results

Productive parameters

Table 2 briefly illustrate results regarding feed intake, body weight gain and milk yield. Feed intake was significantly ($p<0.05$) effected by aniseed (*Pimpinella anisum* L.) supplementation at the level 1.00, 2.00 and 3.00 g/kg body weight. Highest FI was observed in goats treated with 3gkg^{-1} (2.64kg), followed by animals treated with 2gkg^{-1} (2.33kg) and 1gkg^{-1} (1.56kg) of aniseed (*Pimpinella anisum* L.*)* supplementation. Body weight gain was significantly ($p<0.05$) effected by aniseed supplementation highest weight gain 3.44kg (from 24.44kg to 27.88kg) was recorded in animals treated with 3g/kg(Table 2). Significant ($p<0.05$) increase in milk yield was observed with the increase in lactation period as well as with the increase in aniseed supplementation.

Highest increase 875.43 mL (925.9 to 1801.33) in milk yield was recorded in group treated with 3g /kg of aniseed in whole experimental period.

Table 1. Chemical composition of the experimental diets (% DM basis) of feed ingredient provided during the experimental period.

Feeds	Chemical composition					
	% DM	%CP	%EE	%CF	%ASH	%NFE
Concentrate	89.73	17.12	4.95	10.16	4.14	52.97
Barseem	15.00	19.61	1.90	20.80	15.20	42.5
Wheat Straw	90.00	3.21	0.12	41.81	10.9	44.23

DM: Dry matter, OM: Organic matter; CF: Crude fiber; CP: Crude protein; EE: Ether extract and NFE: Nitrogen free extract.

Milk composition

Milk composition was significantly affected by aniseed supplementation in early lactating Damani goats. Significant decrease in milk fat was observed with increase in aniseed supplementation during the experimental period (Table 3).

Highest reduction in milk fat (-1.43) was recorded in experimental group treated with 3g/kg. Milk protein was increased with the increase in aniseed supplementation. Highest increase in milk protein percent was recorded for experimental group treated 3g/kg aniseed. A significant increase in milk lactose percentage was recorded with the increase in aniseed supplementation during the whole experimental period, while milk ash percent was decreased with the increase in aniseed supplementation.

Table 2. Productive performance (Mean ± SE) of Damani goats (n=20) supplemented with different concentrations of aniseed during 1st and last (8th) week of experimental period.

Parameters		Control	1g/Kg BW	2g/Kg BW	3g/Kg BW
Feed intake (kg)	1st week	4.08±0.09^{a}	4.13±0.11^{a}	4.28±0.07^{a}	4.18±0.06^{a}
	8th week	4.40±0.10^{b}	5.98±0.12^{c}	6.61±0.03^{d}	6.82±0.01^{d}
	Feed Gain	0.32	1.85	2.33	2.64
Weight Gain (kg)	1st week	24.69±0.48^{a}	24.79±0.60^{a}	24.80±0.46^{a}	24.44±0.34^{a}
	8th week	25.48±0.46^{b}	26.90±0.55^{ab}	27.96±0.53^{c}	27.88±0.41^{c}
	Weight Gain	0.79	2.11	3.1	3.44
Milk yield (MY) (mL)	1st week	866.30 ±15.03^{a}	867.30 ±18.70^{a}	853.9±20.81^{b}	925.9±9.35^{b}
	8th week	1059.90 ±37.31^{c}	1371.3±135.5^{c}	1657.30±50.00^{d}	1801.33±32.64^{d}
	Increase in MY	193.6	504	803.4	875.43

Means with different superscripts with in rows and columns in same parameter are significantly different at α=0.05.

Blood biochemical profile

The results indicated that blood glucose, blood protein, cholesterol and triglyceride were significantly affected by the experimental treatments (Table 4). Highest mean blood glucose level of 51.13g/ml was showed by Damani goats supplemented daily 3g/kg body weight of aniseed.

Regarding blood protein, highest mean blood protein level of 6.667g/ml was showed by Damani goats supplemented daily 3g/kg body weight of aniseed.

The results indicated that blood cholesterol and triglyceride was significantly decreased with aniseed supplementation (3g/kg body weight).

Table 3. Milk composition (Mean ± SE) of Damani goats supplemented with different concentrations of aniseed during experimental period.

Parameters		Control	1.00 g/Kg BW	2.00 g/Kg BW	3.00 g/Kg BW
Fat (%)	1st week	4.2±0.03^{a}	4.16±0.01^{a}	4.17±0.04^{a}	4.2±0.03^{a}
	8th week	3.91±0.03^{a}	3.61±0.04^{b}	3.11±0.05^{c}	2.77±0.04^{d}
	Change	-0.29	-0.55	-1.06	-1.43
Protein (%)	1st week	3.44±0.07^{a}	3.52±0.03^{a}	3.40±0.06^{a}	3.51±0.01^{a}
	8th week	3.17±0.03^{a}	3.42±0.04^{a}	3.65±0.02^{b}	3.79±0.05^{c}
	Change	-0.27	-0.1	0.25	0.28
Lactose (%)	1st week	4.29±0.01^{a}	4.24±0.06^{a}	4.30±0.06^{a}	4.31±0.01^{a}
	8th week	4.28± 0.03^{a}	4.49± 0.02^{b}	4.60± 0.01^{b}	4.68±0.01^{c}
	Change	-0.01	0.25	1.2	0.37
Ash (%)	1st week	0.81± 0.008^{a}	0.78± 0.02^{a}	0.80± 0.02^{a}	0.82± 0.07^{a}
	8th week	0.82± 0.01^{a}	0.85± 0.01^{ab}	0.89± 0.02^{bc}	0.90± 0.01^{c}
	Change	0.01	0.07	0.09	0.08
Total Solids (%)	1st week	12.77± 0.05^{a}	12.72± 0.04^{a}	12.67± 0.06^{a}	12.85± 0.02^{a}
	8th week	12.19± 0.09^{c}	12.39± 0.03^{a}	12.26± 0.06^{a}	12.16±0.10^{c}
	Change	-0.58	-0.33	-0.41	-0.69
Solids Not Fat (%)	1st week	8.56± 0.08^{b}	8.55± 0.03^{b}	8.49± 0.07^{b}	8.64± 0.03^{bc}
	8th week	8.27± 0.07^{a}	8.77± 0.05^{c}	9.15± 0.01^{d}	9.38±0.08^{d}
	Change	-0.29	0.22	0.66	0.74

Means with different superscripts with in rows and columns in same parameter are significantly different at α=0.05.

Discussion

The present study showed that aniseed supplementation increased feed intake. Results of the present study regarding feed intake are in line with (Abdelhamid *et al.,* 2011; Shehata *et al.*, 2006; Shehata *et al.,* 2004) found that adding medicinal herbs such as chamomile had positive effect on daily dray matter intake during late pregnancy and lactation (suckling, mid and late lactation) periods especially during mid–lactation period.

Table 4. Effect of Aniseed supplementation on some blood biochemical parameters in early lactating Damani goats.

Parameters	Sampling intervals	Control	1.00g/Kg BW	2.00g/Kg BW	3.00g/Kg BW
Blood triglycerides (mg/dL)	Day 1st	41.68±0.01^{a}	39.20±0.05^{a}	39.40±0.09^{a}	42.80±0.01^{a}
	Day 28th	42.81±0.09^{a}	44.01±0.03^{a}	32.01±0.04^{b}	27.23±0.08^{c}
	Day 56th	42.27±0.03^{a}	40.08±0.09^{a}	20.62±0.05^{b}	14.43±0.09^{c}
Blood glucose (mg/dL)	Day1st	38.14±0.05^{b}	44.62±0.03^{a}	34.84±0.09^{bc}	42.80±0.07^{a}
	Day 28th	38.29±0.07^{c}	46.41±0.04^{b}	39.81±0.02^{c}	50.84±0.05^{a}
	Day 56th	37.22±0.01^{c}	51.07±0.01^{b}	48.80±0.05^{b}	59.82±0.09^{a}
Blood protein (mg/dL)	Day 1st	06.88±0.06^{a}	05.92±0.03^{b}	06.46±0.09^{ab}	05.98±0.05^{ab}
	Day 28th	05.46±0.03^{bc}	06.08±0.05^{ab}	06.84±0.01^{a}	06.72±0.02^{a}
	Day 56th	05.38±0.01^{c}	06.30±0.03^{b}	07.18±0.06^{a}	07.34±0.03^{a}
Blood cholesterol (mg/dL)	Day 1st	79.80±0.09^{a}	76.43±0.09^{b}	76.15±0.09^{b}	74.56±0.01^{bc}
	Day 28th	81.31±0.03^{a}	74.46±0.07^{b}	67.23±0.05^{c}	59.62±0.04^{d}
	Day 56th	86.06±0.08^{a}	72.41±0.05^{b}	55.21±0.03^{c}	37.01±0.06^{d}

Means within row with different superscripts are significantly different at α=0.05.

This may be attributed to the increase rumen size of the animals for the parturition and being free of the gravid uterus stress on the rumen. Medicinal herbs contain essential oil which modify rumen microbial fermentation and may allow treatment of rumen fermentation to enhance animal performance and feed utilization (Castillejos *et al.,* 2008). Body weight gain was significantly increased with the increase in aniseed supplementation. Similar findings were recorded by Zeid and Ahmed, (2004) that body weight tend to increase by supplementation of some medicinal herbs (chamomile and thyme) in Zaraibi doe rations. Abdelhamid *et al.,* (2011) also recorded slight increase in body weight gain by adding medicinal herbs at 90 days post kidding (weaning) in Zaraibi goats. Steiner,(2010) recorded considerable increase in daily weight gain, feed conversion ratio and feed intake by adding phytogenic in ration of different species of farm animals. The increase in body weight might be due to the presence of active material such as anethole, which has stimulating effects on the digestive system as reported. Significant ($p<0.05$) increase in milk yield was observed with the increase in lactation period as well as with the increase in aniseed supplementation. Similar results were recorded by Abdelhamid *et al.,* (2011),treating Zaraibi Goats with some medical herbs including aniseed at the rate of 3 and 6g/100kg BW/daily at 90 days post kidding (weaning) in Zaraibi goats. Positive effect of some medicinal herbs supplementation on milk yield was also observed by Shehata *et al., (*2006) in lactating *Zaraibi* goats. This increase in milk yield may be due to significant effect of medicinal herbs on the digestion coefficient of nutrients and their feeding values such as (TDN, SE and DCP).Blood glucose, blood protein, cholesterol and triglyceride were significantly affected by the experimental treatments. Results of the present study regarding blood glucose are in agreement with the findings (Zeid, 2004; Tawfik *et al.,* 2005).

Hassan and Hassan (2009) also reported that medicinal herbs increase the blood glucose , blood urea nitrogen and growth hormone (GH), while decreases the plasma uric acid. Abdelhamid *et al.*, (2002) reported that blood protein and iron concentrations improved while, the concentration of total lipids and the activity of ALP and ALT was reduced as a result of adding some medicinal herbs to the contaminated diet. Regarding blood protein, highest mean blood protein level of 6.667g/ml was showed by Damani goats supplemented daily 3g/kg body weight of aniseed while lowest protein level (5.90g/ml) was showed by goats fed aniseed supplementation. These results of the present study are in line with the observations of Zeid (2004) and Tawfik *et al.,* (2005). Similar results were reported by El–Ekhnawy *et al.,* (1999) and Mohamed *et al.,* (2003) in sheep by feeding medicinal herbs in early lactation period. The increase in serum total protein may be due increase in protein digestibility (Youssef and Zaki, 2001; Shahen *et al.,* 2004; Kassab, 2007).The results indicated that blood cholesterol and triglyceride was significantly decreased by aniseed supplementation with 3g/kg body weight. Shehata *et al.*, (2004) and Priolo *et al.,* (2007) reported similar results in lactating goats and ewes.

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