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Reproductive performance of seasonal ewes and does fed dry fat during their postpartum period

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Abstract

This study was carried out to evaluate the effect of feeding a dry fat source to seasonal ewes and does on their postpartum reproductive performance. Forty five multiparous Awassi ewes (LW = 60.1 ± 3.2 kg) and 45 Shami does (LW = 49.6 ± 2.4 kg) were randomly assigned into 3 dietary treatments (n = 15/spp) for 60 days postpartum in a completely randomized design (CRD) set. Females were housed with their offsprings and fed one of three isonitrogenous total mixed rations (TMR) containing 0, 3, or 5% of dry fat. Blood samples were taken individually every 3 days to determine serum progesterone concentration levels starting one week postparturition via radioimmunoassay kits. Progesterone concentrations increased (P < 0.05) in ewes fed 3% fat addition but not for 5% level. Meanwhile, those of doe were not affected by adding supplemental fat. No differences were observed in days to 1st or 2nd postpartum ovulation in both species. Milk production was higher (P < 0.05) for fat treated ewes with no differences between the 2 fat levels, while it was not different among does groups. Final live weight of females in both species was also not affected by fat supplementation. However, live weight changes were higher (P < 0.05) for ewes with no differences between 3% fat level and control groups, and lower in does with increased fat level and with no differences between the 2 treatment groups. Weaning weight and average daily gain of the newborn in both species were not affected by fat supplementation. Litter weight was not different for ewes, but it was higher (P < 0.05) for treated does with no differences between 3% and 5% supplemented fat groups. Therefore, one can conclude that supplemental fat to ewes at 3% during their postpartum period might recover their cyclicity late in the breeding season, but not at high levels (5%), and can improve their milk production and affect live weight change during that period with no effect on weaning weight or litter weight of lambs. For does, supplemental fat is not capable of affecting their postpartum cyclicity, milk production, and weaning weight of their kids, but reduces their live weight change and litter weight.

Keywords: Awassi ewes; Shami doe; Fat supplementation; Postpartum reproductive performance

1. Introduction

Awassi sheep and Shami does or Damascus goats are considered to be the most predominant and important breeds in Middle East countries. Both breeds are known to be seasonal breeders. Hassan and Shaker (1990) reported that the breeding season in Shami does starts from May and becomes more steady during September to November, while the normal breeding season of Awassi sheep is between June and July and they undergo postpartum anoestrus during the spring (Oqla

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Table 1
Ingredient composition and chemical analysis of the experimental diets

	Diets		
Ingredients (DMB)	0% fat	3% fat	5% fat
Barley	52.00	52.00	52.00
Soybean meal	18.00	18.00	18.00
Alfalfa hay	10.00	10.00	10.00
Straw	13.00	10.00	8.00
Wheat bran	5.00	5.00	5.00
Dry fat	0.00	3.00	5.00
Di-calcium phosphate	1.00	1.00	1.00
Salt	0.40	0.10	0.40
Limestone	0.50	0.50	0.50
Minerals and vitamins [a]	0.10	0.10	
Chemical composition			
Dry matter (%)	94.29	94.39	94.30
Crude protein (%)	16.07	16.20	16.32
Ether extract (%)	1.25	3.35	4.45
Crude fiber (%)	14.38	14.81	14.23
NDF (%) [b]	29.67	30.42	23.89
ADF (%) [c]	12.22	13.09	12.25
Ash (%)	7.50	7.91	12.40
ME (MJ/kg) [d]	10.21	10.95	11.44

[a] Vita-M Premix (DADvet, Na'ur, Jordan) each 1 gram contains: 1500 I.U. Vitamin A; 150 I.U. Vitamin D3; 2 mg Vitamin E 50%; 300 μg Vitamin B1; 300 μg Vitamin B2; 300 μg Vitamin B6; 300 μg Vitamin K3 50%; 218 μg Manganese Oxide; 435 μg Ferrous Sulfate; 15.5 μg Cupper Oxide; 138.5 μg Zinc Oxide; 2.2 μg Potassium Iodide; 0.9 μg Sodium Selinate; 0.43 μg Cobalt Carbonate, CaCO3 reach 1 g.
[b] Neutral detergent fiber.
[c] Acid detergent fiber.
[d] Metabolizable energy.

et al., 2004). Under natural conditions, both breeds undergo a postpartum anoestrus which results in only one offspring per year. As a result, much of the attempts to increase the productivity of small ruminants in the semiarid regions were concentrated on either increasing twinning rate or having two parturitions per year.

Nutrition plays a key role in regulating the reproductive performance in farm animals. Restriction of energy intake has a major role in increasing the length of postpartum anoestrus in sheep and cattle (Schillo, 1992). Prolonged and intense negative energy status delays resumption of oestrous cycles (Schillo, 1992). Fertility of Shami does is highly impaired by high production, long lactation period, or any conditions that result to energy deficiency (Van Horn et al., 1992). Sormunen-Cristian and Jauhiaimen (2002) stated that such conditions delayed oestrus activity and ovulation. Oqla et al. (2004) reported that well-fed postpartum Awassi ewes returned to oestrus earlier, indicating the possibility of lambing every six months.

Currently, an increasing number of nutrition reproduction studies are evaluating different dietary ingredients to determine their effect on reproduction and fat is one of these nutrients. De Fries et al. (1998) reported that fortifying ruminant animals with lipids might represent a practical means of affecting ovarian functions and promoting follicular development, hence leading to an increase in ovulation rate. Adding fat to a cow's diet may positively influence the reproductive performance of cows by promoting an earlier return to postpartum cycling activity (Espinoza et al., 1995).

Fat supplementation increases circulating progesterone concentrations, serum and follicular fluid cholesterol concentrations, and plasma LH, and positively modified a number of ovarian characteristics in beef cows after calf removal (Espinoza et al., 1995; De Fries et al., 1998). Supplementation with fat source resulted in increased follicular growth of beef (De Fries et al., 1998; Bottger et al., 2002).

The precise mechanism through which fat supplementation modifies ovarian physiology in ruminants remains undetermined completely. Limited information is available regarding the response of sheep and/or goat to supplemental fat. Therefore, the objective of this research was to study the effect of using a Ca-soap dry fat supplementation to retain cyclicity of Awassi ewes and Shami does late during their breeding season.

2. Materials and methods

Forty five Awassi ewes and 45 Shami does with average age of 3–4 years at the beginning of the study were used in the study. Initial live weight averaged around 60 kg for ewes and around 50 kg for does. The females selected had given birth at least once before entering the experiment and were randomly assigned in one of three dietary treatments with 15 females per group of each species in a completely randomized design (CRD). Treatment groups were fed one of three total mixed rations (TMR) containing 0, 3, or 5% dry fat (Feedaren, The Modern Establishment for Fats and Glycerin Manufacture, Amman, Jordan). The experimental diets were formulated to be approximately isonitrogenous but not isocaloric according to the NRC recommendation for sheep (1985) and doe (1981). The percentage of dietary ingredients composition and chemical analysis of the diets are mentioned in Table 1. Fatty acid profile of the Ca-soap dry fat used is presented in Table 2. The experiment started directly following lambing or kidding and lasted to the end of the weaning period around 60 days. Using intravaginal sponges, oestrous was synchronized in all females in the experiment at the beginning of the breeding season so that all females were mated at the beginning of June to