

Full Length Research Paper

Effect of nutritional flushing on reproductive and body weight performance of Abergelle goat does

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This study was aimed to evaluate the effect of flushing on the reproductive and body weight change on Abergelle breed does. The study indicated that a mix of 300 or 450 g wheat bran (WB) with 50 g noug seed cake (NSC) flushed per day improved the does' conception rate (70 to 80%) and kidding rate (70%); while does flushed with low concentrate level (150 g WB plus 50 g NSC) or those not flushed had poor and reduced conception and kidding rate almost by half from the flushed ones. However, the high concentrate level is not strategic to reduce abortion rate. Does flushed with high concentrate level (300 and 450 g WB mix with 50 g NSC) were significantly ($p < 0.05$) better in body weight at kidding (18.52 kg) and postpartum weight (19.48 kg) than does flushed with low concentrate level (16.44 and 17.70 kg, respectively). As the concentrate levels supplementation of their dam increased, birth weight of kids increased (1.73 to 2.36 kg). Therefore, the conception rate, postpartum weight, kid production of Abergelle goat can improve by flushing with 300 g WB and 50 g NSC concentrated feed. However, its effect on the reduction of abortion rate is not promising. Further study is needed on the abortion problem.

Key words: Abortion rate, birth weight, body weight, conception rate, concentrated feed, goat, kidding rate, supplementation.

INTRODUCTION

Reproduction in goat is seasonal which is mainly influenced by photoperiod. Comparing to temperate, tropical goat breeds are continuous breeders, can ovulate every month throughout the year due to less day length change in the area. However, forage unavailability and temperature change have strong influence to fully express their potential (Fatet et al., 2011). Seasonal feed availability and quality is a major constraint to biological productivity of small ruminants in the tropics (Berhane and Eik, 2006; Ben Salem and Smith, 2008). As a result, the huge resources of goats, estimated to be 32.74

million in Ethiopia (CSA, 2018), have not fully benefited the small holder farmers as well as the country in economy and food security. Feed scarcity in quantity and quality is a major factor for the reduced goat productivity in Ethiopia. Cattle, sheep and goat often depend on poor quality feeds of pasture (56%) and crop residues (30%) (FAO, 2019).

In addition, feed resources of grazing pasture are reduced due to overgrazing and expanding crop production (Ben Salem and Smith, 2008). The number of establishments in the food establishments in the food and

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and beverages factories is increasing (CSA, 2017). Wheat bran and noug seed (*Guizotia abyssinica*) cake industry byproducts are widely used as animal feed in the country. These byproducts are less fibrous and rich in energy and/or protein with high digestibility. Wheat bran has 151 g CP and 460 g NDF per kg DM. Whereas, noug seed (*G. abyssinica*) cake has 353 g CP and 339 g NDF per kg DM (Tesfay and Tesfay, 2013)

Rekik et al. (2007) indicated that short, medium and long dietary changes can modify the reproductive traits of goat. Animal production in tropics is dependent on supplemental feeding as supply of energy and protein for reproduction, but these feeds can contain compounds that affect various components of reproductive cycle (Blache et al., 2008). Responses to flushing, however, are often variable and inconsistent depending on factors such as genotypes (Chemineau et al., 2004), body conditions of the animals (O'Callaghan et al., 2000), timing and duration of flushing (Sabra and Hassan, 2008; Karikari and Blasu, 2009), the amount and quality of dietary supplements (Acero-Camelo et al., 2015).

In the study area, keeping of goats with low fertility rate which have long kidding interval (Belay et al., 2014) and high abortion rate (Abay et al., 2017) are major problem of Abergelle goat in smallholder farmers. Therefore, this research aimed to evaluate the effect of energy and protein mix concentrated feed supplement prior and during breeding time in reproduction and production performance of Abergelle goats.

MATERIALS AND METHODS

Experimental site

The study was conducted at the goat breed evaluation and improvement farm of Abergelle agricultural Research Center in Tanqua-Abergelle district, central zone of Tigray, Northern Ethiopia. The latitude, longitude and altitude at the goat farm are 13° 22' N, 38° 99' E and 1574 m above sea level, respectively. The area is categorized as hot to warm sub-moist lowland (SM1-4) sub-agroecological zone of the region with an altitude of 1300-1500 m above sea level and the mean annual rain fall ranging from 400 to 600 mm which is characterized by low, erratic and variable rainfall. The mean annual temperature ranges from 28 to 42°C (WOARD, 2011).

Animal type and feeding management

The experiment was undertaken on a station goat farm which has semi intensive production system using wheat bran and noug seed (*G. abyssinica*) cake feeds as flushing feeds for one to two years old Abergelle breed goat does. Their age was estimated using FAO (2011) guide of goat age estimation from dentation. Basal diet of the does was hay, and free grazing and browsing in the pasture of fenced farm. Half of the flushing feeds were given in the morning and half in the evening, individually. All experimental goats were drenched with a broad spectrum anthelmintic, sprayed with an acaricide and vaccinated against major diseases (sheep and goat pox and ovine pasteurellosis). Flushing period was nine weeks, three weeks before joined buck and continued for six weeks during

breeding period or joining bucks in the breeding season to have a second chance of oestrus cycle and mating.

Experimental design and sampling methods

The experimental animals were twenty Abergelle goat does which had grade three (scale of 0 to 5) body conditions score. The sample was selected randomly using randomized complete block design with five replications and four treatments. The treatments were:

- T1. *Ad Libitum* hay
- T2. *Ad libitum* hay + 150 g wheat bran + 50 g noug seed (*G. abyssinica*) cake per day
- T3. *Ad libitum* hay + 300 g wheat bran + 50 g noug seed (*G. abyssinica*) cake per day
- T4. *Ad libitum* hay + 450 g wheat bran + 50 g noug seed (*G. abyssinica*) cake per day.

Data to be collected

All the experimental does were tagged with an identification ear tag. Data on initial weight, weight prior to breeding, mating date, abortion, kidding date, litter size, birth weight of kids, monthly postpartum weight for three months, health status and death were recorded.

Data analysis

The collected data were analyzed using reproductive rates calculation (conception rate, kidding rate and abortion rate listed below) and SAS version 9 Analysis of variance, carried out by SAS, version 9, was used to statistically test the effect of treatments upon the body weight changes of does and kids' birth weight. When ANOVA detected significant differences within treatments, the post-hoc Dunnett test was applied to perform multiple comparisons. The reproductive performances were calculated as follow:

$$\text{Conception rate} = \frac{\text{number of does conceived}}{\text{number of does joined to bucks}}$$

$$\text{Kidding rate} = \frac{\text{number of kids born alive}}{\text{number of does joined to bucks}}$$

$$\text{Abortion rate} = \frac{\text{number of does aborted}}{\text{number of does joined to bucks}}$$

RESULTS AND DISCUSSION

Effect of flushing on reproductive traits of Abergelle goat dams

The treatments of the current study were categorized as high (T4 and T3) and low concentrate level (T2 and T1) because of similar results in each category. The does flushed with 450 g and 300 g wheat bran mixing with 50 g noug seed (*G. abyssinica*) cake per day had showed high conception rate (70 to 80%) and kidding rate (70%) (Table 1). This high-level of flushing concentrated feed induced energy to mate and conceive higher than of those does flushed with low level of concentrated feed

Table 1. Effect of flushing on conception, abortion and kidding rate of Abergelle does.

Studied trait	High concentrate level (HCL)		Low concentrate level (LCL)	
	T4 (%)	T3 (%)	T2 (%)	T1 (%)
Conception rate	70	80	54	57
Abortion rate	0	10	11	11
kidding rate	70	70	43	46

T4= *Ad libitum* hay + 450 g wheat bran + 50 g noug seed (*G. abyssinica*) cake T3= *Ad libitum* hay + 300 g wheat bran + 50 g noug seed (*G. abyssinica*) cake, T2= *Ad libitum* hay + 150 g wheat bran + 50 g noug seed (*G. abyssinica*) cake, T1= *Ad libitum* hay.

Table 2. Live body weight change of experimental does.

Parameter	Initial weight	Prior to breeding weight	Kidding weight	Post-partum weight	Kids' birth weight
	Mean	Mean	Mean	Mean	mean
HCL (kg)	14.83	15.72	18.52	19.48	2.36
LCL (kg)	14.89	15.73	16.44	17.07	1.73
SEM	0.26	0.46	0.41	0.4	0.15
<i>P</i>	0.913	0.988	0.008	0.002	0.04

HCL=high concentrate level (T3 and T4), LCL= low concentrate level (T1 and T2).

and none supplemented. However, flushing with high level concentrate supplementation is not effective to reduce abortion. An experiment in ewes in India confirmed that the community rangeland in semi-arid area of the country is low in feed biomass and insufficient to meet nutrient requirement for reproduction. Higher lambing (79.2%) and conception (73.7%) rates were recorded by flushing with 1.5% concentrate feed of their body weight in the mating season as compared to none flushed ewes (Chaturvedi et al., 2006). In the other way, flushing with 153 g/day CP and 2.19 Mcal/kg metabolized energy improved both the sexual receptivity and the reproductive performance of sheep (Fazel et al., 2014). Energy and protein sources feed supplementation (27 to 30% CP) for the short period of time has improved the reproductive efficiency of Spanish and their crossbred with Boer does under poor body condition (Melesse et al., 2013).

Effect of flushing on body weight change

Table 2 indicates an increment of live body weight of experimental does. High level concentrated feed supplemented does were significantly heavier in kidding (18.52 kg) and postpartum average weight (19.48 kg) than does supplemented with low level of concentrated feed (16.44 kg) in kidding and 17.70 kg at postpartum (Table 2). 3-4 years old WAD does may benefit from concentrate supplementation (420 g DM/d with 231 g/kg CP) than 5-6 years old WAD does of moderate body condition (Karikari and Blasu, 2009).

Birth weight of kids increased as concentrated feed level for does supplementation increased. The mean values of kids' birth weight from does flushed with high concentration level of feed were 2.36 kg, while the kids born from the does supplemented with low concentrate level were 1.73 kg.

CONCLUSION AND RECOMMENDATION

Supplementation of mixed concentrate feeds of 300 g wheat bran with 50 g noug seed (*G. abyssinica*) cake as flushing in the breeding season is effectively improved the conception rate and kidding rate of Abergelle does whereas flushing with low level of concentrate could not improve reproductive performances of the does. In addition, flushing with higher than 300 g of wheat bran plus 50 g noug seed cake per day per doe has not improved the reproductive performance of Abergelle does.. However, flushing of Abergelle does with high (>300 g) level of wheat bran with 50 g noug seed cake per day per doe is important for dam to stay in good body condition (weight) for the next breeding and have heavier kids as well. This study indicates that the abortion problem is not reduced using this flushing experiment protocol, therefore further study is needed to prevent abortion in Abergelle does.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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