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Animal Health

Effect of broiler litter supplementation on reproductive performance of West African Dwarf sheep

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Abstract

Four low cost feed samples were formulated using 0, 25, 50 and 75% levels of broiler litter processed into feed along with other feed ingredients. Sixteen (16) primiparous West African Dwarf (WAD) ewes aged between twelve and eighteen months old were dewormed using Ivermectin and dipped against ticks and fleas using diazintol. Oestrus was artificially synchronized in all the ewes using 1ml of Prostaglandin - 2Fα administered intramuscularly, the animals were mated with rams of known fertility and lineage bred. Ewes were evaluated in a pregnancy trial while the lambs born were evaluated in a pre-weaning growth trial. All the ewes were weighed before conception and bimonthly thereafter until parturition. The parameters studied were weight at mating, weight before and after parturition, weight changes during pregnancy, weight changes in lactation and nursing, lambs birth weights and daily weight of lambs, dam's weight at weaning and gestation length. Results obtained showed weight at mating, weight before mating, weight at parturition, gestation length, weight gain in pregnancy, weight change in lactation and nursing, lambs birth weights and daily weight gain of lambs were significantly affected ($p<0.05$) while dam's weight at weaning and lambs' weaning weight were not affected ($p>0.05$). Results of this study indicate that inclusion of broiler litter up to 50% in feed mixtures of ewes has no deleterious effect on the performance and health status of ewes during pregnancy and lactation.

Key words: Ewes, pregnancy, parturition, lactation, broiler litter

Introduction

Broiler litter: a byproduct of poultry industry represents a potentially valuable source of both energy and protein for ruminants. It is a readily available and cheap agricultural by-product that can be used as feed. Besides, using broiler litter as a feed; it is environmental friendly. Broiler litter is high in ruminally degraded crude protein and moderate to low in available energy concentration; therefore, most efficient use is as a crude protein supplement with low-protein forages such as cereal grain residues. However, because of low cost, broiler litter is frequently included in diets at moderate to high levels (Goetsch and Aiken, 2000).

In any given region of the world, the major factor influencing livestock production is an adequate supply of nutrients such as protein, energy, minerals and vitamins. Caloric intake remains sub optimum for most of the population in the developing world. Haan et al. (2001) observed that by 2020, the global population is projected to consume about 120 million tons of meat and 220 million tons of milk above the current consumption. However, the limiting factor in world food supply now and in the foreseeable future is protein leading to a need for improvement in the method of livestock production.

The limited supply of raw materials for the livestock feed industry has resulted in a continuous increase in the cost of production, causing a phenomenal rise in the unit cost of production of livestock products. Thus, the products have become too expensive for the majority of the population. The shortage of good quality feeds needed to sustain livestock growth especially during dry season has been a perennial problem and this can be reduced or eliminated by finding alternative sources of protein and energy in the concentrate mixture given to animals.

Ruminants have a unique digestive system that enables them to use a number of non-conventional feedstuffs, which cannot be utilized as nutrient sources by monogastrics animals. Noland et al. (1955) observed that broiler litter is a cheap dietary ingredient for ruminants.

However, Tagari et al. (1976) reported that broiler litter is better for fattening of cattle, ever since, various concerns has been raised about its use in the diets of pregnant animals.

This study was designed to assess the performance of the ewes during pregnancy, when exposed to broiler litter diets and to observe the performance of the lambs during the pre-weaning stage of growth.

Materials and Methods

Experimental design and diets:

Sixteen (16) primiparous West African Dwarf (WAD) ewes raised on the farm were used in this experiment. The animals between one and one and half years old with an average weight of 20.66 kg. The animals were reared in batches according to the treatments. Similarly, they were fed *ad – libitum* with fresh water served every day and salt lick was offered free choice. Broiler litter used for the study was collected from birds reared on deep litter for 8 weeks. The litter was dried and milled with other feed ingredients. Experimental design was a completely randomized design consisting of four animals per replicate. The model adopted for this experiment is a one-way analysis of variance in a completely randomized design. Dietary treatments consisted of 0, 25, 50 and 75% levels of broiler litter inclusion in their diets (Table 1).

Experimental procedure

The animals were treated against

Table 1: Gross Composition of Diets

	DIETS			
Ingredients	1	2	3	4
Broiler litter	0	25	50	75
Palm kernel cake	52	27	2	-
Wheat bran	30	30	30	15
Corn bran	15	15	15	7
Salt	2	2	2	2
Palm oil	1	1	1	1
Calculated CP	16.1	17.5	18.8	20.9

Broiler litter used contain 20% Crude Protein and 1400 ME Kcal/kg endoparasites and ectoparasites infestation with Ivermectin and dipped against ticks and fleas using diazintol. Prior to synchronization, the ewes were denied access to rams therefore; none of the ewes was pregnant. Thereafter, the ewes were synchronized by the administration of PG 2F-alpha (synthetic hormone) at 1mL/ animal in a deep intramuscular route. Oestrus was artificially synchronized in all the animals with Prostaglandin 2F-alpha at 1mL/ewe in a deep intra muscular route. Twenty four hours after administration of the hormone, the animals came on heat and were mated with rams of good fertility record and lineage bred on the farm. All ewes were weighed before mating and bi-monthly thereafter until parturition. Parameters studied were: weight at mating (kg), weight before parturition (kg), weight after parturition (kg), weight of dam at weaning (kg), gestation length (days), weight gain in pregnancy (kg), weight change in lactation and nursing (kg), lamb birth weight (kg), ratio of twin: single (%), ratio of male: female (%), weight gain of lambs from 0-13 weeks (kg), lamb weaning weight (kg), daily weight gain of lambs (g), lamb mortality at birth (%) and lamb mortality at weaning (%).

Statistical analysis

All data were subjected to Analysis of variance (ANOVA) procedure using SAS (1999) and significant treatment means were separated using Duncan option of the same package.

Results and Discussion

Table 2 shows the reproductive performance of WAD ewes fed broiler litter based diets.

Mean weights of ewes at mating ranged from 23.5kg to 27.8 kg with ewes on ration A having the heaviest mean weight of 27.8 kg and those on ration C having the least mean weight of 23.5 kg. There were significant differences ($p<0.05$) observed between the weight of ewes at mating. In like manner, weight before parturition ranged from 30.0 kg to 35.8 kg. Ewes on ration B had the heaviest mean weight of 35.8 kg while those on ration C had the least mean weight of 30.0 kg.

Also, there were significant differences ($p<0.05$) between the ewes on rations A, B, C and D. Similarly, the weights at parturition ranged from 28.6 kg to 32.5 kg with ewes on ration B having the heaviest mean weight of 32.5 kg and ewes on ration D having the least mean weight of 28.6 kg. Also, there were significant differences ($p<0.05$) observed between these treatments. However, the weight of dam at weaning ranged from 26.8 kg to 29.8 kg. There were no significant differences observed between live weight at mating and duration of pregnancy. The findings of this work do not agree with the findings of Orji (1976) who found no significant correlation between live weight at breeding and length of pregnancy.

Significant differences ($p<0.05$) were observed for the mean gestation length which ranged from 147 days (ration A) to 152 days (ration D). Values for ewes on rations C and D were 150 and 152 days, while those on rations A and B were 147 and 149 days respectively. This result agrees with the report of White and Termonth

Table 2: Reproductive performance of WAD ewes fed broiler litter based diets

	Treatments			
Parameters	A	B	C	D
Mean wt. at mating(kg)	27.8±1.0a	26.0±0.5ab	23.5±0.3c	24.5±0.3bc
Mean wt. before parturition (kg)	34.4±0.8a	35.8±0.4a	30.0±0.1b	34.9±1.0a
Mean wt. after parturition(kg)	29.5±.2ab	32.5±0.4a	28.9±0.1ab	28.6±1.0b
Mean wt. of dam at weaning(kg)	29.5±2.2	29.8±0.5	28.2±0.1	26.8±1.0
Mean Gestation length(days)	147.8±0.6c	149.3±0.3b	150.8±0.5a	152.0±0.4a
Mean wt. gain in pregnancy (kg)	4.1±0.3a	4.1±0.1ab	5.0±0.2ab	5.3±0.2a
Mean wt. change in lactation and nursing(kg)	0.8±0.0a	0.7±0.0a	0.52±0.0b	0.4±0.0b
Mean lamb birth wt.(kg)	1.6±0.1b	1.0±0.1c	2.1±0.1a	1.7±0.1b
Ratio of twin: single (%)	75:25a	50:50b	50:50b	25:75c
Mean ratio of M: F lambs (%)	75:25a	74:36b	73:27b	30:70c
Mean wt. gain of lambs from 0-13wks (kg)	7.5±0.1a	7.4±0.2ab	7.3±0.1ab	5.9±0.2c
Lamb weaning wt.(kg)	7.0±0.0	8.3±0.5	8.5±0.2	7.6±0.1
Daily wt. gain of lambs (g)	63.6±3.0c	80.9±3.8b	89.1±0.7a	60.7±1.1c
Lamb mortality at birth (%)	0	0	0	20
Lamb mortality at weaning (%)	0	0	0	0

a, b, c, d: Means in the same row with different superscripts are significantly different ($p<0.05$)

(1970) as reported by Uwechue (2000) who stated that a low plane of nutrition prolong gestation length. Mean duration of gestation in most sheep breeds varies from 144-155 days (Hafez, 1968). Also, Hill (1960) observed a gestation length of 140-169 days. The results of this experiment are in agreement with the reports of these authors. Forbes (1968) studied the growth of the uterus in pregnant ewes until the 120th day of gestation; he discovered that little depressed change in rumen volume occurred. This suggests that depressed roughage intake which sometimes occur in late pregnancy in ewes could partly be due to physical restriction.

All animals gained weight during pregnancy showing that DM intakes were sufficient both for maintenance and production. Weight gain during pregnancy were highest for animals on ration D (5.3 kg) and significantly lowest ($p<0.05$) for animals on rations A and B (4.1 kg). These values reflect and show the increase in dam body weight due to pregnancy and not total weight gains. Orr and Treacher (1989) reported that the level of concentrate feeding during pregnancy significantly affect all the aspects of performance. Also, it was observed that gains in late pregnancy increased and losses of body condition were smaller with each increment in the amount of concentrate offered. There were significant effects of concentrate feeding in pregnancy on changes in weight of the ewes in lactation.

The values for ewes on rations A, B, C and D were 0.8 kg, 0.7kg, 0.5 kg and 0.4 kg respectively. Ewes on rations A and B were significantly different ($p<0.05$) from ewes on rations C and D. This agrees with the study carried out by Adu (1975) who observed that ewes generally lose weight during lactation or gain weight at a very low rate depending on their plane of nutrition.

In all the groups the type of birth was either single or twins. Multiple births were common among treatments A, B and C. The ratio of single to multiple births in treatments A to C was 75:25 respectively. Significant differences ($p<0.05$) due to treatment were observed between treatments for type of birth. Out of the four ewes per treatment, three ewes in treatment A and two each from treatments B and C gave birth to twins. Uwechue (2000) citing Hill, 1960 and Ngere (1975) stated that twinning rate for WAD sheep vary greatly and range from 20 to 87%, with values from Taiwo (1979) of 51.9%, Ademosun (1973) of 27% and Dettmers *et al*. (1976) of 55% being intermediate. Values obtained in this study were still within the range reported by the various workers cited. In the WAD sheep, the sex ratio of lambs at birth has been reported as 46:54 males to females (Dettmers and Loosli, 1974). The birth weight of the lamb is influenced by age, size, nutrition of the dam, gestation length, sex of the offspring and litter size. Osinowo and Adu (1985) observed that nutrition exerts a big influence on reproductive performance in sheep. Under – nourishment during late pregnancy may cause pregnancy toxemia, low birth weight of lambs and poor management, at least 80% of ewes mated should lamb with about 25% of the ewes producing twins.

Significant differences due to treatments were observed between treatments A and B and D for mean ratio of male to female lambs (M: F). Ratios of M: F lambs for rations A, B and C were 75:25 and treatment D was 30:60. Taiwo (1979) revealed that sex ratio 48:52 (M:F) and Dettmers and Loosli (1974) obtained sex ratios of 46:54 (M:F). However in this study, more males were produced than the females, therefore, further observations on a larger number of ewes needed to be done in order to ensure that ratios obtained in this study are actually repeatable.

The mean birth weight of lambs for rations A, B, C and D were 1.6±0.1 kg, 1.0±0.1 kg, 2.1±0.1 kg and 1.7±0.1 kg respectively. Significant differences ($p<0.05$) were observed between mean lamb weights of rations A, D and B and C. Also, the lamb weaning weight increased gradually from ration A (7.4 kg); ration B (8.3 kg); ration C (8.5 kg) and a decrease in ration D (7.6 kg). However, there were no significant differences between the lamb weights. Furthermore, the animals gained weight with the increase in the rate of inclusion of broiler litter in their diets. Ewes on rations A, B and C gained 63. 6g, 80.9g and 89.1g daily, but, the animals on ration D gained less than animals on other treatments. Also, there were significant differences ($p<0.05$) in live weight gains of animals on ration C (89.1 g), ration B (80.9 g) and rations A and D (63.6 g and 60.7 g) respectively.

Conclusion

This study revealed that broiler litter supplementation in the diet of pregnant ewes increased the weight of dam during pregnancy. Furthermore, broiler litter supplementation improved weight of dam during pregnancy while lambs gained weight with increase in inclusion rate of broiler litter in their diets.

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