

**PRODUCTIVE AND REPRODUCTIVE TRAITS OF TAGGAR GOATS  
AS AFFECTED BY TYPE OF RATION UNDER DRY LAND FARMING  
SYSTEM IN WESTERN SUDAN**

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**ABSTRACT**

The experiment was conducted on Taggar goats to evaluate the effect of two different levels of protein and energy in ration on some reproductive and productive traits. Forty seven (47) mature Taggar goats were used in this experiment. Animals were allocated to three feeding regimes in a complete randomize design according to live body weight. The results indicated that supplemented does secured higher litter size (1.50 and 1.33) compared with control group (1.2). Kidding rate was high in supplemented groups (100%) compared with control group (93.8%). Body weight was heavier at time of kidding and time at weaning for supplemented does compared with control does. These results indicated that supplementation reduced body weight losses through lactation period. The kidding interval for the supplemented does was shorter ( $247.81 \pm 8.38$  and  $242.60 \pm 7.88$  days) for does in groups B and C respectively compared with does in control group ( $288.94 \pm 6.84$  days). Similarly, the service period had been reduced in supplemented does compared with control does, the respective values were  $74.32 \pm 4.96$ ,  $83.46 \pm 4.67$  and  $93.08 \pm 4.22$  days for groups B, C and A, respectively. The results of milk analysis indicated that supplemented does produced higher protein, lactose and total solids content whereby the fat content was higher in control does. The supplementation that given to does had reduced the aborted number and abortion and mortality rates compared with the unsupplemented does. In conclusion the investigated environmental factors showed an impact on both reproductive and productive traits of the Taggar goats under rangeland farming system.

**Key words:** *Taggar, goat, production, reproduction, concentrate ration, dry land, Sudan*

## INTRODUCTION

Goats play a potential role in the subsistence economy of Sudan where they are generally raised by poor farmers and distressed women. Its population in Sudan is estimated by 42 million (M.A.R, 2007). The large population of goats is mainly composed of Nubian, Desert, Nilotic and mountain (Taggar) breeds (A.O.A.D, 1990). The tropical goats are kept for meat production and are rarely milked as most goats in tropical countries (Ohiokpehai, 2003). The Sudanese mountain goats (Taggar) are classified as meat type, and are widely distributed in many parts of Sudan and they are concentrated in Nuba mountain of Southern Kordofan. Their importance comes from the fact that they have a wide range of adaptability and high ability to survive and produce in harsh conditions where other livestock can not. In the tropical area, especially for animals raised under traditional systems, energy intake fluctuates according to the season. This should have an impact on meat production as animals may use more energy searching for grazing over long distance than the energy they gain from this poor quality feed (Mohgoub and Lu, 2004). Such system of production causes reduction in growth rate, body weight losses and poor reproductive performance, which in turn results in severe economic losses especially during dry seasons. Several studies have shown that concentrate ration supplementation during prepartum period had impact on growth and improved goats productivity (Totanji and Lubbadah, 2000; Madibela and Segwagwe, 2008). The authors also reported that grazing alone may not be sufficient for optimizing live weight gain of meat production. The present experiment was designed to study the effects of supplementation types on productivity performance of Taggar goats under dry conditions.

## MATERIALS & CONDITIONS

The present study was conducted in Dalanj which lies within the medium rain (500mm) woodland savannah (longitudes 12.02° N, Latitudes 29.39°E). The total area extends over 9300 km<sup>2</sup> with total population of 250000 inhabitants. The soil types varied from sandy (goz) in north to heavy clays (vertisoil) and the lighter clay (gardoud) in the south. The mean monthly temperature ranged from 31.3 C° in April to 25.8 C° in July, annual rainfall ranging between 500-800 mm, with peak rain in August (S.K.D.P, 2000).

Forty seven pregnant Taggar does with three bucks were acquired by direct purchasing from Dalanj livestock local market. The age of experimental animals varied between 1-4 years. Does and bucks were treated with the necessary medication against endo- and ecto-parasites (AGVET, Ivomec super drench, USA 1.0 ml/50 kg body weight subcutaneously injected) and vaccinated against goat pox, Anthrax and Hemorrhagic Septicemia. The does were ear tagged, weighed and divided into three groups 1, 2 and 3 consisting of 16, 16 and 15 does respectively. The averages of initial live body weight were 19.16± 6.53, 19.14± 4.17 and 19.17± 4.05 kg of groups 1, 2 and

3, respectively. Each group was kept in separate enclosures constructed of iron bars and wire, and equipped with feeders and water troughs. Inside each enclosure, the animals were individually tethered at sufficient distance away from each other and offered supplement type in separate troughs. All does were daily turned and maintained to graze on pasture from 8.00 am to 6.00 pm. By return from pasture does in groups 2 and 3 were offered 350g/day/head of concentrate ration A or B, respectively (Table 1). The does were weighed at weekly interval for 8 weeks before kidding and 12 weeks after kidding. The does were fasted overnight before being weighed. Milk samples were collected at the beginning and monthly thereafter for 3 months in clean bottles. Milk chemical analysis were conducted according to (A.O.A.C, 1990). The data from feeding trials and reproductive traits were statistically analyzed according to complete randomizes design using SPSS v.14.0 software package. Duncan's Multiple Range Tests (DMRT) was also used to test significance differences among means, analysis of covariance was carried out.

### **RESULTS**

#### **Effect of concentrate ration type on litter size and kidding rate**

The tested type of concentrate ration was affected litter size significantly ( $P < 0.05$ ). Does in group 2 received ration A secured the largest litter size followed by does in groups 3 supplemented with ration B and the smallest litter size was obtained by the un-supplemented does in group 1 (Table 2). The supplemented groups (2 and 3) showed higher kidding rate compared with the un-supplemented group (group1) (Table 2).

#### **Effect of type of concentrate ration on body weight at kidding and weaning**

The results show that the live body weight at kidding of both supplemented groups (2&3) were significantly ( $P < 0.05$ ) higher than that of the control (Table 3). The results indicated that dams experienced variable body weight losses imposed by types of concentrate ration. The live body weight of the supplemented groups (2 and 3) at weaning time was significantly ( $P < 0.05$ ) higher than the control group. Similarly body weight losses was significantly ( $P < 0.05$ ) higher in the control group compared with the supplemented groups (2&3) (Table 3).

Table 1. Ingredients and chemical composition of the experimental feed stuffs.

Components (%)	Ration A	Ration B
Sorghum grains	15	15
Groundnut Cake	45	-
Rosella seeds	-	50
Wheat bran	19	19
Groundnut Hulls	20	15
Common Salt	0.75	0.75

**Proximate analysis (DM basis) (follow Table 1)**

Supplement types	DM%	CP %	CF%	EE %	NFE %	Ash%	ME(MJ/Kg DM)
Ration A	93.2	20.4	10.3	4.5	58	6.8	12.20
Ration B	93.9	16.7	17.4	6.6	47.5	11.8	11.57

(DM= Dry matter, CP= Crude protein, CF= Crude fibre, EE= Ether Extract, NFE=Nitrogen Free Extract)

Table 2. Effect of concentrate ration type on litter size and kidding rate.

Animal groups	N	Number of kidding does	Number of kids	Litter Size	Kidding rate %
Group1	16	15	18	1.20±0.10 <sup>ac</sup>	93.8
Group2	16	16	24	1.50±0.13 <sup>ab</sup>	100
Group3	15	15	20	1.33±0.12 <sup>a</sup>	100
Overall mean	47	46	62	1.35±0.07	97.9

Table 3. Effect of concentrate ration on body weight at kidding and weaning.

Animal groups	N	Body weight at kidding (Kg)	Body weight at weaning (Kg)	Body weight change (Kg)	Change (%)
Group 1	15	23.86±0.30 <sup>b</sup>	20.10±0.37 <sup>b</sup>	-3.76±0.27 <sup>a</sup>	15.7
Group 2	16	25.45±0.35 <sup>a</sup>	22.70±0.43 <sup>a</sup>	-2.75±0.39 <sup>ac</sup>	10.8
Group 3	15	24.83±0.29 <sup>a</sup>	23.02±0.36 <sup>a</sup>	-1.81±0.28 <sup>bd</sup>	7.3

Values in same column with different superscripts differ significantly (P<0.05)

**Kidding interval and service period**

The data pertinent to the effect of concentrate ration type on kidding interval and service period is presented in (Table 4). The results indicated that kidding intervals of both supplemented groups (2&3) were significantly ( $P<0.01$ ) shorter than that of the control group.

**Table 4. Effect of type of concentrate ration on kidding interval and service period**

<b>Animal groups</b>	<b>N</b>	<b>Kidding interval(days)</b>	<b>Service period(days)</b>
<b>Group 1</b>	14	288.94±6.84 <sup>ac</sup>	93.08±4.22 <sup>ac</sup>
<b>Group 2</b>	16	247.81±8.38 <sup>b</sup>	74.32±4.96 <sup>b</sup>
<b>Group 3</b>	14	242.60±7.88 <sup>bd</sup>	83.46±4.67 <sup>bd</sup>

Values in same column with different superscripts differ significantly ( $P<0.05$ )

**Milk composition**

The effect of type of concentrate ration on milk chemical composition of experimental goats is illustrated in (Table 5). The data indicated that type of supplement had exerted a significant ( $P<0.01$ ) effect on fat and total solid content. The fat content was higher in the unsupplemented control (group 1) than in both supplemented groups (2&3). The total solid content was significantly ( $P<0.01$ ) higher in the two supplemented groups (2&3) compared with the control (group1). The data also indicated insignificant effects of supplementation on crude protein, lactose and ash content

**Table 5. Effect of type of concentrate ration on milk composition**

<b>Animal groups</b>	<b>N</b>	<b>Fat</b>	<b>Protein</b>	<b>Lactose</b>	<b>Ash</b>	<b>Total solid</b>
<b>Group 1</b>	10	3.60± 0.05b <sup>c</sup>	3.49± 0.04	4.25± 0.06	0.79± 0.01	12.36± 0.02 <sup>c</sup>
<b>Group 2</b>	9	3.04± 0.04 <sup>a</sup>	3.50± 0.04	4.29± 0.06	0.79± 0.01	12.48± 0.02 <sup>a</sup>
<b>Group 3</b>	10	3.48± 0.05 <sup>c</sup>	3.78± 0.04	4.31± 0.07	0.80± 0.01	12.38± 0.02 <sup>bc</sup>

Values in same column with different superscripts differ significantly ( $P<0.05$ )

**Abortion and mortality rates**

The data indicated that the control (group1) suffered significantly ( $P<0.01$ ) from abortion compared with the second and third groups (Table 5). Cause of abortion was diagnosed to be an infection of vibrosis bacteria. The type of ration exerted insignificant effect on mortality rate (Table 6). However, goats in group 2 recorded zero mortality compared with the control (group1) and group 3 which recorded one doe for

each group.

**Table 6. Effect of type of concentrate ration on some reproductive traits**

Animal groups	N	Number of aborted does	Abortion rate %	Number of kidding does died	Mortality rate (%)
<b>Group 1</b>	16	2	12.5	1	6.3
<b>Group 2</b>	16	0	0	0	0
<b>Group 3</b>	15	0	0	1	6.7

## DISCUSSION

The current results are comply with the previous claims adapted by **Kudouda (1985)** and **Acero-Camelo *et al* (2008)**, who authenticated that supplementation favours litter size positively, **Ikwuegbu and Ofodile (1994)** and **Gubartalla *et al* (2002)** findings are in consistent with the present results. The positive impacts of the type of concentrate ration on litter size reflect the importance of plane of nutrition on goat production systems. **Sachadeva *et al* (1973)** advocated that the level of feeding goats affects litter size.

Goats are the most prolific domesticated ruminants under tropical and subtropical conditions, and able to breed throughout the year (**Greyling, 1988**). The results the dealing with kidding rate in the present study are similar to results of **Alexandre *et al* (2001)** who reported 90.5% for kidding rate for Creole goats. The present results however are higher than that observed by **Saddul *et al* (1999)**, **Kale and Tomer (1999)** who reported 51.98± 2.11% for kidding rate and **Kumar *et al* (2002)** 83.6% for kidding rate in Kutchi goats.

The highest kidding rates were obtained in goats that had been offered concentrate ration prepartum. Nonetheless, it was observed that goats that had been supplemented with concentrate ration were serviced and conceived within a shorter time compared with the control group, similar results were obtained by **Alexandre *et al* (2001)** for Creole goats, however, the present results are higher than that reported by **Saddul *et al* (1999)**, **Kale and Tomer (1999)** and **Kumar *et al* (2002)** for Kutchi goats. This could be attributed to the supplementary feeding which had led to increased goat fertility, hence, leading to high kidding rate. Plane of nutrition, body weight of the mother and system of management were found to be an important factor to improve kidding percentage (**Sachadeva *et al*, 1973**). Clearly, there confirmed that maintenance of pregnancy was supported by prepartum supplementary feeding. This is in agreement with the findings of **Oyeyemi and Akusu (2002)** who reported that high fertility and prolificacy were observed in the highly supplemented groups. Similar results were

obtained by **Hossain *et al* (2003)** and **Joshi *et al* (2004)** who claimed that the number of pregnant does were higher in high energy supplemented groups. The obtained postpartum weight in the concentrate ration supplemented goats was higher than un-supplemented control group, and this could be due to the prepartum supplementary feeds. It's evident that the prepartum supplementation increased weight in this study. These results also are on line with the findings of **Ebro *et al* (1998)**, **Totanji and Lubbadah (2000)** in Shami goats, **Madibela *et al* (2002)** and **Madibela and Segwagwe (2008)** who reported that supplementation of grazing goats with concentrate and or Lablab hay resulted in increasing live weight gain.

The value of body weight at weaning was very high for the concentrate ration supplemented goats compared with the un-supplemented goats. The change in body weight mass after parturition throughout the lactation and weaning periods was highly significant. This could be due to the high milk secretion for offspring. Similar results were reported by **Gubartalla *et al* (2002)** who reported that in early lactation the dry matter intake was low and the daily milk yield was high so the energy supplies is below maintenance and milk production requirements, so more energy was mobilized from body reserve resulted in animal losing weight. The results of this study also showed positive utilization of the supplementation feeds, however, a significant body weight gain or /loss in supplemented groups compared with non-supplemented groups showed positive influence of concentrate supplementation during pregnancy in goats which reduced the mass losses throughout the entire lactation period. These findings are in agreement with data reported by **Guessous *et al* (1989)** and **Hussain *et al* (1996)** who reported that a decrease in quantity and quality of available biomass as grazing progressed was accompanied by loss of live mass in non-supplemented ewes. The results also agreed with **Oyeyemi and Akusu (2002)** who reported that the nutrition have a significant influence on mass changes at different period of gestation and in the pre weaning period. Confirming that adequate feeding prevents large losses in body weight at time of parturition and pre weaning post body weight. Non-supplemented grazing goats with concentrate ration had longer kidding interval compared with supplemented goats, considerable evidence showed that adequate feeding prevents large losses in body weight at time of kidding and therefore reducing the time to reinstate ovarian activity. These results were in consistent with **Chiboke *et al* (1988)** and **Chowdhury *et al* (2002)**.

The service period in present study was similar to those reported by **Gubartalla *et al* (2002)** and **Malau-Aduli *et al* (2005)** in Sudanese Nubian goats; and higher than that reported by **Akusu and Oyeyemi (1998)** and **Greyling (2000)**, while it was lower than that reported by **Rout *et al* (2000)** and **Hassan *et al* (2007)**. The difference in service period and kidding interval in the present study and other studies could be due to different management practices and levels of nutrition. The nutritional stress appears to be a prime probable cause of cyclicity and long kidding interval in the goats, body weight changes support this hypothesis.

Milk fat and total solid content of the control group was significantly ( $P < 0.05$ )

higher than that of concentrate ration supplemented groups, and this may be a reflection of the low milk yield; since fat content and yield are inversely proportional. Similar results were obtained by **Gubartalla et al (2002)**, **Min et al (2005)** and **Stella et al (2007)** who reported that average of fat and protein were lower in milk of goats given zero concentrate compared with other supplemented groups. This result confirms with **Fedele et al (2000)** who reported that increasing the level of energy intake in dairy goats improved their milk yield and decreased the fat percentage. The fat content observed in the present study was lower than that reported by **Ciappesoni et al (2004)** and **Zahraddeen et al (2007)**, 4.77%, and higher than that obtained by **Szymanowska and Lipecka 2000**, 3.4% in Poland goats. The milk protein, lactose and ash were not affected by the concentrate ration types, but the protein content in the present study was higher than that reported by **Szymanowska and Lipecka (2000)**, and lowered than that reported by **Zahraddeen et al (2007)**.

Supplementation with concentrate ration to grazing goats reduced the incidence of abortions, while it was high in the unsupplemented goats. Similar results were reported by **Joshi et al (2004)**, **Mellado et al (2006)** and **Tedonkeng-Pamo et al (2006)** who reported that abortion rate may be increased or lowered according to feed condition. The causes of abortion may be due to infection of vibriosis bacteria and may be also due to environmental agent and/or deficiency in feed nutrient, since the shortage of energy especially under range conditions are known to cause abortion in goat (**Tedonkeng-Pamo et al, 2002**). The mortality rate presented in the present study was lower than that obtained by **Mahanjana and Cronje (2000)** in South Africa goats, and higher than that observed by **Rout et al (2000)** in Jamunapari goats (3.4%). The low mortality rate may reflect the good management that was practice during the study.

## CONCLUSION

The results showed that concentrate supplementation improved reproductive and productive traits of Taggar goats under grazing condition. However, animals lost live weight without supplementation under the same feeding regime. Therefore, supplemented of grazing goats with concentrate ration may be suggested to optimize growth performance. Further studies with different levels of concentrate supplementation may be conducted using large number of animals for a longer period to get more detailed information related to reproductive performance.

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الإدءاء الإنتاجى والتناسلى لماعز النقر تحت مستويات غذائية مختلفة تحت نظم المراعى الجافة بجنوب السودان

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#### الخلاصة

هذه التجربة أجريت في الماعز النقر لتقييم تأثير عليقتين مختلفتين علي بعض المميزات التناسلية والإنتاجية. سبعة واربعون (٤٧) عذرة بالغة من النقر استعملت في هذه التجربة. إخضعت الحيوانات لثلاثة أنظمة غذائية اعتماداً علي الوزن الحي للماعز وفقاً للتصميم الكامل العشوائية. أشارت النتائج بان الماعز التي اعطيت علائق اضافية سجلت أعلى نسبة مواليد للبطن الواحدة 1.50 و ١.٣٣ مقارنة بالماعز الشاهد ١.٢. كما ان نسبة الولادات كانت مرتفعة في المجموعة التي اعطيت علائق اضافية بنسبة ١٠٠% مقارنة بمجموعة حيوانات الشاهد ٩٣.٨%. وزن الجسم عند زمن الولادة والفظام كان أكبر في الحيوانات التي اعطيت العلائق الاضافية مقارنة بحيوانات الشاهد. اوضحت النتائج ان العلائق الاضافية قللت من الفقد في وزن الجسم خلال موسم الحلب. الفترة بين ولادتين متتاليتين كانت أقصر ٢٤٧.٨١±٨.٣٨ و ٢٤٢.٦٠±٧.٨٨ في المجموعات ٢ و ٣ التي أعطيت علائق اضافية مقارنة بمجموعة الشاهد ٢٨٨.٩٤±٦.٨٤. ايضاً دورة الشبق التالية كانت أقصر في المجموعات التي أعطيت علائق اضافية مقارنة بمجموعة الشاهد، حيث كانت ٧٤.٣٢±٤.٩٨، ٨٣.٤٦±٤.٦٧، و ٩٣.٠٨±٤.٢٢ للمجموعة ٢، ٣، و ١ علي التوالي. نتائج تحليل تركيب اللبن اوضحت ان المجموعات التي غذيت علائق اضافية سجلت نسب عالية في محتويات البوتين، اللاكتوز والمواد الصلبة الكلية، في حين ان نسبة الدهن كانت مرتفعة في مجموعة الشاهد. العلائق الاضافية التي غذيت بها الماعز قللت من عدد الماعز التي أجهضت ومن معدل الاجهاض والنفوق مقارنة بالماعز التي لم تعطي علائق اضافية. خلاصة ان العوامل البيئية المختبرة قد أثرت علي المميزات التناسلية والإنتاجية للماعز النقر في ظل الظروف الطبيعية للمناطق الجافة.