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Effect of castration on feedlot performance and some serum metabolites of Nubian male kids

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Abstract

Ten male Nubian kids, 6 months old, were used to investigate the effect of castration on production performance and some blood metabolites (glucose, total cholesterol, total protein, albumin, globulin, urea and uric acid). Five males were castrated using Burdizzo method, while equal number and weight of animals remained intact. The kids were individually accommodated and fed *ad libitum* on a concentrate diet and roughage. The examined traits were taken from both of the experimental groups for two weeks adaptation period followed by eight weeks experimental period. Independent student t-test was used to examine the significance of differences between the intact and castrated Nubian kids. The study showed no significant differences between the two experimental groups on most of the examined feedlot performance traits and blood metabolites. Intact kids had significant higher weight gain and blood urea. Blood glucose level was significantly higher for the castrated kids. The study concluded that castration of goats exerted no effect on feed consumption and metabolism. The study gave encouraging highlights on castrating bucks to fulfill goat meat market options.

Key words: Castration, Feedlot, Goats, Metabolites, Nubian

Introduction

Total goats' population in the Sudan is about 43 Million heads; out of this population 70% Nubian goats (MAR, 2008). Nubian goats are mainly kept for dairy production. Most of the dairy goats' male kids are not being kept as future flock sires. However, males are usually castrated and culled as a meat source) Ensminger and Parker. 1986).

Goat meat accounts for about 30% of meat consumed in Africa (Reed *et al*., 1988) and most people prefer goat meat to other kinds of meat (Devendra and McLeroy 1982). This preference is due to attributes such as high tenderness and juiciness (Babiker *et al*., 1985). Intact male goats will develop a very offensive odor as they mature, particularly during breeding season. Breeders producing for meat know that intact bucks when used for meat, the "buck odor" most often can be a problem in the overall taste of the meat. Bretschneider (2005) noted that un-castrated and sexually mature goats are difficult to sell or they may have low market price because of their strong male taint. He added that castration in goats has an advantage of eliminating the strong male odor present in bucks. In addition as bucks mature, they often become more aggressive and are likely to butt humans. Since castrated animals are usually less aggressive and easier to manage so castration enhance on-farm safety for animals, producers and employees (ESGPIP, 2008). They also noted that castrated sheep and goats prevent breeding of related individuals (inbreeding) that can result in genetic defects, poor growth rate and other problems, as males and females are traditionally allowed to run together.

Castration affects animal growth and carcass composition as it alters metabolism (Solomon et al., 1991). ESGPIP (2008) mentioned that castration could retard growth and reduce the quantity of lean meat if done late (after 6 months of age). It also noted that carcasses from castrated sheep and goats have more fat tissue. The biochemical traits as blood metabolites for domestic animals have been investigated as indicator for metabolism (Zubcic, 2001). However, few studies have been carried on indigenous goat breeds of the Sudan (Hassan, 1967). This study was initiated in order to investigate the effect of castration on feedlot performance and metabolism of Nubian yearling bucks.

Materials and Methods

The experiment was conducted at the Animal Production Research Center, Small Ruminants' Research Department, Khartoum, Sudan. Ten male Nubian kids of body weights ranging between 9-14 kg and at sexual maturity age (about 6 months) were used. The animals were divided randomly into two groups (each of 5 animals) of matching average body weight (14.6 ± 3.41 kg for group A and 14.8 ± 3.36 for group B). Group B was randomly selected to be castrated using Burdizzo castrator; whereas those of group A remained intact.

Animals were kept individually in pens of a concrete floor, roofed with zinc sheets and well ventilated. The animals were treated against endo- and ecto- parasites by subcutaneous Ivomec injection (1 ml/50kg). Animals were fed *ad libitum* on chopped Abu70 and a concentrate diet which included crushed sorghum grains 50%, wheat bran 22%, groundnut cake 25%, lime stone 2% and salt 1%. The feed was offered daily in one meal at morning at the rate that assures 10% weigh back as refusal and this was adjusted weekly. Lick stone and clean water were available all the time. Live body weight was taken weekly throughout the experimental period in the morning before blood sampling and feeding. Three ml of blood were bled through the jugular vein using disposable syringes weekly throughout the experimental period. The blood metabolites included: glucose, total cholesterol, total protein, albumin, globulin, urea and uric acid. The metabolites were analyzed spectrophoto-metrically using commercially available diagnostic kits (Crescent Test kits, KSA).

Statistical Analysis

The data of daily dry matter intakes (absolute and percentage of body weight), weight gain, feed conversion ratio and the blood metabolites between intact and castrated kids were tested by independent t-test (StatSoft, 2010).

Results and Discussion

Table 1 showed the daily dry matter intake (DMI), weight gain (Wt gain) and feed conversion ratio (FCR) of intact and castrated kids. The dry matter intake as percent of body weight (DMI %) in this study is consistent with that of Garray (2005) who noted that for the same breed the DMI% ranged between 3-5%. Similar to the present DMI% results, Mohammed (1994) also found that castrated kids had an insignificant decrease in feed consumption. The findings of the weight gain were found significantly ($p<0.05$) higher for the intact kids than that of the castrated ones. This may be attributed to the fact that testosterone hormone is considered as a growth promoter and responsible for the distinguishing characteristics of the masculine body (Ismail, 2006). Similarly, Mahgoub and Lodge, (1998) reported that among species/sex/slaughter weight groups, castrated male and female goats had the lowest growth rate. Murray et al. (2001) reported that the growth rate of entire Boer and feral backs were significantly higher than those of castrated respective. The values of body gain in the present study were in agreement with that reported by Gubartella et al. (2002) for Nubian male kids (ranged between 56 and 80 g/ day). Garray (2005) reported that the extra activities of goat and their relatively high maintenance requirement caused poor growth rate when compared to sheep. The feed conversions ratio were similar ($p>0.05$) for the castrated and intact kids. Similar observations were reported by Babiker et al. (1985) and Muhammad (1994) for entire and castrated goat kids. The insignificant superiority of intact kids of the present study could be attributed to the effect of testosterone hormone that is known to increase the efficiency of dietary nitrogen utilization (Garray, 2005). This ultimately increases muscle protein accretion in intact kids (Morgan et al., 1993).

Table 2 shows the levels of the examined blood metabolites of the intact and castrated kids. The concentration of glucose was significantly ($p<0.05$) higher for the castrated kids than that of intact ones. This difference may be attributed to the sex influence on the glucose values in young goats as reported by Mbassa and Poulsen (1991). The present glucose results were consistent with the normal range reported for goats (50-75 mg/dl) by Dhanotiya (2004). However, the present results were lower than 66.3 mg/dl obtained by Turner et al. (2005). This difference may be attributed to the difference in breed, age or feed consumed (Mbassa and Poulsen, 1991).

It was observed (Table 2) that there were no significant ($p>0.05$) differences between the two groups of kids in total cholesterol, total protein, albumin, globulin and uric acid levels. Consistently, Madruga et al. (2001) noted that castration had a significant effect on total cholesterol contents in castrated goat meat but not in plasma's cholesterol due to the fact that castration deposited more fat and cholesterol in tissues rather than in plasma.

The concentration of the total protein reported in the present study was comparable to the normal range of goats (6.4-7g/dl) reported by Dhanotiya (2004) and lower than 7.48 ± 9.4g/dl demonstrated by Zubcic (2001). These differences may be due to the influence of breed, age or feed that fed to goats (Mbassa and Poulsen (1991). The concentrations of albumin observed in the present study were higher than that reported by Dhanotiya (2004) (2.7 -3.9g/dl) and Zubcic (2001) (3.3 ± 6.1g/dl). These findings of blood globulin levels were lower than the range 2.7 - 4.1 g/dl noted by Dhanotiya (2004).

Table (2) also illustrated that blood urea level was significantly ($p<0.05$) higher for the intact than that of the castrated kids. This may be due to the fact that the usual quantity of testosterone hormone secreted by the testes during active sexual life increased the digestion efficiency of protein resulting in increased blood urea level (Lee et al., 1990). The present findings of urea levels were higher than the normal range (10–20 mg /dl) noted by Dhanotiya (2004). This may be due to more protein in diets. Schmidely et al. (1999) concluded that any increase in protein intake causes increase in blood urea level. The concentration of uric acid was not significantly ($p>0.05$) different between the intact and the castrated kids. This result coincided with the normal range of goats (0.3–1 mg/dl) noted by Dhanotiya (2004).

Castration had no effect on most of feedlot performance traits and blood metabolites. The study gave encouraging highlights on castrating bucks to fulfill goat meat market options as reduction of ill-smell in the meat. However, the study was based on a rather small number of observations; therefore, large sample of animals is recommended for future research.

Table 1: Feedlot performance of the intact and castrated Nubian kids

Parameters	Intact ± SD	Castrated ± SD	P value
DMI (g/day)	751±31.84	585.5±4 9.7	NS
Initial body weight (kg)	14.6±3.41	14.8±3.36	NS
Final body weight (kg)	17.5±3.50	16.3±4.28	NS
Daily weight gain (g/day)	103.5±14.09	76.2±14.4	.05
FCR (g DMI/g weight gain)	7.3±2.83	7.8±0.88	NS
DM%	5.1±0.96	3.9±0.4	NS

*Significant ($P<0.05$); DMI: Dry mater intake; FCR: Feed conversion ratio; DM%: dry mater intake as percentage of live body weight

Table 2: Blood metabolites levels of the intact and castrated Nubian kids

Parameters	Intact ± SD	Castrated ± SD	P value
Glucose (mg/dl)	55.3±9.4	61.4±15.8	.05
Total Cholesterol (mg/dl)	70.8±20.4	58.5±18.1	NS
Total protein (g/dl)	6.03±0.8	6.4±1.3	NS
Albumin (g/dl)	4.2±0.5	4.2±0.5	NS
Globulin (g/dl)	1.9±1.0	2.2±1.3	NS
Urea (mg/dl)	57.2±19.7	51.5±11.2	.05
Uric acid (mg/dl)	0.3±0.4	0.5±0.5	NS

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