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Comparative Growth Performance and Carcass Characteristics of Jamunapari, Barbari and their Crossbred under Stall Fed Condition

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ABSTRACT

Background: Large variation for body size and weight exist among indigenous goat breeds. Many livestock development agencies recommending crossbreeding of large size goats with small and medium sizes to increase the body size, growth rate, dressing weight and dressing percentage of progeny without being systemic data and combining ability among breeds used. In view of above crossbreeding experiment was conducted by crossing Jamunapari male with Barbari female.

Methods: Ten Barbari females were crossed with medium size two Jamunapari male. The crossbred males (07) were kept under stall feeding on high input diet along with Barbari and Jamunapari pure-bred males at weaning. The growth (body weight and average daily weight gains) were studied up to 9 months of age. The animals were slaughtered at 9 months and carcass traits (dressing weight and percentage) were studied.

Result: Pre-weaning growth (0-3m) was statistically similar (P>0.05) in all the group of goats. However different trend was obtained in post weaning growth stage, ADG being significantly (P<0.05) more in Jamunapari breed (94.10g) as compared to Barbari (73.43g) and crossbred goats (74.24g). The dressing (%) was significantly (P<0.05) higher in Jamunapari goats (47.28) as compared to Barbari (40.47) and crossbred (40.44). The carcass results revealed that growth and carcass performance was highest in Jamunapari kids and significantly different from pure bred Barbari and crossbred kids. However, Carcass traits (Carcass weight and Dressing percent) performances were not significantly different in between Barbari and Jamunapari x Barbari crossbred kids. Thus, crossing of Jamunapari with Barbari breed is not being suggested to increase body weight and carcass attributes of crossbreed progeny.

Key words: Barbari, Crossbred, Carcass characteristics, Growth, Jamunapari.

INTRODUCTION

There are 34 registered breed of goats in India with their home tract (NBGAR 2020). These breeds vary in their potential for production of meat, milk, skin and fibre. Large variations also exist globally among goat breeds and crossing of Indian goat breeds with exotic breeds could not yield satisfactory and sustainable improvement and thus discontinued (Rai *et al.* 2005 and Singh *et al.* 2014). Crossbreeding experiments involving native breeds was also initiated under AICRP to increase genetic potential for body weight with large size breeds like Jamunapari and Beetal (improver breed). Results revealed that crossbred exhibited high magnitude of improvement in milk yield (76.3% to 91%) and body weight (20-52%) over the breeds of low potential (small size goat) such as Beetal x Bengal as compared to less divergent breeds like Beetal x Sirohi. (Singh and Sengar, 1990 and Singh *et al*. 1991). However, performances of crossbred goats for reproductive traits and meat and quality were significantly deteriorated. However, several reports indicated that body weight (growth) performance of crossbred kids excelled over body weight of smaller size goat breeds under optimum/intensive feeding conditions (Singh *et al.* 2000, Nahardeka *et al.* 2002, Amin *et al.* 2000, Patel *et al.* 2005 and Bhowmik *et al.* 2014) and crossbreeding among native breeds should be exploited for commercial goat farming (Shrestha and Fahmy, 2007). However, combining ability of breeds involved in crossing is important aspect as performance of the many crossbreds compositions do not perform well inspite of large variation in their body size. Therefore, identification of suitable breed with respect to combining ability and meat quality should be explored before allowing crossbreeding at field level. In recent past crossbreeding among indigenous breeds with large x small, large x medium and medium x small sizes goat breeds was implemented by several state animal husbandry departments in their respective states (Uttarakhand, Himachal, Uttar Pradesh). Beetal, Sirohi and Jamunapari were mostly used as improver goat breeds.

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Progressive farmer's and some NGO's are also doing crossbreeding among indigenous goat breeds to explore higher carcass yield and to develop synthetic breeds suitable for their agro-climatic conditions such as Jamunapari x Sirohi, Sirohi x Barbari, Jamunapari x Barbari and Jamunapari x Sirohi x Jakhrana. Good demand at higher price has been emerging for these genetic groups (cross-bred or graded goats). It was also observed that some (10-20 year) crossbreed progeny outperform and rest of the crossbred goats performance was similar to small size breed being used in cross- breeding.

Barbari is a dual purpose (meat and milk), medium sized goat breed, widely known for prolificacy- fecundity, reproductive efficiency, milk yield, faster weight gain (body weight), quality and delicious meat and adaptability over wide range of agro-climatic conditions and feeds (Singh *et al*. 2020 and 2021). Whereas, Jamunapari is largest body size goat also known for high milk yield in Asia (Singh *et al*. 2009).

Limited information is available on overall productivity of crossbred *viz*-a-*viz* purebred based on systemic experiments particularly on Jamunapari x Barbari. Improvement in the body weight and carcass quality of the cross bred of Jamunapari and Barbari is expected. Keeping above facts in view and generate reliable productive data on crossbreeding among indigenous goat breeds present experiment was conducted.

MATERIALS AND METHODS

The present experiment was conducted during 2019-20 at cross-breeding unit at ICAR-Central Institute of Research on Goats, Makhdoom, Mathura. Ten multiparous Barbari females (2nd to 4th parity) were naturally mated with Jamunapari males (2 in no) of known pedigree and adult average body weight (43kg) in autumn season (Oct-November, 2019). Male and females used in this experiment were selected from the Nucleus breeding Flock of Jamunapari and Barbari unit at ICAR-Central Institute of Research on Goats, Makhdoom, Mathura. Jamunapari and Barbari females were mated with their corresponding male. All animals were vaccinated and dewormed before breeding season. Pregnant goats were kept in semi-intensive management system and were fed with concentrate, dry and green fodders along with 5-6 hour grazing. The newly born kids were weighed on digital balance and birth weight was recorded.

Kids were fed with colostrum within half an hour of their birth. These kids also allotted an identification number. The kids suckled their dams, twice in the morning and evening upto weaning at 3 months of ages. Kids were provided with green leaves/fodder and mash concentrate mixture after 2 weeks of age. Kids were kept in group housing before weaning and thereafter, weaned at 3 months of age. Kids were vaccinated in phase manner for PPR, HS, ET, FMD and JD after 3 months of age. Drenching was carried out as per prophylactic health calendar of the institute. Each kid was assigned an identification number by ear tattooing; and date of birth, sex, birth type and body weights were recorded. Under this experiment 8 Jamunapari, 8 crossbred (Jamunapari x Barbari) and 6 Barbari male weaned were reared under stall feeding up to 9 months of age. All the animals were housed in individual cage and feeding was done individually. These kids were fed with concentrate pellet having 16% Crude protein (CP), green fodder and dry fodder (gram straw). Daily intake of concentrate pellet, green fodder and gram straw were recorded. The representative sample of feed offered and refusal was collected daily and pooled for estimation of monthly dry matter. The DM was estimated by drying samples at 100±2°C in hot air oven to a constant weight. Body weights of each animal in each group were recorded at monthly intervals in the morning before feeding and watering. After attainment of 9 months of age the animals were slaughtered to study their carcass characteristics. Goats were fasted for 16–18 h with free access to water. Dressed carcass comprised the body after removing head, skin, feet, non-carcass fats and the viscera. The hot carcass was split into fore and hind quarter at the intersection of 12th and 13th vertebrae. Carcass traits were studied by weighing of the carcass parts.

The experimental data generated were analyzed using ANOVA as per Snedecor and Cochran (1989) according to a complete randomized design using statistical software package (SPSS) and means were compared using Duncan's multiple range test. Individual animals were considered as experimental units. The difference between means was significant at 95% significance level ($P < 0.05$).

RESULT AND DISCUSSION

The weight of kids at birth, 3, 6 and 9 months and Average daily gain (ADG) 0-3 months, 3-9 months in Barbari, Jamunapari and their cross bred male kids is presented in Table 1. The average litter size in Barbari, Jamunapari and crossbred was 1.5, 1.43 and 1.88 respectively. The birth weight (Kg) was significantly ($P<0.05$) higher in Jamunapari kids (4.56) as compared to Barbari (1.65) and Crossbred (2.06). The birth weight of Barbari and crossbred kids were statistically similar. The crossbreeding was conducted to improve the weight over Barbari breed but no improvement was reported. There was no significant ($P>0.05$) improvement of body weight at 3 and 9 months of cross bred male as compared to Barbari goats. Jamunapari goats have significantly ($P<0.05$) higher body weight as compared to both Barbari and cross bred (Table 1). The dry matter intake (% B. Wt.) varied from 3.82 to 4.32 in different group of goats at different age and was statistically similar between groups. The Jamunapari kid's performance under intensive feeding was in agreement of those reported by Singh *et al* (2010). The average daily weight gain (g) of Jamunapari goats were 69.44 during birth to 3 month and 94.10 during 3-9 months of age while average daily weight gain (g) of Barbari kids were 87.59 during birth to 3 month

Table 1: Comparative growth performance of Jamunapari, Barbari and their crossbred male kids.

Breed	Birth weight (kg)	3 M wt. (kg)	6 Month weight (kg)	9 M wt. (kg)	ADG (g/d) (birth-3 month)	ADG (g/d) (3-9 month)
Barbari (6)	1.65^{b}±0.08	9.53^{b}±0.39	16.57^{b}±1.12	23.0^{b}±0.97	87.59±5.08	73.43^{b}±3.54
	(1.5-2.0)	(8.2-11)	(12.8-20.5)	(19.5-26.5)	(68.89-105.56)	(62.7- 86.1)
Jamunapari (8)	4.56^{a}±0.33	10.90^{a}±0.39	18.31^{a}±0.63	29.10^{a}±1.54	69.44±5.35	94.10^{a}±7.52
	(3.5-6)	(9-12.5)	(15.5-21.0)	(18.0-33.0)	(55.6-100.0)	(44.44- 113.9)
JxB Crossbred (8)	2.06^{b}±0.11	9.47^{b}±0.34	15.91^{b}±0.66	22.57^{b}±1.21	85.00±3.82	74.24^{b}±5.26
	(1.6-2.5)	(8.2-11)	(13.5-19.0)	(19.0-28.0)	(72.22-100.0)	(56.11- 97.22)
Mean	2.72 ±0.29	9.95±0.26	16.82±0.52	24.59±0.87	80.30±3.08	81.36±3.61
P value	0.00	0.034	0.025	0.001	0.111	0.000

^{a,b} Means bearing different superscript in a column differ significantly at 5% level of significance.

Table 2: Comparative carcass characteristics of Jamunapari, Barbari and their crossbred male kids.

Breed	Slaughter weight (kg)	Empty body weight (kg)	Carcass wt. (kg)	Dressing (%)	Fore quarter (Kg)	Hind quarter (Kg)
Barbari (6)	21.75^{b}±0.99	17.85^{b}±0.91	8.83^{b}±0.56	40.47^{b}±0.90	5.02^{b}±0.34	3.82^{b}±0.22
	(18.5-25.0)	(14.74-20.75)	(7.2-10.5)	(37.3-43.5)	(4.0-6.0)	(3.2-4.5)
Jamunapari (8)	24.63^{a}±0.89	21.37^{a}±0.89	11.51^{a}±0.52	47.28^{a}±0.49	6.46^{a}±0.32	5.24^{a}±0.23
	(20.5-29.5)	(17.1-25.6)	(9.55-14.8)	(46.04-50.2)	(5.2-8.3)	(4.3-6.5)
JxB Crossbred (8)	21.31^{b}±0.97	16.92^{b}±0.90	8.61^{b}±0.38	40.44^{a}±0.28	4.89^{b}±0.27	3.73^{b}±0.11
	(18.0-25.0)	(14.0-20.0)	(7.5-10.1)	(39.04-41.7)	(4.1-6.0)	(3.4-4.1)
Mean	22.63±0.62	18.79±0.66	9.72±0.39	42.93±0.77	5.49±0.23	4.30±0.18
Sig	0.042	0.005	.001	0.00	.002	0.00

^{a,b} Means bearing different superscript in a column differ significantly at 5% level of significance.

and 73.43 during 3-9 months of age. Growth performance of the kids was in agreement of those reported by Singh *et al*. (2020, 2021). Cross bred (JXB) was having average daily weight gain (g) 85.00 during birth to 3 month and 74.24 during 3-9 months of age. Pre-weaning growth (0-3m) was statistically similar (P>0.05) in all the group of goats. However different trend was obtained in post weaning growth stage, ADG being significantly (P<0.05) more in Jamunapari breed as compared to Barbari and crossbred goats. These results indicated that performance of Jamunapari x Barbari crossbred kids under intensive feeding management was not significantly (P>0.05) different from pure Barbari goat performance. Thus crossing of Barbari with Jamunapari breed to improve the growth (body weight gain) is not advisable to explore growth performance.

Carcass characteristics

The animals were slaughtered after attainment of 9 months of age. The carcass characteristics of Pure Barbari, Jamunapari and their cross bred is presented in Table 2. The average slaughter weight (Kg) was significantly (P<0.05) higher in Jamunapari goats (24.63) as compared to Barbari (21.75) and Cross bred (21.31). Other carcass attributes like empty body weight, carcass weights, fore quarter and hind quarter weight was significantly (P<0.05) higher in Jamunapari breed as compared to Barbari and Cross bred. Present results were in agreement of those reported by Singh *et al.* (2021). Large variation exists in individual carcass attributes as evident from Table 2. It is obvious on account of their individual growth expression. Higher carcass attributes obtained in fore quarter as compared to hind quarter. All the carcass characteristics were higher in Jamunapari pure-bred as compared to Barbari pure-bred and Jamunapari x Barbari crossbred. It is obvious due to their large body size and higher body weight. The post weaned growth was also significantly higher in Jamunapari kids exhibited up to 114 g/d with an average of 94.10±7.52 g/d. The dressing (%) was significantly (P<0.05) higher in Jamunapari goats (47.28) as compared to Barbari (40.47) and Cross bred (40.44). The carcass results revealed that growth and carcass performance was highest in Jamunapari kids and significantly different from pure bred Barbari and cross-bred kids. However, Carcass traits (Carcass weight and Dressing percent) performances were not significantly different in between Barbari and Jamunapari x Barbari crossbred kids. It might occur due to poor combining ability in between these breeds for growth and carcass traits.

CONCLUSION

Present study concluded that Jamunapari goats ranked first in growth and carcass attributes, which was obvious due to large size. Whereas performance of crossbred kids (Jamunapari x Barbari) is similar to Barbari. Thus crossing of Jamunapari male with Barbari females to obtain higher carcass weight and dressing percentage above and over Barbari breed is not suggestive.

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