Productive performance of Brangus cattle at weaning in grazing conditions in Colombia

Comportamiento productivo de la raza Brangus al destete en condiciones de pastoreo en Colombia

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Abstract

The aim of this study was to evaluate and compare the performance of Brangus calves at weaning under grazing conditions, and determine the influence of the sex on its performance. This study was conducted in the Cartago municipality (Colombia), in a herd dedicated to the production of beef with Brangus breed. The data were analyzed by ANOVA with a 95% significance using the statistical software InfoStat 2015. Full records of second lactation cows that were served by the same bull were evaluated to reduce the error factor. The variables evaluated were: weight at birth, weight at weaning, meat production index and average daily gain (ADG). The following model of age at weaning was considered as a covariate: $Y_{ij} = \mu + T_i + \beta X_{ij} + \varepsilon_{ij}$. The weight at birth was 33.22 ± 1.86 and 31.88 ± 0.89

Resumen

El objetivo del estudio fue evaluar y comparar el desempeño productivo al destete de terneros Brangus en pastoreo, y determinar la influencia del sexo sobre su rendimiento. El trabajo se desarrolló en el municipio de Cartago, Colombia, en un hato dedicado a la producción de carne con la raza Brangus. Fueron evaluados registros completos de vacas de segunda lactancia servidas con el mismo toro para reducir el error. Los datos fueron analizados mediante ANAVA al 95% de significancia en software estadístico InfoStat 2015; las variables evaluadas fueron: peso al nacimiento, peso al destete, índice de producción de carne y ganancia diaria de peso (GDP), y se consideró como covariable la edad al destete mediante el siguiente modelo $Y_{ij} = \mu + T_i + \beta X_{ij} + \varepsilon_{ij}$. Para machos

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kg for males and females respectively, weight at weaning was 246.00 ± 51.69 and 225.81 ± 21.78 kg respectively, rate of production was 0.64 ± 0.12 and 0.62 ± 0.05% respectively, ADG was 890 ± 280; 850 ± 100 grams/day respectively, and age at weaning of 251.78 ± 44.01 and 228.19 ± 16.30 days respectively. Only statistical significant difference for weight at birth (p = 0.0286) was observed. In conclusion, both males and females Brangus showed differences in birth weight; however, differences in meat production levels are not significant since these reach at weaning similar weight, meat production index and average weight gain. In this sense, the productive trend may be similar at post-weaning stage, being feasible to employ both males and females interchangeably for the production of beef; additionally, the heifers can arrive faster at age for bull service.

Keywords: Adaptation, Grazing, Sustainable Production, Profitability.

y hembras, el peso al nacimiento fue 33,22 ± 1,86 y 31,88 ± 0,89 kg, respectivamente; el peso al destete, 246,00 ± 51,69 y 225,81 ± 21,78 kg, respectivamente; el índice de producción de carne, 0,64 ± 0,12 y 0,62 ± 0,05%, respectivamente; GDP, 890 ± 280 y 850 ± 100 gramos/día, respectivamente, y la edad al destete, 251,78 ± 44,01 and 228,19 ± 16,30 días, respectivamente. Solo hubo diferencia significativa para peso al nacimiento (p = 0,0286). En conclusión, machos y hembras Brangus presentan diferencias de peso al nacimiento, pero ninguna significativa a nivel productivo, puesto que alcanzan un peso al destete, un índice de producción de carne y una ganancia de peso similares. En este sentido, es posible que la tendencia productiva sea similar en la etapa post-destete, siendo factible emplear machos y hembras de forma indistinta para la producción de carne; también, las novillas llegarán más rápido a la edad de servicio por toro.

Palabras clave: Adaptación, Pastoreo, Producción sostenible, Rentabilidad.

Introduction

In systems of beef production, weaning weight and weight at 24 months is very important since it influences economic efficiency of any system of cattle production in pasture grazing (1, 2, 3). The growth at pre and post-weaning is an important component to be evaluated in order to estimate the profitability in the production of beef, in addition to the reproductive efficiency of the cow (4).

In tropical environments, the use of the *Bos t. taurus* x *Bos t. indicus* cross-breed cattle is a very useful tool to improve productive rates of a settlement (5). Through the introduction of Brangus and Brahman genetics to Angus, the Brangus cattle (Angus plus) derived from purebred lines between 65% and 96% Angus or Brangus and a minimum of 4% Brahman, offers advantages both for rough and humid environment as low quality forage (6).

The cross-breed of cebu by *Bos t. taurus*, using F1 cows for breeding, achieved an increase of 25 to 35% in kg of calf weaned per cow. This increase in productivity is the result of a combination of factors, being the most important the rate of survival of calves and the maternal ability of crossbred cows (7, 8, 9, 10), the reproductive behavior of breeding cows and the weight gained by the calves at weaning are the key component of the productivity of the herd, since this group consumes of the most of the food (10).

The climate is a factor that affects production efficiency for several reasons, such as permanent heat stress, poor pastures, scarcity or excess water, aspects related to times and critical phases of the animal (7). Colombia has a great diversity of climates and ecological regions (11), that challenges the ability of a breed to be adapted and productive in all environments (2).

The genetic identification of superior individuals allows to improve the efficiency of production and desirable characteristics of the final livestock product. The use of criteria for an objective selection in cattle, as predictions of breeding values, requires the characterization of the cattle according to genetic and non-genetic influences, and these are considered in the model of evaluation (12, 13, 14). The most common way to use zebu livestock, is in the crosses with synthetic and European races in different proportions, such as Braford and Brangus 1/4, 3/8, 5/8, and others (15). For this reason, farmers in Colombia have imported semen and animals of various beef breeds (Angus, Brangus, Senepol) to increase growth and improve the carcass traits (2).

The aim of this article is evaluating and comparing the performance of the weaning of Brangus calves under grazing conditions and determining the influence of sex on his performance in a herd of Cartago (Colombia).

Materials and Methods

The work was developed in the farm "Jazmin" located in the inspection of Zaragoza, Cartago, (Valle del Cauca), at 900 MAMSL, annual rainfall average of 1800 mm, average temperature of 25 °C and relative humidity of 60%, area classified according to the Holdridge life zones as Tropical dry forest (16) (17).

The place is dedicated to bovine meat production from breeds such as Angus and Brangus, under grazing in meadows with a predominance of African Star grass (*Cynodoplectostachyus*). The calves remained with their mothers from birth until weaning. To reduce the random error factor, full records of Brangus cows were assessed in 2008, only took into account second-lactation cows and served by artificial insemination with the same Bull. From 32 records, only a total of 25 complete records were found, where nine (9) corresponded to males and 16 to females.

The data were analyzed using the Software InfoStat version 2015, due to sampling heterogeneity, an analysis of variance was used with test comparisons Fisher LSD at a level of significance of 95% ($p < 0.05$) (18). The variables evaluated were weight at birth, weaning weight, meat production index and average daily gain (ADG), and the age at weaning was considered as a covariate taking into account the following model:

$$Y_{ij} = \mu + T_i + \beta X_{ij} + \varepsilon_{ij}$$

Where μ is the general mean, due to the effect of the i-th treatment; β is the unknown parameter that represents the rate of change of Y and unit change of X; Xi is the covariate and εij is the random error associated to the experimental unit (18).

Results and Discussion

From summary measures such as central tendency, statistics were made for both males and females as shown in table 1.

Table 1. Measures of Central Tendency for Variables and Covariates of Weight in Males and Females Brangus at Weaning.

Sex	Variable/Covariable	n	Average	S.D	CV	Min	Max
F	Weight at birth, kg	16	31.88	0.89	2.78	31.00	34.00
	Age at weaning, days	16	228.19	16.30	7.14	203.00	255.00
	Weight weaning, kg	16	225.81	21.78	9.64	190.00	266.00
	Meat production index	16	0.62	0.05	8.78	0.51	0.70
	ADG, g/day	16	0.85	0.10	11.32	0.72	1.03
M	Weight at birth, kg	9	33.22	1.86	5.59	30.00	36.00
	Age at weaning, days	9	251.78	44.01	17.48	223.00	367.00
	Weight at weaning, kg	9	246.00	51.69	21.01	118.00	291.00
	Meat production index	9	0.64	0.12	18.50	0.35	0.75
	ADG, g/day	9	0.89	0.28	31.05	0.38	1.30

n: simple size, S.D: standard deviation, CV: coefficient of variation, Min: minimum value, Max: maximum value, ADG: average daily gain

Worth noting the high weight gain in females and males whom over a period of 7.5 and 8.0 months of growth respectively, reach weaning weights exceeding 225 kg, with Average Daily Gain – ADG more than 850 grams, that are high for grazing under tropics Colombian, because (2, 19, 20, 21) the reported weigh weaning is of 191 ± 32 kg, 177.6 ± 29 kg, less to 160 kg, and 151 ± 35.7 kg respectively; and ADG less to 380 g and 636 ± 122 g (20,19) respectively.

The studies carried out by (22, 23, 24, 25, 26) found an average weight at weaning unadjusted in calves Brangus 145 ± 43 kg; 206.3 ± 3.9 kg; 222.6 ± 39.1 kg, 222.46 kg and 141,37 kg respectively, being a lower parameter regarding to this work. Further, for (3) Angus was found that the weight at weaning in males and females were of 273.8 ± 6.6 kg and 246.5 ± 6.9 kg respectively, being higher than this study. In addition, (14) it was found that animals with genetic Angus between 60 and 65% and the remaining Brahman (Brangus cattle) have higher weights at weaning with 230 and 229 kg respectively, being lower than males, but slightly higher than females in this work.

In Figure 1, it is observed that there is a significant statistical difference ($p = 0.0286$, $F25 = 5.49$) between birth at weight of 33.26 kg and 31.85 kg in males and females Brangus in grazing conditions, respectively.

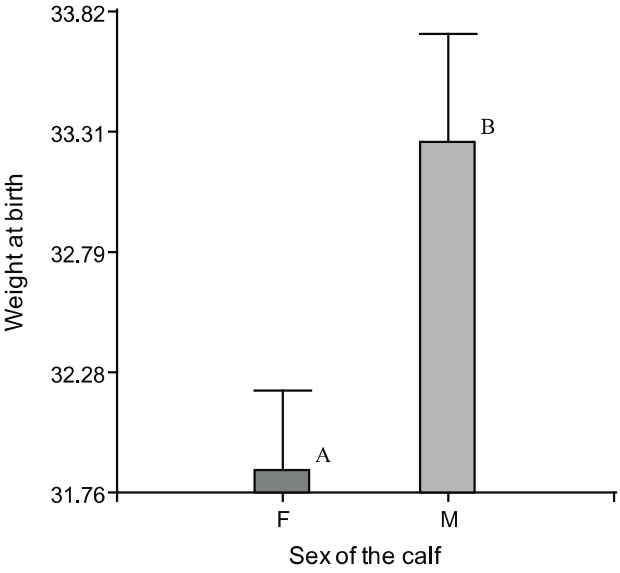

Figure 1. Relation between Sex and Weight at Birth in Brangus Breed in Colombia.

The studies have shown a significant difference between males and females (27) in birth weight, but (3) in Angus plus breed has not a significant statistical difference. For (28) the birth weight of

Brangus 5/8 is 39 kg, which is higher than the one found in this work. The average weight at birth in a multibreed population was 36.3 ± 3.4 kg, higher than the present study (21). In the Northern Great Plains in USA (29) the weight at birth found was 31.2 kg and 40.4 kg in Angus x Hereford and Angus x Simmental cows respectively.

Figure 2 shows that (p = 0.2916, F25 = 1.17) between females (226.82 kg) and males (244.22 kg) there is no significant statistical difference for weight at weaning of calves Brangus under grazing conditions.

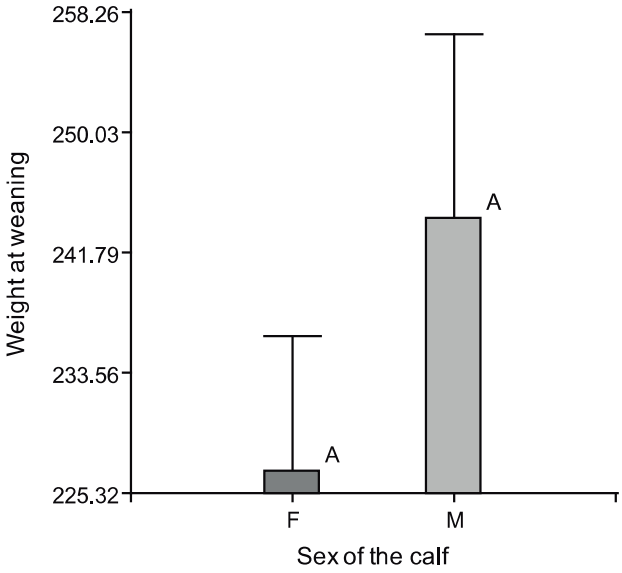

Figure 2. Relation between Sex and Weight at Weaning in Brangus Breed in Colombia.

According to (27, 3) a statistical difference per sex was found in weight at weaning of calves Braford and Brangus plus with 152.3 ± 21.8 kg and 273.8 ± 6.6 kg for males and 142.9 ± 20.4 kg and 246.5 ± 6.9 for females respectively, contrary to this study, which indicates that regardless of the animal´s sex, under similar conditions of handling, Brangus calves will reach a similar weaning weight.

Figure 3 shows that there is no significant statistical difference (p = 0.7790, F25 = 0.08) between the meat production index and the sex of Brangus weaning calves in grazing conditions.

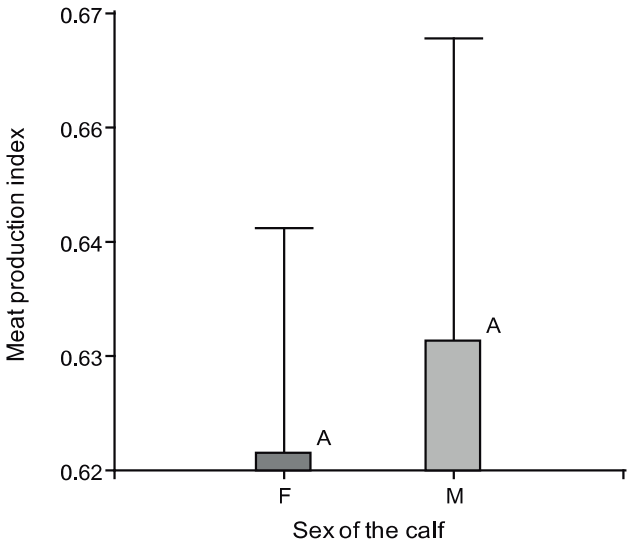

Figure 3. Relation between Sex and the Meat Production Index at Weaning in Brangus.

The meat production index animal Brangus at weaning is of 62% in females and 63% in males, without differences between males and females, indicating that the performance of the two categories is similar.

Figure 4 shows that there is no significant statistical difference (p = 0.2200, F25 = 1.59) between the average daily gain of males (0.93 g/day) and females (0.83 g/day) in Brangus breed under grazing conditions.

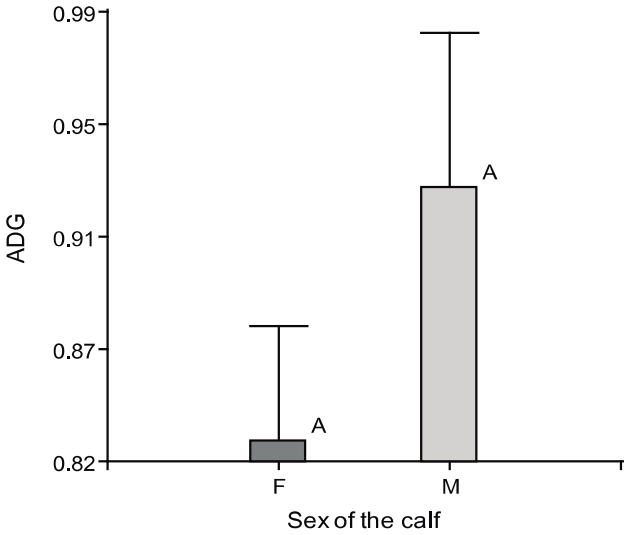

Figure 4. Relation between Sex and Average Daily Gain –ADG– at Weaning in Brangus Breed in Colombia.

For (23, 28), higher weight gains are obtained in calves Brangus 5/8 with an average of 789 ± 16 and 584 grams per day, being a lower parameter than the one found in this work. However, (3) found significant statistical difference between males and females Angus plus, with Average Daily Gain of 1,167.1 ± 19.3 g and 1,031 ± 22.2 g respectively, being a higher parameter than this study. In Florida (30) the weight at weaning in Angus, Brangus, Brahman and Romosinuano breeds was evaluated. These ones were dewormed 90 days prior to weaning, and it was found an overall weight of 237.35 kg, being higher than females but lower than males of this study.

Conclusions

In summary, both males and females of the Brangus breed in grazing presented differences in weight at birth, higher in calves than females; however, these differences at production level of beef are not significant since reached a weight at weaning, meat production index and similar average weight gain. In this sense, it is possible that the production trend will be similar in the post-weaning stage, for which it is possible to use both males and females interchangeably for the production of beef. Further, the heifers can also arrive faster at age for bull service.

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