PERFORMANCE OF HEIFERS FROM DIFFERENT GENETIC GROUPS WITHOUT ANTHELMINTIC TREATMENT

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ABSTRACT

In Andradina, São Paulo state, the degree of resistance against endo- and ectoparasites was evaluated in heifers from three genetic groups: crossbred Nellore x Aberdeen Angus (Nel x AAn; n=12), Guzerá (Guz; n=22) and Nellore (Nel; n=24). During 12 months, the body weight of each animal was recorded every 28 days as well as the number of *Haematobia irritans* flies near the animals, and fecal samples were collected to count nematode eggs per gram of feces (EPG). The Nel x AAn group had higher fly counts in comparison with other groups throughout the experiment. There was a significant interaction (P<0.001) between the number of flies and time, and the difference between groups increased over time. The Nel group had lower mean EPG values in four of the twelve experimental months. The animals of the Nel x AAn group had higher average body weight gain since the beginning of the experiment. There was a significant interaction between weight gain and time (P < 0.001) and the difference in weight of the Nel x AAn group increased over time in relation to the Guz and Nel groups. It can be concluded that the crossbred Nel x AAn females presented superior weight gain in relation to the Guz and Nel groups, although they were more affected by *Haematobia irritans*. In conclusion, the use of crossbred cattle is a good strategy to increase the efficiency of meat production.

Keywords: cattle, weight gain, helminths, horn fly, resistance.

DESEMPENHO DE NOVILHAS DE DIFERENTES GRUPOS GENÉTICOS SEM TRATAMENTO ANTI-HELMÍNTICO

RESUMO

Em Andradina, estado de São Paulo, o grau de resistência contra endo e ectoparasitas foi avaliado em novilhas de três grupos genéticos: mestiços Nelore x Aberdeen Angus (Nel x AAn; n=12), Guzerá (Guz; n = 22) e Nelore (Nel; n = 24). Durante 12 meses, o peso corporal de cada animal foi aferido a cada 28 dias, bem como a contagem do número de moscas *Haematobia irritans* nos animais, e amostras fecais foram colhidas para contagem de ovos de nemátodeos por grama de fezes (OPG). O grupo Nel x AAn apresentaram maiores contagens de moscas, em comparação com outros grupos, durante o experimento. Houve interação significativa (P <0,001) entre o número de moscas e o tempo, sendo que a diferença entre os grupos aumentou ao longo do tempo. O grupo Nel apresentou menores contagens médias de OPG em quatro dos doze meses experimentais. Os animais do grupo Nel x AAn apresentaram

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maior ganho de peso corporal médio desde o início do experimento. Houve interação significativa entre o ganho de peso e tempo (P <0,001) e a diferença de peso do grupo Nel x AAn aumentou ao longo do tempo, em relação aos grupos Guz e Nel. Pode-se concluir que fêmeas mestiças Nel x AAN apresentaram ganho de peso superior em relação aos grupos Guz e Nel, embora elas fossem mais afetadas por *Haematobia irritans*. Em conclusão, a utilização de bovinos mestiços é uma boa estratégia para aumentar a eficiência da produção de carne.

Palavras-chave: bovinos, ganho de peso, helmintos, mosca de chifre, resistência.

DESEMPEÑO DE NOVILLAS DE DIFERENTES GRUPOS GENETICOS SIN TRATAMIENTO ANTIHELMINTICO

RESUMEN

En Andradina, estado de São Paulo, el grado de resistencia contra endo y ectoparásitos se evaluó en tres grupos genéticos de novillas: Aberdeen Angus x Neloré (Nel x AAN; n = 12), Guzerá (Guz; n = 22) y Neloré (Nel, n = 24). Durante 12 meses, el peso corporal de cada animal fue medido cada 28 días, se realizó conteo del número de moscas *Haematobia irritans* sobre los animales y se tomaron muestras fecales para realizar el conteo de huevos de nematodos por gramo de heces (OPG). El grupo de novillas Nel X AAN presentó recuentos más altos de moscas en comparación con otros grupos durante el experimento. Se encontró relación significativa (P <0,001) entre el número de moscas y el tiempo, aumentando dicha diferencia entre los grupos con el tiempo. El grupo Nel presento conteos más bajos de OPG en cuatro de los doce meses de experimentación. Los animales del grupo Nel x AAN tuvieron una ganancia de peso corporal mayor al promedio desde el comienzo del experimento. Se presentó una relación significativa entre la ganancia de peso y el tiempo (P <0,001) y la diferencia de peso del grupo Nel x AAn aumentó a lo largo del tiempo en relación con los grupos de Guz y Nel. Se puede concluir que las hembras mestizas Nel x AAN mostraron un aumento de peso mayor en comparación con los grupos de Guz y Nel, aunque estas fueron más afectadas por *Haematobia irritans*. En conclusión, el uso de animales mestizos es una buena estrategia para aumentar la eficiencia en la producción de carne.

Palabras clave: bovinos, aumento de peso, helmintos, resistencia, mosca de los cuernos.

INTRODUCTION

Brazil currently has more than 211 million cattle (1), and it is the largest commercial beef producer (2). Parasitism is a major problem in cattle breeding, with a large impact on production. There are many reports of losses caused by gastrointestinal nematodes (3,4) and ectoparasites (5,6). The control of these parasites is mainly through the use of endectocides of the macrocyclic lactone class (7). This poses a problem because not only do the drugs belonging this class (abamectin, doramectin, moxidectin and ivermectin) generally have low efficacy to control endopasites and ectoparasites, they are eliminated with feces and act on other fauna, interfering with the harmony of the ecosystem (8).

Although cattle are typically infected by both endoparasites and ectoparasites, studies examining weight gain in relation to infections and parasitic infestations are scarce. Thus, the aim of this study was to evaluate the performance regarding weight gain of heifers of different genetic groups, naturally parasitized by gastrointestinal nematodes and flies of *Haematobia irritans*, without the treatment with anthelmintics.

MATERIAL AND METHODS

The experiment was conducted at the APTA Research Farm in the municipality of Andradina, São Paulo, Brazil (geographical coordinates 20º53'46" south latitude, 51º22'46" west longitude and altitude averaging 405 m) in the period from June 2007 to May 2008.

Nellore and Guzerá cows belonging to a closed squad selection of the farm were inseminated during the breeding season (December 2006 and January 2007) with conventional semen from three bulls (Aberdeen Angus, Nellore and Guzerá). The calves issued from these matings were weaned at between 8 and 9 months, consisting of 12 crossbred Nellore x Aberdeen Angus (Nel x AAn), 22 Guzerá (Guz) and 24 Nellore (Nel). The average weights (± standard error) were 178.2±5.94, 159.5±3.98 and 163.1±4.9 kg, respectively.

The heifers remained in a 50-hectare paddock planted with *Brachiaria decumbens,* with access to water and mineral salt *ad libitum*. The animals were properly vaccinated against foot and mouth disease and received no anthelmintic or antiparasite treatment before and during the experimental period.

The animals were individually weighed on electronic scales every 28 days, totaling 12 samples (newly weaning at 8-9 months to 19-20 months of age). The number of *Haematobia irritans* flies present in the dorsal region, from the neck until the ends of the hip of each animal, was counted (9). Fecal samples were also collected for later counting of nematode eggs in a McMaster chamber.

The stool samples were processed according to the modified McMaster technique (10), which consists of nematode egg counts in the feces, with 1 egg found in the analysis assumed to represent 50 EPG.

The average rainfall and average temperature during the period of the experiment, from June 2007 to May 2008 were measured at the farm (Figure 1).

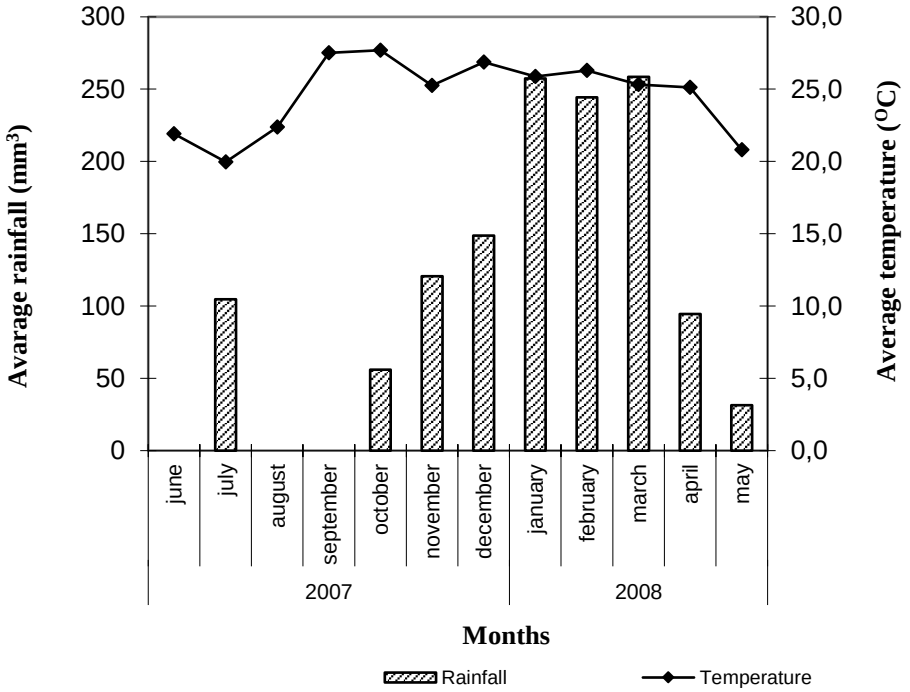

Figure 1. Average temperature (°C) and average rainfall (mm) in June 2007 to May 2008, at the Apta Research Farm, Andradina, SP, Brazil.

The data relating to EPG counts, fly counts and weight of the animals were subjected to repeated measures analysis using the SAS® software (version 9.1). Means were compared by the Tukey test with a significance level of 5%. The data relating to EPG counts were analyzed after logarithmic transformation (log_{10} (x +1)).

RESULTS

The monthly rainfall during the study period was 110±99.61 mm, with extremes in the months of June, August and September 2007, when there was no rain; and the months of January, February and March 2008, when rainfall figures were 257, 244 and 259 mm, respectively. The average monthly temperature was 24.6±2.64 ºC, ranging from 20.0 ºC in July to 27.7 °C in October.

The Nel group had lower mean scores of EPG in the months of June and July 2007 and April 2008 compared to the Guz group (P <0.05), and in March 2008 compared to the Nel x AAn group (Figure 2).

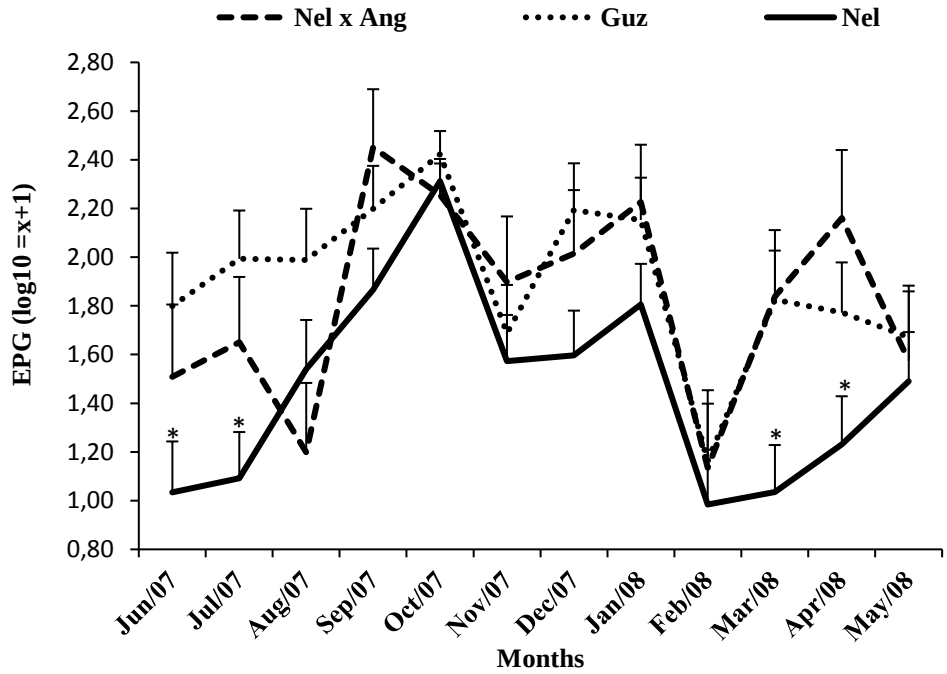

Figure 2. Means (± standard error) of EPG (log10=x+1) in the months of June 2007 to May 2008 of three groups of heifers: crossbred ½ Nellore x ½ Aberdeen Angus, Guzerá, and Nellore, at the APTA Research Farm, Andradina, SP, Brazil; Means (± standard error) followed by * differ by the Tukey test at P <0.05; *P<0.05 and **P<0.001.

The mean (± standard error) of the *Haematobia irritans* fly counts are presented in Figure 3, where the Nel x AAn group had higher mean scores in all months except June and July 2007, compared to the Guz and Nel groups.

In Figure 3 it can be seen that the mean horny fly count of the crossbred Nel x AAn group was significantly greater than those of the Guz and Nel groups, in all samplings throughout the experimental period. There was also a significant time x group interaction for horn fly values: the difference between groups increased over time.

The accumulated weight gains during the evaluation were 177.2±6.52, 129.3±6.31 and 118.9±6.88 kg (± standard deviation) for the Nel x AAn, Guz and Nel groups, respectively.

In Figure 4 it can be seen that the mean live weight of the crossbred Nel x AAn group was significantly greater than those of the Guz and Nel groups, in all samplings throughout

the experimental period. There was also a significant time x group interaction for live weight values: the difference between groups increased over time.

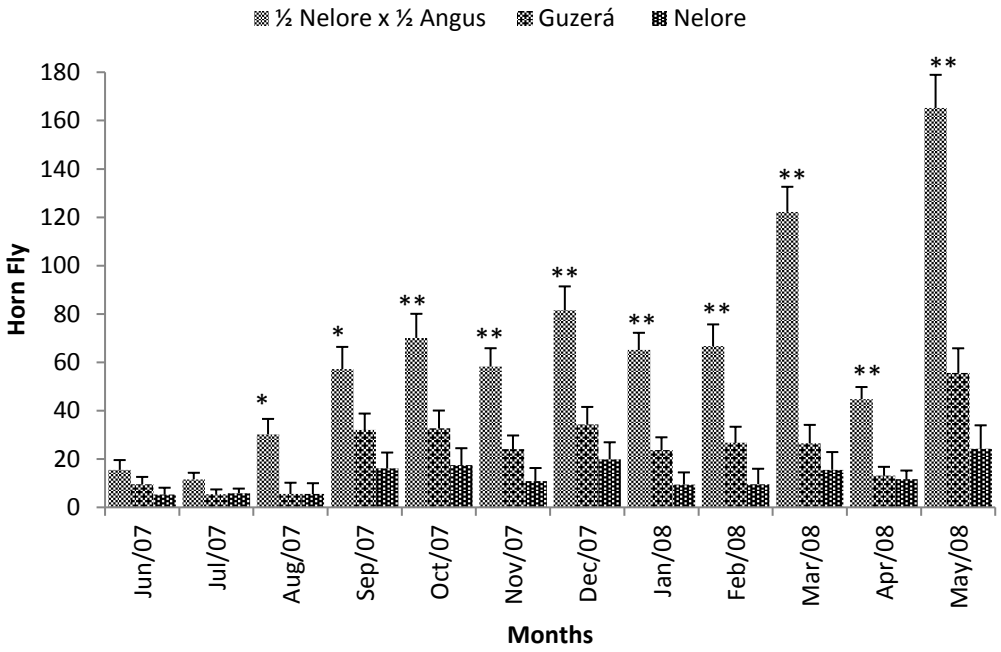

Figure 3. Means (± standard error) of horny fly counts in the months of June 2007 to May 2008 of three groups of heifers: crossbred ½ Nellore x ½ Aberdeen Angus, Guzerá, and Nellore, at the APTA Research Farm, Andradina, SP, Brazil; Means (± standard error) followed by * differ by the Tukey test at P <0.05; *P<0.05 and **P<0.001.

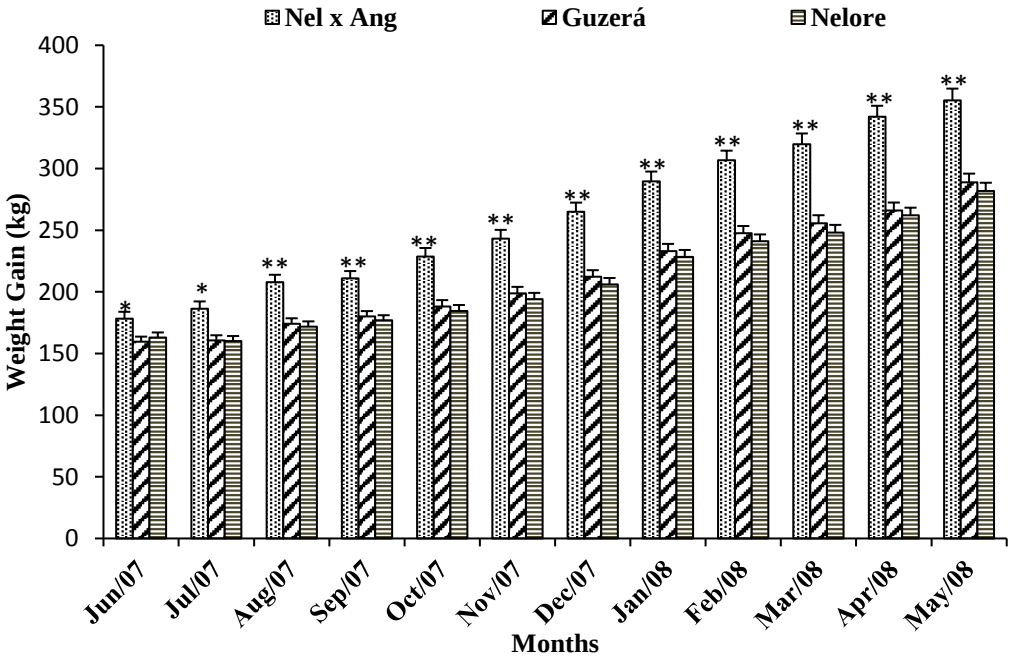

Figure 4. Weight gain in the months of June 2007 to May 2008 of three groups of heifers: crossbred Nellore x Aberdeen Angus, Guzerá, and Nellore, at the APTA Research Farm, Andradina, SP, Brazil. Means (± standard error) followed by * differ by the Tukey test at P <0.05; *P<0.05 and **P<0.001.

DISCUSSION

The Nel animals showed lower EPG counts (P <0.05) in four of the twelve months evaluated regarding endoparasitoses: in July 2007 and April 2008, compared to the Guz group, and in March 2008 in relation to Nel x AAn group.

In contrast, Oliveira et al. (11) evaluated the natural resistance to endoparasites of heifers from the genetic groups Nellore, crossbred Nellore x Senepol and crossbred Nellore x Angus, also in the state of São Paulo, and found no significant differences between the three groups (p> 0.05). However, the authors observed that the animals in the Nellore group showed higher mean EPG than the Nellore x Angus group. However, the authors reported there was a great difference in EPG values between animals of the same genetic group (Nellore), with various animals having EPG of zero and several with high EPG.

The results described corroborate those of (12), who evaluated the 100 Nellore steers, aged 11-12 months, and observed a significant difference (P <0.05) between individuals of the same genetic group, and serum total IgE level can serve as to select an additional, sensitive to infections Nellore marker *Haemonchus placei* and *Cooperia punctata*.

Infestation by *H. irritans* flies has also been assessed in the three genetic groups, but the economic losses caused by this parasite alone are usually difficult to measure. However, according to Kaufman and Weeks (13), economic losses in beef cattle are caused by infestations of more than 200 flies/animal, while Bianchin et al. (14) observed that Nellore cattle showed significant loss (P <0.05) of 5-26 kg/animal, with mean infestations by *H. irritans* between 4-55 flies/animal.

The average scores (± standard error) of *H. irritans* found in this study were 66±12.46, 24± 4.16 and 13±1.73, for the Nel x AAn, Guz and Nel groups, respectively. These averages are below those considered capable of causing losses by Kaufman and Weeks (13), but similar to those found by Bianchin et al. (14).

The Nel x AAn group showed the highest infestation of *H. irritans* (Table 1), throughout the experiment except for the months June and July 2007. This observation confirms reports of Bianchin et al. (15), Delabona and Bicudo (16), and Almeida et al. (17), that *Bos taurus* x *Bos indicus* animals are more susceptible to *H. irritans* than *Bos indicus*.

Although the Nel x AAn group had the highest scores of *H. irritans* for 10 of the 12 months evaluated, this group showed a mean cumulative weight gain of 48 and 58 pounds more than the contemporary Guz and Nel groups, respectively.

In the state of Santa Catarina, Cardoso et al. (18) observed superior performance of crossbred Angus calves compared to purebred Crioulo Lageano calves, with average weight gains of 301 and 239 kg, respectively, after 494 days of experiment. This performance of the animals in the crossbred Angus group were higher than those found here, probably due to the higher nutritional value of the pastures described by Cardoso et al. (18), while the animals of our study were fed exclusively on *Brachiaria decumbens*.

In Mato Grosso do Sul, Soutello et al. (4) evaluated male calves without anthelmintic treatment and without protein supplementation, observing weight gain of 152.5 kg during the 17-month experiment, lower than the performance found in this study, probably because the groups are composed of five Guzerá and five crossbred Nellore x Angus animals.

The existence of cattle with natural resistance to endoparasites (11,12) and ectoparasites (19) has been reported by several authors and was also observed in this experiment. Therefore, for sustainable cattle production, with minimal use of chemicals, the adoption of measures such as selection of resistant animals and identification and exclusion of susceptible animals as suggested previously for sheep by Bassetto et al. (20) seems to be the best alternative.

CONCLUSION

The crossbred Nellore x Aberdeen Angus (*B. indicus* x *B. taurus*) heifers had greater weight gain in relation to the purebred Guz and Nel groups, despite being more affected by *Haematobia irritans*, so using animals of this cross is a good strategy to increase the efficiency of beef production.

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