Effects of introducing New Zealand Friesian genes into a Holstein/Gir dairy herd

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Introduction

New Zealand Friesan genetics could contribute to increase milk solids content, fertility and survival, and to decrease live weight of dairy cattle in pasture-oriented systems (review by (Madalena, 2007)), thus alleviating problems encountered with Holsteins (e.g. Madalena (2008)) and resulting in higher farm profits (e.g. Harris and Kolver (2001)). However, to our knowledge a comparison of Friesians and Holsteins in tropical production circumstances has not been carried out. This paper reports on the comparative performance in economically important traits of Holstein/Gir, the predominant dairy cattle type in the tropical region of Brazil, and Friesian/Holstein/Gir crosses, in a commercial dairy farm in Brazil.

Material and methods

Animals. The comparison was carried out in a commercial farm located in the municipality of Pitangui, Minas Gerais State, S 20º 14' 88" W 45º 39' 00". The farm herd, of Holstein (H)/Gir (G) crossbreds, was concurrently inseminated with H and NZ Holstein Friesian (F), thus generating contemporary HG and FHG crosses. The HG cows were sired by 36 H bulls and the FHG by 10 F and 1 H bulls (these were granddaughters of F sires). The F sires had some H genes, their New Zealand Friesian composition ranging from 0.34 to 0.79 (average 0.69). The averages and ranges of New Zealand Friesian, H and G composition of the FHG were 0.351 (0.125-0.375), 0.629 (0.375-0.750) and 0.082 (0-0.250), and the H and G composition of the HG group were 0.903 (0.625-1) and 0.097 (0-0.375). Thus, the European breed proportion (F+H) of the FHG and HG were 0.918 and 0.903, respectively.

Management. Lactations occurred between January 2005 and June 2009**.** Dairy cows were kept on rotational grazing paddocks of *Panicum maximum* Jacq. cvs Tanzania and Mombaça and *Brachiaria brizanta* cv Marundu during the rainy season and on sugar cane-urea and maize silage during the dry season. Concentrates used were corn meal, cottonseed, ground

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sorghum grain, citrus pulp and minerals, the proportions varying with price fluctuations and milk yield group. Cows were milked twice-a-day (thrice during a four mo spell) in a New Zealand type parlour (2x12). Artificial insemination was practiced, natural service bulls being used after the fifth insemination in cows and the fourth in heifers. Teaser bulls were used to aid heat detection. Heifer calvings were concentrated at the end of the rainy/beginning of the dry season, because better milk prices were obtained in this way. Cows were inseminated all year round. Cows not showing a corpus luteum post calving were subjected to fixed-time artificial insemination protocols. Cows showing a corpus luteum but no heat were injected with prostaglandin. Animals were vaccinated against brucellosis, foot and mouth disease, rabies, leptospirosis, clostridiosis and mastitis. Tick (*Boophilus microplus*) and worms burdens were kept low by chemical control when necessary.

Recording. Data were provided by the farm data bank. Average milk recording interval was 20 d. Milk components concentration was assessed four times per year for all cows and monthly for some 50 random cows (approximately 3 records per cow, depending on component), with an electronic infra-red analyzer (Bentley 2000) and SCC with a flow cytometer (Somacount 300) of the Bentley Combi 2300 equipment (10.2 records per cow). At calving and drying off all cows had live weights estimated from tape chest girth measurements, along with condition scores (in a 1 = very thin to 5 = very fat scale) , and additional record s were taken on some cows during lactation. All reproductive events were routinely recorded.

Statistical analyses. Trait variables were analyzed by restricted maximum likelihood procedures using Proc Mixed of the SAS package. The models included the crossbred group effect (FHG *vs* HG) and the regression on G proportion, plus other fixed effects such as year-season of calving (dry and rainy seasons), parity (first *vs* second plus a few third) and the interactions of the later two effects with crossbred group. All models included the random effect of sire/crossbred group and those for repeated records included also the animal/sire/crossbred group effect. The compound symmetric covariance structure was adopted. SCC was transformed to log (SCC + 10) for analysis.

Results and discussion

As it may be seen in Table 1, lactations were short, reflecting the concentration of calvings imposed by the production system on account of milk prices. Lactations tended to be longer and milk yield higher in HG than in FHG, while milk protein, fat and total solids contents were higher in the latter group, as expected from the literature (e.g. Jasiorowski et al. (1987), Kolver et al. (2002), Madalena (2007), Macdonald et al. (2008), Lucy et al. (2009)). Lactose content was similar in both genetic groups. The higher protein and fat concentration of FHG should be economically advantageous provided these components receive a rewarding price to compensate for the increased feed costs to produce them (Vercesi Fo. et al. (2000)). Although some milk plants in Brazil pay rewarding prices for milk solids, there are still many regions in the Country where this is not the case.

The somatic cell count was lower in HG than in FGH (Table 1). The mean of non-transformed counts in HG and FHG was, respectively, 194.2 ± 557.2 and 254.1 ± 644.1 10^3 cell/ml. McCarthy et al. (2007) found lower somatic cell count in Holstein than in NZ Friesian in a very low count circumstance.

Cow live weights were lower in FHG than in HG (Table 1), in agreement with reports indicating NZ Friesans to have lower weights than Holsteins (e.g. Jasiorowski et al. (1987), Kolver et al. (2000), Madalena (2007)). Reduced feed intake to meet maintenance requirements of the lighter NZ Friesians was an important source of economic gains in a comparison with Holsteins in Argentina (López-Villalobos et al. (2001)).

Most pregnancies (96%) resulted from AI and 4% from natural mating of follow-up bulls. The abortions frequency was similar in HG and FHG (4.7 and 5.5%, respectively, $P>\chi^2=0.55$). A shorter calving to first estrus period in Holsteins than in NZ Holstein-Friesians was reported by Verkerk et al. (2000). Lower calving to conception and calving intervals and gestation length would be expected in NZ Friesians then in Holsteins (e.g. Horan et al. (2004)). However, no difference in the means of reproductive traits in Table 1 could be established between both genetic groups (P>0.05 for all four traits), although the differences between them are in general in the expected direction. Average condition score of cows in this study was considered adequate, and was similar in both groups (respectively, 3.49±0.03 and 3.49±0.05, in primiparous HG and FHG and 3.51±0.04 and 3.46±0.04 in multiparous of the same groups).

Table 1: Least squares means and number of cows recorded (N) for traits in two crossbred groups

Trait	Crossbred group				
	Holstein/Gir		Friesian/Holstein/Gir		P>F
	N	Mean±s.e.	N	Mean±s.e.	
Lactation milk yield, kg	1191	5106±130	213	4619±235	0.08
Lactation length, days	1191	281±5	213	264±9	0.11
Milk protein, %	599	3.26±0.02	144	3.39±0.03	0.02
Milk fat, %	572	3.45±0.05	141	3.79±0.08	0.0006
Milk lactose, %	601	4.58±0.03	145	4.65±0.04	0.10
Milk total solids, %	601	12.30±0.08	144	12.81±0.13	0.002
Somatic cell count, log	683	4.37±0.10	158	4.60±0.06	0.05
Live weight at age 2 mo, kg	1025	79.1±1.2	292	79.7±1.6	0.74
Live weight at calving, kg	937	502.3±4.2	224	491.4±6.7	0.18
Live weight at drying off, kg	462	568.9±7.7	129	548.4±12.1	0.13
Calving to first estrus, days	1232	68.2±1.2	233	72.8±2.2	0.08
Calving to conception, days	1119	118.7±5.0	202	104.8±8.5	0.17
Gestation length, days	816	277.6±0.4	68	277.3±1.2	0.82
Calving interval, days	819	392.4±7.0	69	373.1±1.2	0.25

There were 0.30±0.04 prostaglandin treatments in HG and 0.43±0.06 in FHG (P=0.08) and 0.43±0.04 and 0.30±0.06 fixed-time AI protocols per lactation in the same groups (P=0.08), indicating more silent or undetected heats in FHG than in HG, and more problems in conception in the latter group.

Conclusion

The introduction of NZ Friesian genes into the H/G herd resulted in lower milk yield and higher milk protein and fat content, and in lower cow live weight, as expected from the literature, in spite of the low input of Kiwi genetics (0.35).

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