PRELIMINARY RESULTS ON THE COMPARATIVE PERFORMANCE OF PRIMIPAROUS HOLSTEIN AND FLECKVIEH X HOLSTEIN DAIRY COWS

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SUMMARY

In this paper, preliminary results on the comparative performance of primiparous Holstein (H) and Fleckvieh x Holstein (FxH) cows are presented. Fleckvieh is a a dual-purpose breed derived from the Simmental breed in Germany. Twenty four H and 24 FxH heifers were sourced from a 1800 cow commercial dairy herd. Heifers were reared similarly to first calving. Cows were kept in feedlot style open camps and fed a total mixed ration twice a day. The 305-d milk yield, milk composition, live weight and reproduction parameters were recorded for cows of both breed types and compared. The milk, fat and protein yields of FxH cows did not differ ($P>0.05$) from their H contemporaries, although the fat and protein percentages of the milk of crossbreds was higher ($P<0.05$) than that of purebreds. The live weight of crossbreds was higher, although not significantly ($P>0.05$), at one week before and after calving. Reproduction parameters did not differ ($P>0.05$) between breeds. Further studies should be conducted to determine efficiencies of milk, fat and protein yields.

INTRODUCTION

Crossbreeding in dairy cows has become an important issue in the South African dairy industry. Farmers expect improved farm income from crossbreeding because of improved cow fertility, cow health and calf survival. These aspects seem to have become major problems in the Holstein breed (Funk 2006). Data recording schemes do not always record these so-called secondary traits while low heritabilities for these traits complicate their inclusion in traditional breeding programmes (Freyer *et al*. 2008). Dairy breeds used mostly in crossbreeding studies include Jerseys and Ayrshires. Heins *et al*. (2008), McAllister (2002) and Touchberry (1992) compared Jersey x Holstein, Ayrshire x Holstein and Guernsey x Holstein crossbreds to pure Holsteins, respectively. Dual-purpose breeds such as the Fleckvieh, a Simmental derived breed, have not been seriously considered in crossbreeding programmes. In the 1960's, Canadian Holsteins were included in a crossbreeding programme in Germany to produce a composite milk-emphasized, dual-purpose dairy breed (Schönmuth, 1963). Recently Walsh *et al*. (2008) reported on the differences among breeds such as Holstein-Friesian, Montbéliarde, Normande, Norwegian Red, Montbéliarde x Holstein-Friesian and Normande x Holstein-Friesian. Fleckvieh is a true dual-purpose breed having high milk yields and milk quality traits while in some countries it is primarily used for beef production (Grogan *et al*. 2005). In some parts of Germany, crossbreeding of German Holsteins are underway as crossbreeding is useful to improve fertility and productive life of dairy cows (Swalve, 2007). The aim of this study is to compare milk production parameters, live weight and some fertility parameters of primiparous Holstein (H) and Fleckvieh x Holstein (FxH) cows in a feedlot system.

MATERIALS AND METHODS

Location and Animals. Twenty four H and 24 FxH heifers were sourced from a 1800 cow commercial Holstein dairy herd at approximately one week of age. Heifers were progeny from two

Fleckvieh bulls (Hippo and Randy) and a Holstein bull (Jerome Red). Heifers were reared similarly to first calving at the Elsenburg Research Farm of the Western Cape Department of Agriculture. Elsenburg is situated approximately 50 km east of Cape Town in the winter rainfall region of South Africa. The area has a typical Mediterranean climate with short, cold, wet winters and long, dry summers. Production systems in this area consist of intensive feedlot style open camps or housing systems for dairy cows. Locally produced roughages are cereal crops such as oats, barley and triticale while lucerne hay is imported from the summer rainfall areas. Being a wheat producing area, wheat straw is also available and included in rations. These roughages generally have to be supplemented with large quantities of concentrates to sustain high milk yields. In this experiment, a typical total mixed ration (TMR) providing 17% CP and 11 MJ ME/kg DM consisting of lucerne hay, oat silage, wheat straw and a commercial concentrate mixture , was fed to cows in open camps with fence-line feeding troughs. Sufficient amounts of the TMR was fed twice a day to ensure an *ad libitum* feed intake. Fresh drinking water was freely available at all times. No protection was provided against summer heat and winter rain. Cows were machine-milked twice a day in a milking parlour approximately 500m from the open camps.

Data recording. The milk yield and milk composition of all pure- and crossbred cows were recorded according to standard milk recording procedures. This entailed the recording of the daily (evening and next morning's) milk yields of each cow every five weeks starting from five days after calving to drying up. Milk samples were collected at the afternoon milking for each cow and analysed for fat, protein and lactose concentrations using a Multi-Spec Infra-red Analyser. Following each milk recording event, the National Dairy Cattle Performance Testing Scheme of the Agricultural Research Council provide projected 305-d milk, fat, protein and lactose yields and a persistency value (the daily milk yield at 60-d divided by 280-d milk yield) for each cow using standard lactation curves for the South African Holstein breed (Mostert *et al*. 2003). Cows were weighed one week before and after calving and thereafter on a monthly basis until the end of the lactation period. Cows were observed for heat detection and inseminated from 30 days after calving. The reproductive performance of each cow was determined based on insemination dates and the result of rectal palpations by a veterinarian at least 45 days after the last insemination. The following reproduction parameters were determined: pregnancy rate (irrespective of number of times inseminated), the interval (number of days) from calving to first insemination, rate of first insemination within 80 days after calving, interval from calving to conception and pregnancy rate within 200 days after calving

Statistical analyses. The traits were compared by one-way analysis of variance with breeds as treatments and cows within breed as replicates. Breed means and probabilities of differences are provided. Monthly means for production parameters were calculated based on days in milk at each milk recording event throughout the lactation period. Linear regressions were fitted on monthly mean production parameters. Frequencies were compared in 2 X 2 tables, using Fisher's exact test.

RESULTS AND DISCUSSION

Calving started in August 2007 for both genotypes with the average calving date for the H and FxH cows being 5 and 13 December 2007, respectively. Age at first service was similar for both genotypes (*ca* 15.0 months) mainly because of management reasons. Mean (±SE) age at first calving was 25.7±0.6 and 26.4±0.6 months for FxH and H cows respectively (P>0.05). From the original 48 heifers, 18 H and 20 FxH had actual 305-d lactation records for milk, fat and protein yields as well as fat, protein and lactose percentages. Seven cows (4 H and 3 FxH) had short lactations (<240-days) because of health problems. The projected 305-d lactation records of cows were used for these individuals. The comparative milk traits of cows are presented in Table 1. The milk yield of H and FxH cows varied from 4550 to 9319 and from 3222 to 9224 kg, with coefficients of variance of 19 and 23%, respectively. While average milk yield favoured H cows in absolute terms, this difference was not significant (P=0.30). With the exception of fat and protein percentages, other milk production traits did not differ between breeds (P>0.10). Because of higher (P<0.05) fat and protein percentages, the fat and protein yields of FxH cows were similar to H cows.

Table 1. The mean(±se) 305-d milk production and milk composition of first lactation Holstein and Fleckvieh x Holstein cows receiving a total mixed ration.

Parameters	Holstein	Fleckvieh x Holstein	P
Number of cows	22	23	-
Milk yield (kg)	6519±261	6109±289	0.30
Fat (%)	4.02±0.07	4.29±0.06	0.01
Fat yield (kg)	259±8	260±11	0.98
Protein (%)	3.32±0.05	3.49±0.04	0.01
Protein yield (kg)	215±8	213±9	0.82
Lactose (%)	5.58±0.24	5.16±0.17	0.17
Persistency (%)	105±4	102±4	0.64

The lactation curve for the daily milk yield of H cows showed a peak at the fourth month post calving. Generally the trend in milk yield over the lactation was linear, R^2=0.15 for H and R^2=0.03 for FxH cows. Both trends showed an increase towards the end of the lactation (Figure 1). No information is available in the literature on the lactation curves for Fleckvieh or similar type breeds. Mostert *et al.* (2003) showed that the lactation curve for milk yield of first lactation H cows in the South African national data set show an increase to 60 to 70 days post calving after which milk yield is reduced. First lactation Jersey cows show a downward trend in milk yield from the first test to the end of the lactation. Trends in fat and protein percentages did not differ (P>0.05) between breeds

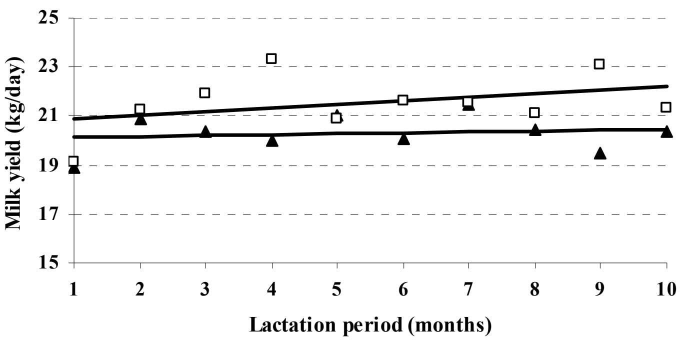

Figure 1. Daily milk yields of first lactation H (□) and FxH (▲) cows.

On average, cows from the two genotypes did not differ for weight at first calving, i.e. 631±10 kg for FxH vs. 608±13kg for H cows (P=0.17), although absolute figures favoured the FxH genotype. Holstein cows lost more weight (P<0.01) than crossbreds from calving to nadir, i.e. -50±10 vs -18±8kg while FxH cows gained weight at a faster rate (P<0.01) than H cows towards the end of the lactation .

With the exception of one cow in each genotype, all cows became pregnant. A similar proportion of FxH was inseminated within 80 days post calving (0.65 vs 0.55; Fisher's exact probability = 0.34). However, the interval from calving to first insemination tended (P=0.08) to be slightly shorter in FxH cows than in H contemporaries (74±4 vs 90±12 days). The interval from calving to conception was similar for both breeds, i.e. 132 and 126 days for H and FxH cows respectively. The proportion of cows confirmed pregnant by 200 days in milk was 0.83 for FxH and 0.64 for H cows (Fisher's exact probability = 0.47). Clearly more data is required to adequately assess the reproductive performance of the two genotypes.

Results obtained in the present study are similar to an ongoing study at Iden Experimental Station in Germany where H cows are crossed with Brown-Swiss (BS), a milk-emphasized dual-purpose breed in Germany. F1 (BSxH) cows reached almost the same milk yields accompanied by higher ($P<0.05$) fat and protein percentages (Swalve, 2007). Because of the small number of experimental animals in this study, results should be treated with caution. This is exploratory research for this area. A small number of local farmers have been crossbreedng using Fleckvieh sires. No crossbreeding studies have been done in this country because of a lack of facilities. Funds were also limited resulting in the small number of experimental animals. The project is ongoing and progeny from the original H and FxH cows will be included in the dataset. Farmers taking part in crossbreeding are encouraged to do milk recording to increase the number of crossbred animals. Further studies are invisaged to include reproduction and lifetime performance of crossbred and purebred cows.

CONCLUSIONS

The milk, fat and protein yields of FxH cows did not differ ($P>0.05$) from H cows while fat and protein percentages of the milk of FxH was higher ($P<0.05$). The difference in live weight at first calving between H and FxH cows was not significant, but H cows lost more weight ($P<0.050$) after calving and gained weight at a slower rate towards the end of the lactation. Reproduction parameters did not differ between breeds, possibly as a result of inadequate numbers. Further studies should be conducted to determine the efficiency of milk, fat and protein yields.

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