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REPRODUCTIVE PERFORMANCE OF HOLSTEIN AND FLECKVIEH X HOLSTEIN HEIFERS AND COWS IN A TOTAL MIXED RATION FEEDING SYSTEM

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SUMMARY

The fertility in dairy herds is becoming a major issue as several studies indicate a decline in the reproductive performance of dairy cows. Crossbreeding is regarded as a way to overcome this. In this paper, preliminary results of the reproductive performance of Holstein (H) and Fleckvieh x Holstein (FxH) heifers and lactating cows are presented. Heifers and cows were in an on-going breed comparison study in a total mixed ration (TMR) feeding system. Reproductive traits were derived from interval traits between birth and artificial insemination (AI) dates for heifers and calving and AI dates for cows. Means±sd for the interval from calving to first insemination (CFS) were 91±31 and 85±31 days (P=0.10) for H and FxH cows respectively. The proportion of cows having a first insemination within 80 days post partum (FS<80d), and confirmed pregnant within 100 days post partum (PD100d) for H and FxH cows was 0.41 and 0.51 (P=0.09) and 0.29 and 0.45 (P=0.01) respectively. Age at first service was lower and the proportion of heifers inseminated by 14 months of age was higher (P<0.05) in FxH in comparison to H heifers. While crossbred heifers and cows showed improved absolute reproduction compared to purebred animals, differences between breeds were not significant in all instances. As reproduction management strongly affects the performance of dairy cows, a larger data set and possibly records from other herds might reduce variability in fertility traits.

INTRODUCTION

Breeding and selection programmes in dairy herds in South Africa are mainly focused on the improvement of milk yield and conformation traits. Although the reproductive performance of dairy cows affects herd profitability, little emphasis is put on the genetic improvement of fertility. Cows may have repeated failed inseminations followed by hormonal treatment and eventually natural service. At best, non-pregnant cows are culled. In South African Holsteins, calving interval (CI) increased from 386 days in 1986 to 412 days in 2004 (Makgahlela 2008). Little local research has been done on the genetic improvement of fertility in dairy cows. Recently, Mostert *et al.* (2010) reported on the genetic parameters for CI for the four major dairy breeds in South Africa.

Because of increasingly poor reproductive performance in dairy herds, farmers are considering crossbreeding as a possible solution, as fertility traits are lowly heritable and should benefit from heterosis. While crossbreeding is applied in some herds, no research has been conducted locally to provide scientific support for it. Furthermore, crossbreeding in dairy herds is very contentious and regarded by breed societies as a poor way to overcome breeding and/or management problems. Crossbreeding is, nevertheless, increasingly being considered by global dairy producers because of their concerns about fertility, cow health and calf survival in the Holstein breed in particular (Funk 2006). Dairy breeds used mostly in crossbreeding studies include Jerseys and Ayrshires (Heins *et al*. 2008). McAllister (2002) compared Jersey x Holstein, Ayrshire x Holstein crossbreds while Touchberry (1992) compared Guernsey x Holstein crossbreds to pure Holsteins generally showing improved performances with crossbreds.

Dual-purpose breeds such as the Fleckvieh, a Simmental-derived breed, have not been seriously considered in crossbreeding programmes. True dual-purpose breeds have high milk yields and milk quality traits while in some countries it is primarily used for beef production (Grogan *et al*. 2005). 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). Heins & Hansen (2012) showed that Normande x Holstein, Montbéliarde x Holstein cows had fewer ($P<0.01$) days to first breeding, better first-service conception rates ($P<0.10$), fewer days open ($P<0.01$) than Holstein cows. Recently Walsh *et al*. (2008) found that Holstein-Friesian cows had lower ($P<0.05$) submission rates and overall pregnancy rates in comparison to Montbéliarde, Normande, Norwegian Red, Montbéliarde x Holstein-Friesian and Normande x Holstein-Friesian cows. In some parts of Germany and Holland, crossbreeding of Holsteins is underway to improve beef production, fertility and productive life of dairy cows (Swalve, 2007). The aim of this paper is therefore to compare the reproductive performance of H and FxH heifers and cows in a total mixed ration feeding system.

MATERIAL AND METHODS

Location and Animals. This paper was based on an on-going breed comparison study being conducted at the Elsenburg Research Farm of the Western Cape Department of Agriculture (Muller *et al*. 2009). 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 and hot summers. Holstein (n=24) and FxH heifers (n=24) were initially sourced from a commercial H dairy herd and reared at Elsenburg until first calving. Subsequently, the production performance of these H and FxH cows and their progeny was compared in a total mixed ration (TMR) feeding system. Records from the Elsenburg Holstein herd (36 Holstein cows and 28 heifers) were also included in the study. Pure- and crossbred heifers were reared similarly to first calving. After calving, all cows received a TMR, providing 17% CP and 11 MJ ME/kg DM consisting of alfalfa hay, oat silage, wheat straw and a commercial concentrate mixture in open camps with fence-line feeding troughs. The TMR was fed twice a day at levels ensuring an *ad libitum* feed intake. Fresh drinking water was freely available at all times. Cows were machine-milked twice a day in a milking parlour, approximately 500 m from the open camps.

Data recording. Cows were routinely checked within the first 10 days after each calving and treated by a veterinarian for retained placentas and uterine infections. From 40 days after calving, a tail-marker was put on each cow to enable oestrus detection. Cows not showing signs of reproduction activity were treated according to a standard hormonal programme. Oetrus detection was done daily pre-milking. Cows were artificially inseminated (AI) from about 60 days after calving when showing standing oestrus. At 13 months of age, heifers were put in an AI-service group after being checked by a veterinarian for reproductive activity. Heifers were artificially inseminated when showing standing oestrus. The reproductive performance of heifers and cows was determined based on AI dates and the result of pregnancy diagnosis by rectal palpation by a veterinarian at least 45 days after the last insemination. Reproductive parameters determined for cows were the interval (number of days) from calving to first insemination (CFS), number of inseminations per conception (SPC), interval from calving to conception (DO), whether first insemination occurred within 80 days post partum (FS<80d), whether cows became pregnant from first insemination (PDFS) or within 100 (PD100d) or 200 days (PD200d) after calving. Reproduction parameters determined for heifers were age at fist insemination (AFS), whether first insemination of heifers was before 14 and 17 months of age, conception age of heifers and whether heifers became pregnant before 14 months of age as well as age at first calving (AFC). Categorical traits were scored as 1 for yes and 0 for no.

Statistical analyses. Binomial fertility traits (1 or 0) were compared between breeds within the production system using frequency tables with Chi-square tests for categorical records and analysis of variance for continuous records using cows within breed as replicates. Breed means and probabilities of differences are provided.

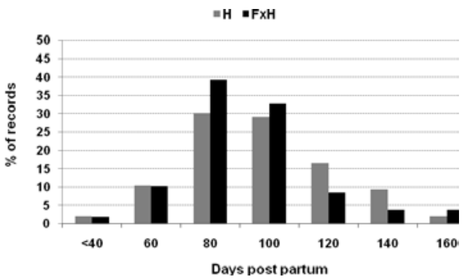
RESULTS AND DISCUSSION

Fleckvieh x Holstein heifers were inseminated earlier (P<0.05) than H heifers, i.e. 15.3±1.8 and 16.0±2.1 months of age respectively (Table 1). This resulted in more (P=0.05) FxH heifers being inseminated for the first time by 14 months of age. Age at first calving was, however, similar (P>0.05) for both breeds, i.e. 26.4 vs. 26.3 months with first service success rate higher (P<0.05) for H heifers. Fleckvieh x Holstein heifers showed oestrus more regularly, as indicated by the larger absolute number of SPC, i.e. 2.33±1.45 vs. 1.86±1.21 for H heifers. Haile-Mariam *et al. (*2004) reported a SPC of 1.84 for Holstein cows in Australia.

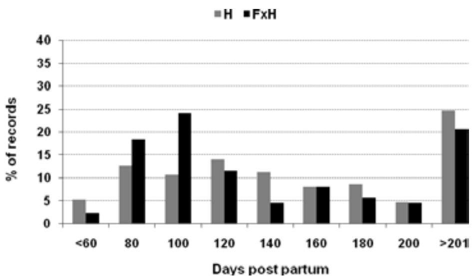
Table 1. The reproductive performance of Holstein (H) and Fleckvieh x Holstein (FxH) heifers and cows in a total mixed ration feeding system (CFS = interval calving to first service; DO = interval calving to conception; DIM = days in milk)

	Heifers			Cows	
Variables	H	FxH	Variables	H	FxH
Number of records	115	53	Number of records	201	108
Age first service (m)	16.0[a]±2.1	15.3[b]±1.8	Lactation number	1.83±0.98	1.97±1.03
First service <14m	0.14[a]	0.26[b]	Interval CFS (days)	91[a]±31	85[b]±31
First service <17m	0.75	0.85	First service <80DIM	0.41[a]	0.51[b]
Services per conception	1.86±1.21	2.33±1.45	Services/conception	2.33±1.51	2.34±1.68
Pregnant first service	0.56[a]	0.35[b]	Pregnant first service	0.37	0.40
Conception age (m)	17.2±2.4	17.1±2.3	Interval DO (days)	149±72	137±71
Pregnant <14m	0.21	0.23	Pregnant <100DIM	0.29[a]	0.45[b]
Age at first calving (m)	26.4±2.4	26.3±2.3	Pregnant <200DIM	0.57	0.66

[a,b]Values with different superscripts differ at P<0.10



(a)



(b)

Figure 1. The distribution of the number of records for (a) interval from calving to first service (CFS) and (b) interval from calving to conception (DO) for Holstein (H) and Fleckvieh x Holstein (FxH) cows

Although average values for some traits for cows were acceptable, large variations were observed as indicated by high standard deviations. The coefficient of variation for interval traits ranged from 0.34 to 0.52 for CFS and DO respectively. The CFS interval for H and FxH tended to differ (P=0.10) while proportion of first services within 80 days after calving was 0.41 and 0.51 respectively.

While the first service success rate did not differ (P>0.05) between breeds, the number of cows confirmed pregnant PD100d was higher for FxH in comparison to H cows, 0.45 vs. 0.29 respectively (Table 1). Only 57 and 66% of all cows were confirmed pregnant within 200 days postpartum. According to an Australian survey (Little, 2003), this level of performance would indicate reproductive problems in a herd. Mackey *et al*. (2007) reported that in 19 Holstein-Friesian dairy herds in Ireland, fertility performance was generally poor with the interval to first service being 84.4±35.4 days and the first insemination success rate 40.6±0.68%. The 100-day in-calf rate was 46.0±0.68% and CI 404±65 days. The major causes of the poor reproductive performance in these herds were the prolonged interval to first service and the poor AI success rate at first AI.

CONCLUSION

Absolute differences in reproductive performance in favour of FxH cows and heifers were observed for a number of fertility parameters. While first insemination was earlier for FxH heifers, age at first calving did not differ between FxH and H heifers because of a higher first insemination success rate in H heifers. Similarly, FxH cows were inseminated earlier after calving than H cows with a larger proportion pregnant by 100 days in milk. This advantage, however, did not result in a shorter interval (number of days) between calving and conception. While in this study crossbred heifers and cows showed better absolute reproductive values in comparison to purebred animals, differences between breeds were not significant in all instances. As reproduction management strongly affects the performance of dairy cows, a larger data set and possibly records from other herds might reduce variability in fertility traits.

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