

Effect of strain of Holstein-Friesian cow and feed system on reproductive performance in seasonal-calving milk production systems over four years

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Introduction In Ireland most dairy farms operate seasonal calving grass-based milk production systems. Feed demand and supply are matched by having calving highly concentrated in spring. This requires high pregnancy rates within a short time following the start of mating in late April or early May, but has become increasingly difficult to achieve due to declining fertility in Irish dairy herds (Mee, 2004). In New Zealand, cows of North American Holstein-Friesian origin have poorer fertility than New Zealand Holstein-Friesians on pasture-based seasonal calving systems (Harris & Kolver, 2001). The present study sought to determine the effect of strain of Holstein-Friesian (HF) cow and feed system on reproductive performance within Irish milk production systems.

Materials and methods Three strains of Holstein-Friesian (HF) cows: high production North American (HP), high durability North American (HD) and New Zealand (NZ) were assigned, within strain, to one of three pasture-based feed systems: Moorepark (MP; 350 kg concentrate/cow, stocking rate of 2.47 cows/ha), high concentrate (HC; 1,500 kg concentrate/cow, stocking rate of 2.47 cows/ha), and high stocking rate (HS; 350 kg concentrate/cow, stocking rate of 2.74 cows/ha). The total number of animals in each of the four years ranged from 99 to 126. Cows were bred by artificial insemination (AI) over a 13-week period, starting in late April. Pregnancy detection was performed by ultrasound imaging at 30 to 37 d and again 60 to 67 d after AI. A final manual pregnancy examination was carried out 150 d after mating start date. Data for number of services were analysed using a non-parametric model (PROC NPARIWAY) (SAS, 2002). Differences in 24-d submission rate and pregnancy rates were investigated taking account of year, parity, strain of HF and feed system using the PROC GENMOD (binomial distribution and logit link function) procedure of SAS (SAS 2002).

Results There was no significant interaction between strain of HF and feed system for any of the reproductive variables measured and therefore only the main effects are shown (Table 1). The HP strain received a greater number of services per cow and had a lower submission rate than the other strains. The NZ strain had a higher pregnancy rate to first service and six-week pregnancy rate compared to the HP strain, with the HD strain intermediate. The HP strain had the lowest overall pregnancy rate and the NZ strain had the highest. Feed system had no significant effect on reproductive performance.

Table 1 Effect of strain of Holstein-Friesian and feed system on reproductive performance (2001-2004)

	Strain of HF			Sig. [†]	Feed system			Sig. [†]
	HP	HD	NZ		MP	HS	HC	
24-day submission rate (%)	78 ^a	90 ^b	88 ^b	**	90	79	87	NS
Conception rate to first service (%)	45 ^a	54 ^{ab}	62 ^b	**	56	51	54	NS
Services per cow (no.)	2.07 ^a	1.79 ^b	1.61 ^b	**	1.86	1.77	1.83	NS
6-week pregnancy rate (%)	54 ^a	65 ^b	74 ^b	***	66	65	61	NS
Overall pregnancy rate (%)	74 ^a	86 ^b	93 ^c	***	84	82	86	NS

HP = High production, HD = High durability, NZ = New Zealand, MP = Moorepark feed system, HS = High stocking rate feed system, HC = High concentrate feed system, ^{a,b} Means with different superscripts within the same row are significantly different (P<0.05). Significance: ***= P<0.001, **= P<0.01, NS = Not significant

Conclusions Both the NZ and HD strains, selected for lower milk production and better reproductive traits, had better reproductive performance than a North American HF strain selected for high milk production. The results indicate that offering higher levels of concentrate supplementation will not alleviate the reduced reproductive performance of the HP strain in a pasture-based feed system.

References

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