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Comparison of suckling frequency of red and F1 wapiti-red calves reared on red hinds

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ABSTRACT

In New Zealand venison production systems crossbreeding red hinds with wapiti stags is very common. The resultant wapiti-red crossbred offspring is a larger, faster growing animal than its red counterpart. How do these crossbred progeny grow faster on a red hind? We hypothesised that the crossbred progeny would have increased milk intakes, which would be reflected in increased suckling of their red hind dams. A pasture based lactation experiment was conducted over the 'natural' (non-weaned) suckling period (birth Nov/Dec. to Sep.) with F1 wapiti-red crossbred single and twin calves (n=11) naturally reared by red hinds (n=9), and red calves (n=8) naturally reared by red hinds (n=8). Suckling behaviour was observed at least one day per month between dawn and dusk. Suckling bout frequency, duration and time of day were recorded for all calves and any allosuckling was also noted. We found no significant differences ($p > 0.05$) in suckling bout time, frequency or total time spent suckling between red or wapiti crossbred offspring. The only confirmed allosuckling was between individuals from different sets of twins. The F1 wapiti-red crossbred offspring were 30% heavier, with growth rates up to 39% greater than their red cohorts. These results have interesting implications for the red hind crossbred calf venison production system; do the wapiti-red crossbred calves consume more milk? If so how do they influence the hind's milk production? Do they consume more pasture and/or substitute it for milk? Better understanding of these factors should help increase calf growth rates during lactation.

Keywords: Wapiti; red deer; suckling.

INTRODUCTION

North American wapiti (*Cervus elaphus nelsoni, manitobensis, roosevelti*) are approximately twice as large as the average European red deer (*Cervus elaphus scoticus, hippelaphus*) farmed in New Zealand. In New Zealand pastoral systems, due to their greater weight for age, wapiti crossbreds make up a large proportion of prime venison production (55-65 kg carcass weight) (Nicol *et al*., 2003). Judson & Nicol (1997) concluded that much of the crossbred live weight advantage comes prior to weaning (*i.e.* from lactation) with commercial crossbreds being 10.3 kg heavier at weaning than reds (Deer Master 2000). We instigated a study on the nutritional and energetic costs of the red/red *vs*. crossbred/red calf hind system (using the extreme cross of F1 wapiti x red). This paper reports one part of that study *i.e.* the observed suckling behaviour of wapiti crossbred and red purebred calves on red hinds from just after birth until natural weaning at 9 months of age.

MATERIALS AND METHODS

Animals

The hinds studied were a group of 17 multiparous red hinds from Invermay; mean age 7 years (range 6-10). The mating was timed to synchronise conception date, with 9 of the hinds artificially inseminated on 8 April 2003 with semen from a Pure Canadian wapiti stag (TCAR132W), while the other 8 hinds were synchronised naturally mated by red stags, on or about 8 April 2003 also. From 25 September 2003 all hinds were run as a single mob on the 'flat farm' at Invermay Agricultural Research Centre, Mosgiel. The hinds calved from 17 November-7 December 2003 with means for red, F1 singleton, and F1 twin 22 Nov, 30 Nov and 6 Dec respectively. All calves were tagged, matched to dams and weighed within 24 hours of birth. The calves observed for the study were 8 red (3♂, 5♀), and 11 (5♂, 6♀) F1 wapiti crossbred (2 sets of F1 twins (3♂, 1♀)). Twins were included in the study due to low animal numbers. The animals were all run together as one mob unweaned for the entire study and rotationally grazed on predominantly ryegrass pastures. From 29 May 2004 to 1 August 2004 rotational grazing continued but was supplemented with pasture baleage and barley (~0.5 kg hd/day). All animals were subject to very frequent handling, yarding (approximately daily for 10 days, 7 times during the experiment) and manipulations including manual or crush restraint, blood sampling, faecal sampling, C32 alkane dosing, isotope dosing, weighing and milking during the study. For observation purposes all animals wore neck collars (Te Pari Products, Oamaru) which were uniquely coloured and numbered for individual identification. Three hinds died during the winter from Malignant Catarrhal Fever; and data from their calves immediately before the deaths and after death was removed from the analysis.

Observations and Measurements

The observations ran from 18 December 2003 until 3 September 2004, from dawn to dusk. Initially observations were for 1 day approximately 3-weekly to 2 February, but from 17 February 2004 these animals were utilised as a control for another study and observations changed, to approximately monthly for 2 consecutive days (excluding late March, 2/3 days; 29th & 31st). The observation paddock was 0.42 ha in area with two large trees which obscured some animals from observation. The animals were in the observation paddock for at least the day prior to observation and were not interfered with during observation other than supplement feeding in winter. Observations were conducted from a tower (observation bench height in tower 3.7 m) and observers were able to enter and leave without being seen by the animals. Observations were carried out by several different individual observers using the same recording sheets, with each observer's observation period lasting approximately 3½ hours. The observers used binoculars and spotting scopes to record all visible suckling bouts, using bout definition as: the calf in sucking position for ≥5 s and bout end by: spatial (>2 m) or time (>60 s) separation, or some other behavioural indicator. The time the bout commenced and ended was recorded to the second with a stopwatch, along with the collar details of the participant hind and calf/calves. Observers also noted any disturbances which may have influenced the bout and any occurrences of allosuckling (calves suckling hinds other than their genetic dam). The observers were provided with a list of all collar identities and hind calf pairs in order to minimise recording errors and double check identities in any cases of allosuckling. Calves were weighed at birth (resolution 0.5 kg), then from 15 December 2003 at least fortnightly (resolution 0.1 kg), then at least monthly from April 2004 (resolution 0.5 kg). Live weights on the day of observations were interpolated from the nearest recorded weight before and after observation day and the growth rate between those two weights.

Statistical Analysis

Live weight and growth rate data were analysed by REML with fixed terms for genotype / rearing rank, sex, and month, and random terms for animal and sample within animal. Genotype / rearing rank was included as a fixed term as the F1 wapiti had twin and single raised calves, whereas the reds were all single reared. Random spline terms were also included for the live weight analysis. Sucking frequency was analysed using a Poisson-log generalized linear mixed model, and mean and total length of sucking bout using gamma-log generalized linear mixed models, with the same fixed and random effects as for the REML analysis. Summary statistics (over time) of these variables for each animal were analysed using least squares, fitting the given fixed terms.

RESULTS

Summary live weights and growth rates are given in Table 1. Growth rate showed a significant ($P < 0.001$) genotype / rearing rank by age interaction (Figure 1). Singleton wapiti calves had initial growth rates of 670 g/d, compared to 460 (SED 16) g/d for singleton red calves and 340 (SED 21) g/d for twin wapiti calves. These rates decreased ($P < 0.001$) approximately linearly within each group to 310, 220 and 250 g/d, respectively at 9 months of age. For wapiti calf growth rates no difference was observed with sex ($P > 0.05$), while for red calves, males maintained a consistently higher growth rate than females by 57 (SED 20.2) g/d ($P < 0.01$).

The mean over the first three observation dates (December – January) of total and mean time of sucking bouts differed significantly with sex ($P < 0.05$), with male calves sucking for longer than female calves. Apart from that there were no

Table 1: Mean birth weight, and live weight and growth rate to 18 February classified by genotype, rearing rank and sex. RSD is residual standard deviation.

Breed	Sex	Rearing Rank	n	Birth weight (kg)	Live weight (kg)	Growth rate (g/d)
Red	F	Single	5	9.1	43.6	389
Red	M	Single	3	11.0	49.3	449
F1 Wapiti	F	Single	5	12.6	58.4	573
F1 Wapiti	M	Single	2	13.5	59.8	583
F1 Wapiti	F	Twin	1	5.5	21.5	185
F1 Wapiti	M	Twin	3	5.0	21.4	199
RSD				1.59	3.52	35

Figure 1: Observed live weights and growth rates to 9 months of age of singleton red and singleton and twin F1 wapiti red crossbred calves on red hinds.

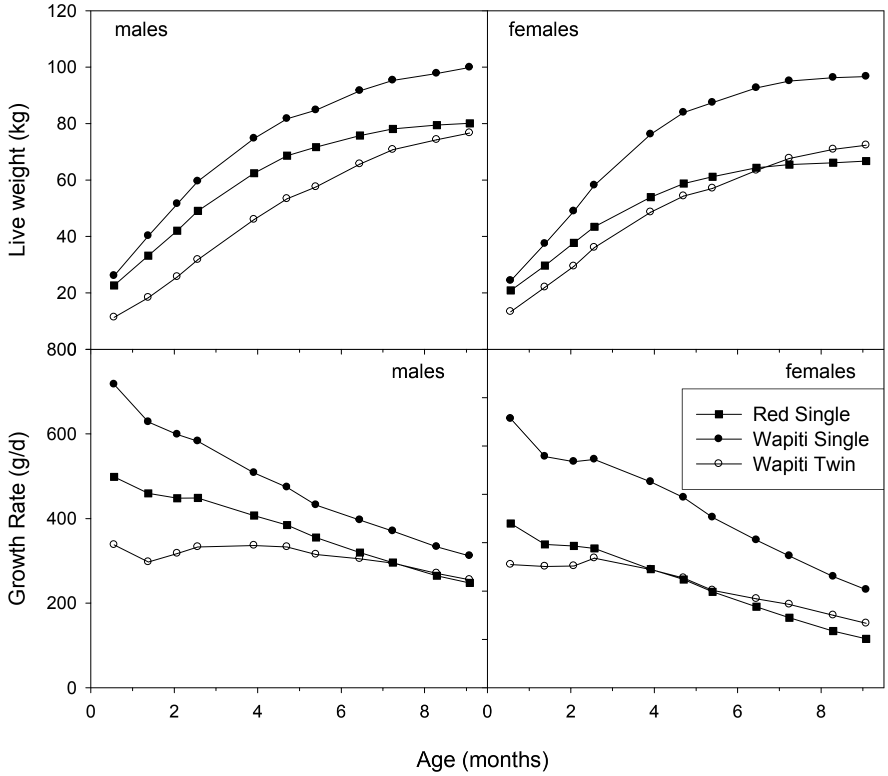
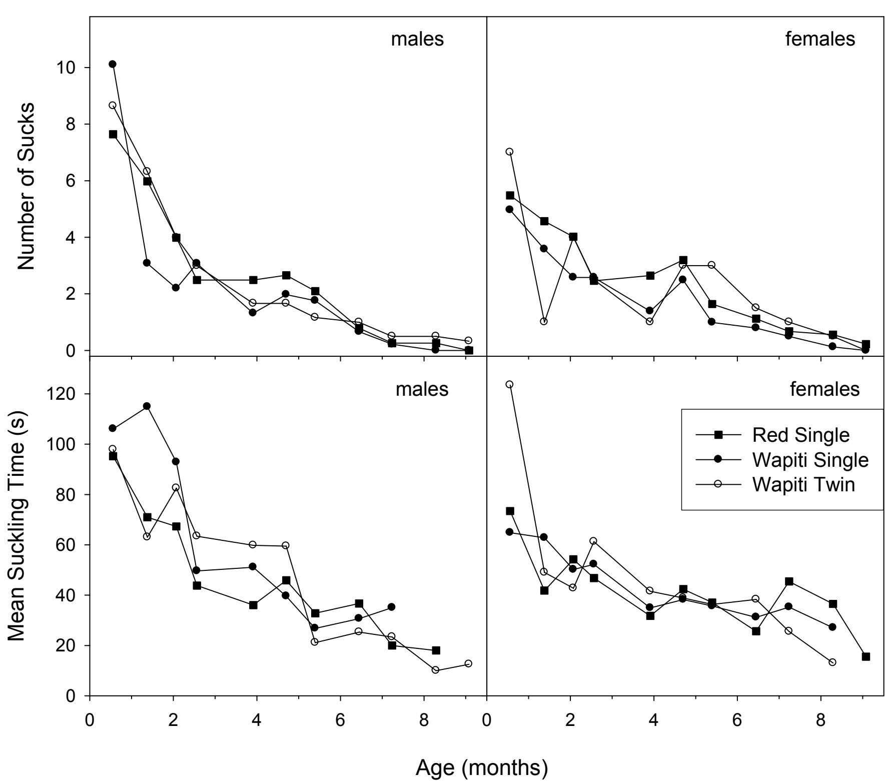


Figure 2: Observed suckling frequency and mean suckling duration of singleton red and singleton and twin F1 wapiti red crossbred calves on red hinds (suckling bouts ≥ 5 s).



significant ($p > 0.05$) differences with genotype, rearing rank or sex for any of the measures of sucking performance (Figure 2).

Allosuckling was only observed on 3/19 observation days: 12 Jan, 2 Feb and 17 Feb when there were 7 allosucks observed from 6 bouts (from a total of 200 sucks over the 3 observation days). All allosuckling involved the 3 of the 4 F1 twin progeny and their 2 dams; with either 2 or 3 calves sucking at the same time.

DISCUSSION

We had expected we might find some significant differences in suckling behaviours given such a large genotype contrast between the offspring. However our finding of no significant differences in suckling time or frequency does agree with other literature: Milne (1987) found that F1 calves suckled no longer than red calves of a similar age, while Cameron (1998) has questioned the validity of suckling observations to quantify milk transfer and suggested it needs further quantification with isotope labelling studies. It is important to note that our observations were only during the dawn to dusk period. However Clutton-Brock *et al.* (1982) found that suckling frequency differed little between day and night, so it is likely that the daytime records were representative of the behaviour over 24 hours. However, the possibility remains that there were differences between treatments at night. The 4 March (weaning proxy) weights (♀ 48.7 kg, ♂55.3 kg) of the red calves were above industry averages (Deer Master, 2000) for their genotype, yet were not matching the growth of their F1 wapiti cohorts. If the F1 wapiti calves were achieving near their genetic maximum growth rates, one might have expected sex based differences, as there were for the reds calves. However no significant live weight differences between F1 male and F1 female calves were observed. This might suggest that nutrition was limiting expression of growth potential in the F1 calves and that the dams of the F1 wapiti calves were very close to their maximum milk production capability. Other as yet unpublished data from the larger study shows the F1 wapiti calves did consume markedly more milk than red calves (Archer, J.A. pers. comm.), but did not consume markedly more pasture (Stevens, D.R. pers. comm.). How might this have been achieved in the same amount of suckling time? Birgersson *et al.* (1998) found that male fallow deer calves sucked harder and were more motivated to obtain milk than female calves; a similar contrast may exist between red and F1 wapiti genotypes. Milne (1987) found a positive relationship between birth weight and early growth, with birth weight explaining 81% and 97% of the variance in 16-49 day weight for red and F1 wapiti, respectively. It could be that larger body size (and birth weight) could relate to greater strength and suckling vigour allowing more rapid consumption of a greater volume of milk. Indeed bottle fed F1 wapiti calves have been observed to suck much harder and faster than red calves (O'Neill, K.T. pers. comm.). This higher demand for milk from the beginning of lactation may result in a high milk production throughout lactation.

Allosuckling was not recorded for singletons of either genotype, but only twin F1 wapiti. Milne (1987) recorded allosuckling with F1 wapiti singleton calves on red dams, but not red singletons, in a mixed mob situation very similar to ours. Both Vasquez *et al*. (2004) and Landete-Castillejos *et al*. (2000) recorded relatively high occurrences of allosuckling with red deer, but these animals were all housed indoors and perhaps spatial or other considerations may have influenced this behaviour more than in our pastoral situation. It would seem in our situation allosuckling was only tolerated by hinds with multiple offspring and is probably rare in most New Zealand pastoral deer systems.

Larger F1 wapiti offspring probably demand and consume a greater volume of milk faster, from their genetic red dam, than most red deer are able to. This may well set up a feedback loop contributing to increased growth through lactation (particularly early lactation), without markedly different pasture intake. This may be one of the important mechanisms behind achieving greater weaning weights in wapiti crossbred systems for venison production.

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