Lactation duration and milk quality

The speed at which sucker lambs reach slaughter weight and condition depends initially on the quantity and quality of colostrum and milk provided by the dam. The growth rate of lambs during the first month of their lives is largely dependent on the dam's milk yield and the lamb's ability to consume the milk. The amount of milk produced can be affected by; ewe breed, nutrition, lactation number, stage of lactation, number of lambs born or reared, age and live weight of the ewe.

The breed and genotype of sheep can affect the quality and quantity of milk produced. Selection for dairy production has led to the creation of specialist dairy breeds (such as the East Friesian) that produce more milk than meat or wool breeds. However there is a negative correlation between milk yield and milk composition hence animals that produce more milk usually have a lower concentration of milk fat and protein. The East Friesian has been reported to produce up to 600 litres of milk over a 200-day lactation. Meat breeds such as the Poll Dorset and Border Leicester have been reported to produce yields of 150 litres per lactation, whereas the Merino, essentially a wool breed, produces up to 100 litres per lactation. There is little information on the yields from dual-purpose breeds, such as the South African Meat Merino (SAMM) however one report indicates that the SAMM's production can be as high as 4.8L/d.

Nutrition affects both the yield and composition of milk. Under feeding of ewes in late pregnancy reduces the development of the udder, delays the onset of lactation, lowers the accumulation of colostrum, leads to poor maternal instincts and reduced milk yields.

Milk yields are lowest in maiden ewes and tend to peak at the 3rd or 4th lactation after which lactation yields tend of decline. Milk yield is also directly affected by the stage of lactation. Milk production increases rapidly after parturition and peaks between the 3rd and 5th week of lactation. After the peak the persistency of lactation depends on the ewe genotype, level of nutrition and time of weaning. The milk composition also changes as lactation progresses. The concentration of milk fat, protein and total solids decline over the first 3 to 4 weeks before peaking at the end of lactation. The concentration of lactose closely follows the lactation yield (ie increasing initially before falling to its lowest levels as lactation finishes.) Ewes rearing twin lambs will produce more milk than ewes rearing single lambs and generally heavier ewes will produce more milk than lighter ewes.

The lactation study was designed to test the following hypotheses;

1) The East Friesian first cross ewe will produce higher daily milk yields than the other genotypes tested.

2) The milk composition of the East Friesian first cross ewe is more dilute than the milk composition of the other genotypes tested.

3) The progeny of the East Friesian first cross ewes will grow faster up to weaning than the progeny of the Merino and the first cross ewes.

The ewes selected in this study were all scanned bearing single lambs, offered the same level of nutrition (white clover / grass annual pasture plus supplementary grain) and were all on their 3rd lactation to minimise any external factors influencing milk production.

Ninety (90) single bearing ewes whose tag number and lamb birth date, birth weight and sex were known were split into 2 milking mobs depending on the birth date of the lamb.

The ewes were milked on 7 occasions when the average age of the lambs was 1, 3, 5, 7, 9, 12 and 15 weeks of age. Due to some lambs being sold in between weeks 12 and 15 only milk data obtained up to week 12 is included in the analysis. The ewes and lambs were mothered up in the yards on week 1 to confirm paddock identification. On each milking day the ewes were drafted from the lambs and penned in the shearing shed. The ewes were milked on a mobile milking platform (4 ewes at a time), injected intramuscularly with Oxytocin (0.5ml/ewe) to assist milk let down and were then left for 1 minute before milking commenced (plate 1). Whilst on the platform the ewes were offered 225g/hd oats and 175g/hd lupins. The time of the first milking was recorded and once milked the ewes remained in their group of 4, before being re-milked approximately 4 hours later. The same series of events was repeated at the second milking with the ewes being milked in the same order as the initial milking. The milk collected at the second milking was weighed. A sub sample of the second milk was collected, preserved in 30µl of potassium dichromate and then frozen for analysis of milk composition. Daily milk yield was calculated as [wt of milk (2nd milking) / time difference between 1st and 2nd milking] x 24. Ewes with mastitis were treated with Orbenin L.C., a long acting intramammary antibiotic and were not included in the analysis. The lambs were weighed every time their dams were milked to monitor lamb growth rates. The final analysis is based on 77 ewes with a complete data set (ie no incidence of mastitis or only one teat functioning and whose progeny reached weaning.).

Milk composition was determined by analysing the sub-samples with a Milkoscan 133 spectrophotometer. The Milkoscan was calibrated for sheep milk before analysis of the samples. Concentrations of total milk solids per sample are calculated as the sum of concentrations of fat, protein, lactose, plus 0.78% for minerals. The yield of milk solid components was calculated by multiplying milk volume and the concentration of milk solid components.

The daily milk yield for all genotypes increased until a mean maximum of 1900 – 2200 ml/day was attained between weeks 1 to 5 post partum and then declined at an average rate of 18 ml/day across all genotypes until week 12 (Fig 1).

For all genotypes, more than one half of the total milk yield was produced by the end of the 5th week of lactation. The percentage of milk fat fluctuated depending on genotype but the concentration increased towards the end of lactation (Table 3). The percentage of milk protein declined to their lowest levels at week 3 and then increased like milk fat, to their highest levels at the end of lactation. The percentage of milk lactose increased slightly up to week 5 before declining at the end of the lactation.

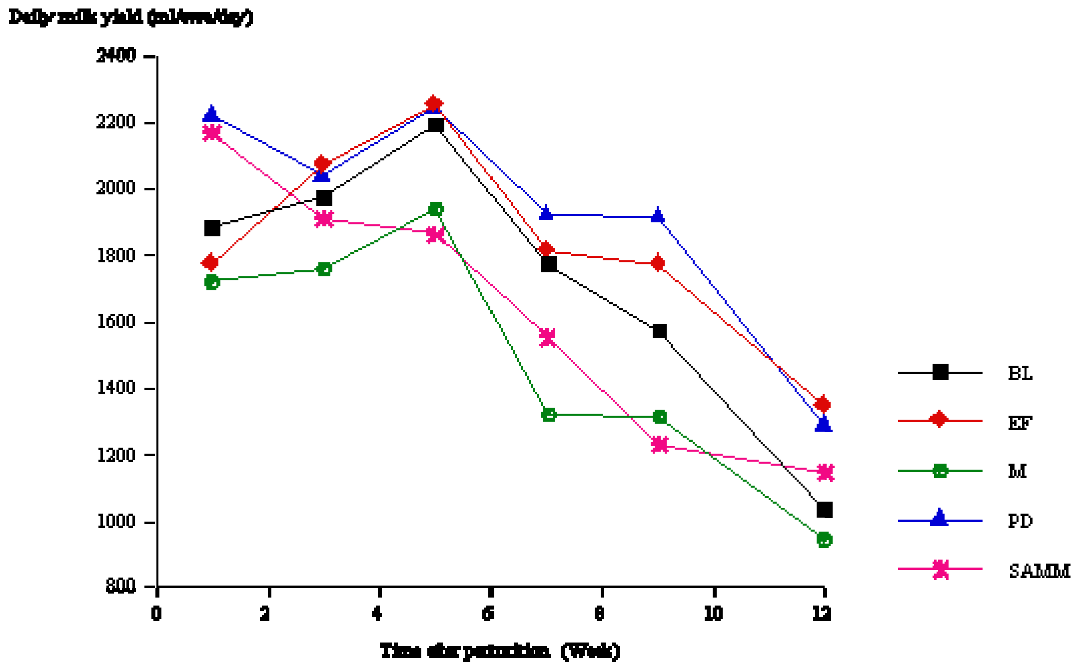

Fig 1: Mean daily milk yields for Merino and crossbred ewes over a 12 week lactation

Plate 1: Ewes on the platform ready for milking

The Poll Dorset first cross ewes produced significantlyhigher daily milk yields averaged over the 12-week lactation than the BorderLeicester and SAMM first cross and Merino ewes. The East Friesian first cross ewes produced higher yields thanthe SAMM first cross and Merino ewes and the Border Leicester first cross ewesproduced more milk than the Merino ewes. The percentage of milk fat produced by the East Friesian first crossewes was significantly lower than the milk fat percentages produced by theother genotypes. The percent of milkprotein did not differ between genotypes. The Border Leicester and Poll Dorset first cross and Merino ewesproduced milk with lower lactose content than the SAMM first cross ewes.

The Poll Dorset first cross ewes produced a higher meandaily yield of milk fat than the East Friesian and SAMM first cross and Merinoewes. The Border Leicester first crossewes produced a higher daily yield of milk fat than the East Friesian firstcross and Merino ewes. The Poll Dorsetfirst cross ewes produced a higher daily yield of milk protein and yield ofmilk lactation than the Border Leicester and SAMM first cross and Merino ewesand a similar result was obtained with the daily yield of milk lactose. The Poll Dorset first cross ewes produced asignificantly higher yield of total milk solids than all other genotypes,whilst the East Friesian and Border Leicester first cross ewes produced ahigher yield of total milk solids than the Merino ewe.

At the end of the lactation study the live weights of theBorder Leicester and Poll Dorset first cross ewes were significantly heavierthan the East Friesian first cross and Merino ewes and the SAMM first crossewes were heavier than the Merino ewes. The Border Leicester, Poll Dorset and SAMM first cross ewes were allfatter than the Merino ewes that were in turn fatter than the East Friesianfirst cross ewes. The live weight ofthe second cross progeny (i.e. progeny from the first cross ewes) were significantlyheavier than the Merino ewe progeny and the Border Leicester first crossprogeny were heavier than the progeny from the East Friesian and SAMM firstcross ewes. The progeny of the BorderLeicester first cross ewes grew faster than the progeny of the East Friesianand SAMM first cross and Merino ewes and the progeny of the Poll Dorset andEast Friesian first cross ewes grew faster than the Merino progeny.

The first hypothesis that the East Friesianfirst cross eweswould produce more milk than all other breeds was not supported. The Poll Dorset first cross ewes (1.92L/ewe/day) produced similar levels to the East Friesian first cross ewes (1.84L/ewe/d). The East Friesian first crossewes only produced more milk than the SAMM first cross and Merino ewes. The East Friesian breed has beentraditionally farmed in the cooler climatic regions of the world (areas of highrainfall and an abundance of feed) and it is possible that it was not able toexpress its full milking potential due to the tight feed season. The breed is naturally a lean but at the endof the lactation study the East Friesian first cross ewes were in poorer bodycondition than all other genotypes. Dueto being a specialist dairy breed it may indicate that the East Friesian firstcross ewes were mobilising more of their body reserves to produce the milk dueto the limited paddock feed available.

The second hypothesis that the East Friesian first crossewes would produce more dilute milk components was partially supported. The percentage of milk fat of the EastFriesian first cross ewes was significantly lower than all genotypesexamined. However there was nodifference in the percentage of milk protein and milk lactose betweengenotypes. The total milk solids of theEast Friesian first cross ewe was significantly lower than the other genotypestested. The mean daily fat yield of theEast Friesian first cross ewes was significantly lower than the Poll Dorset andBorder Leicester first cross ewes. However, the higher milk yield made up for the lower percentage of milkfat to produce similar milk fat yields as the SAMM first cross and Merinoewes. The East Friesian first crossewes also produced significantly higher milk protein and milk lactose yieldscompared to the SAMM first cross and Merino ewes.

The third hypotheses that the East Friesian first crossprogeny would grow at a faster rate up to weaning than all other breeds was notsupported. The growth rate of theBorder Leicester first cross progeny was significantly faster than the EastFriesian first cross progeny. However the higher yield of total milk solids ofthe East Friesian first cross ewes compared to the Merino ewes may provide anexplanation for the faster growth rate of the East Friesian first cross progenycompared to the progeny of the Merino ewe.

Thus it seems that it isn’t milk yield or milk compositionalone but also the various genetics tested that influence the growth rate ofthe progeny.

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