Proc. Aust. Soc. Anim. Prod. (1972) 9: 266

THE MILK PRODUCTION OF MERINO EWES FED WHEAT GRAIN

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Summary

Milk secretion rate estimates of Merino ewes fed wholly on wheat grain plus 1.5 per cent limestone in either pens or small paddocks were compared with similar estimates obtained from ewes fed roughage only. Three rates of wheat feeding, 3.9, 5.5 and 7.1 kg/ewe/week, were examined. A marked depression in milk production was observed with all wheat treatments, relative to roughage, but there were no differences in the rates of milk secretion among the three levels of wheat intake. Lamb growth rates to weaning at 8 weeks reflected the patterns of lactation found among dietary groups.

I. INTRODUCTION

The importance of dietary roughage in maintaining milk fat secretion was demonstrated some 30 years ago (Powell 1939), and this general area has been reviewed by Storry (1970). Ground roughage diets also have been responsible for a milk fat depression in lactating ruminants (Van Soest 1963), however results have been variable. The degree of feed particle fineness appears to be involved, as does the question of whether rumen rations of acetate to propionate are shifted.

The literature, at least for the dairy cow, shows that with an increasing concentrate-decreasing roughage diet the yield of milk tends to increase, remain unaltered or decrease while the milk fat declines (Baumgardt 1967). No reports could be found in the literature detailing milk yield when a 100 per cent concentrate ration was fed. Such a situation can exist in droughts where a complete hand feeding programme of an all grain ration has been decided upon for pregnant ewes through their lactation to weaning. Aberrant milk synthesis when feeding whole grain diets is not referred to or implied in the various drought feeding bulletins (Anon. 1958, Anon. 1969), yet large lamb mortalities were detected when ewes were fed a sole diet of wheat grain plus 1.5 per cent limestone throughout their reproductive cycle (Reynolds, McManus, and Roberts 197 1). The high incidence of starvation found on autopsy of dead lambs suggested milk production abnormalities. This paper reports a preliminary study which was aimed at assessing the milk yield of ewes fed wheat in pens or in small paddocks.

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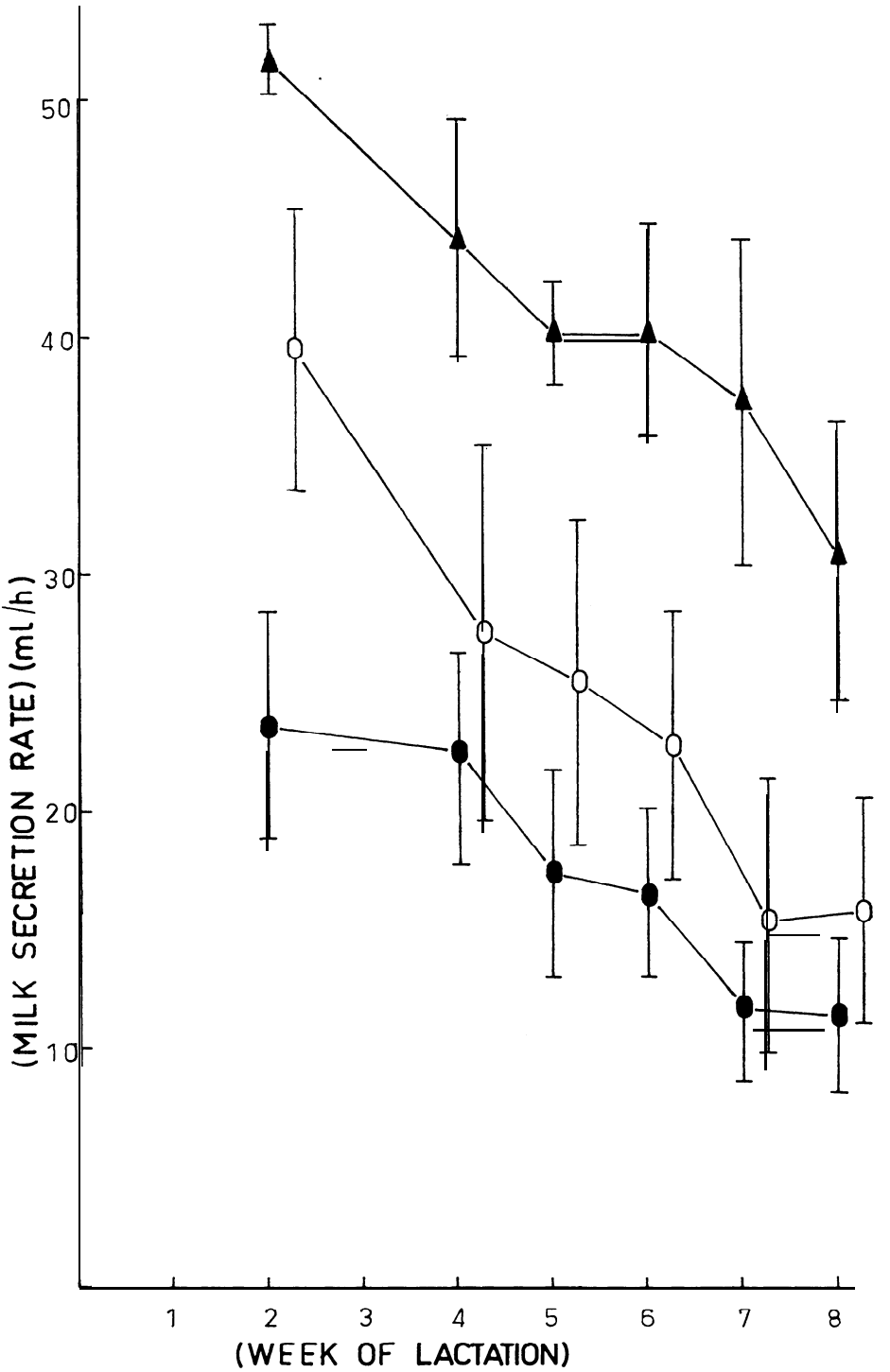

Fig. 1. — The mean secretion rates of milk (± 95% confidence intervals) from ewes during weeks 2 to 8 of lactation.
●———●, wheat fed in pens; ○———○, wheat fed in paddocks; ▲———▲, roughage fed in paddocks.

II. MATERIALS AND METHODS

Seven hundred 5-and six-year-old South Australian strong wool Merino ewes were randomly allocated on the basis of Iiveweight to ten groups. Treatments were imposed one month before mating. Wheat treatments were arranged in a 3 x 3 factorial and were compared with a Pasture (control) group. All wheat offered was supplemented with 1.5 per cent limestone and was fed twice weekly. The three levels of wheat feeding were 3.9, 5.5 and 7.1 kg/ewe/week and these amounts were increased by 10 per cent 4 weeks prior to lambing, and by a further 10 per cent during lactation. At each wheat level, two groups were held in pens measuring 12 m x 37 m where one group received wheat alone, while the other in addition received a vitamin A supplement of 1 x 10^6 I.U. on each of the four occasions: pre joining; mid pregnancy; late pregnancy and early lactation. A third group was placed in an 8.1 ha paddock and fed wheat. The stocking rate was 1.4 ewes/ha and ewes in this situation obtained some roughage, the availability of which varied according to climate and rainfall. A control group of ewes held in a similar 8.1 ha paddock were fed pasture and clover hay.

Five ewes, bearing single lambs, were selected from each of the ten groups on the basis of Iiveweight and lambing date. Within these milk study sub-groups, ewe Iiveweight was as close as possible to the group mean liveweight, and all ewes were at an equivalent stage of lactation $\pm$ 4 days. Milk secretion rate measurements were made by the oxytocin method of McCance (1959). Ewes were test milked initially in their second week of lactation, and further consecutive weekly estimates were obtained on five more occasions.

III. RESULTS

Milk secretion rate data have been pooled for the six groups fed wheat in pens (wheat/pen), and also for the three groups fed wheat in paddocks (wheat/paddock), since the values obtained within these two dietary groups did not differ significantly on the six occasions when measurements were made. The amounts of wheat offered did not influence milk yields in either the wheat/pen or wheat/pasture groups; the resultant three lactation curves are shown in Figure 1.

The pasture control group always had the highest level of milk production. The wheat/paddock group had a level of milk production intermediate between the roughage/paddock and wheat/pen groups at the second week of lactation, but subsequently the recorded levels did not differ from the wheat/pen groups where secretion rates were very low and less than one half that of the roughage/paddock.

The liveweights of lambs surviving to weaning from the three general dietary groups are shown in Table 1. The birth weight of wheat/pen lambs was less ($P < 0.05$) than that of either the wheat/paddock or roughage/paddock which did not differ. By day 37, differences were evident in mean liveweight between dietary groups, and these differences reflected the estimated milk secretion rates.

TABLE 1

Mean liveweights (kg, ± SEM) of all lambs surviving to weaning

Group	No. of lambs	Age (days)		
		0 (birth)	37	56 (weaning)
Wheat/pen	150	4.3[a]* ± 0.1	7.4[a] ± 0.2	8.7[a] ± 0.2
Wheat/paddock	141	4.5[b] ± 0.1	9.4[b] ± 0.3	12 0[b] ± 0.3
Roughage/paddock	56	4.4[b] ± 0.2	11.9[c] ± 0.4	14.2[c] ± 0.5

*Means in the same column with different superscripts differ significantly $P < 0.05$.

IV. DISCUSSION

The obvious failure of ewes to produce adequate quantities of milk when fed wheat alone was associated with elevated lamb mortality between birth and weaning. Survival between birth and weaning for wheat/pen, wheat/paddock and pasture control groups were 40 per cent, 68 per cent and 79 per cent respectively. The pasture intake of wheat/paddock ewes was not measured, but observations were made on the state and supply of native herbage. At the time when the first test milkings were made, dry standing barley grass *Hordeum leporinum*) and medics ***(Medicago praecox, M. minima, M. polymorpha*** and ***M. laciniata)*** were available. Rainfall of 94 mm in the 6 weeks prior to that time allowed a surplus of herbage to develop. Between weeks 2 and 4 of lactation, this dry feed was either consumed or had blown away such that by week 4 wheat/paddock animals were almost totally dependent on wheat grain, and this situation continued to the end of the study. Such a pattern of herbage availability partially explains the higher initial milk secretion rate of wheat/paddock ewes when compared with wheat/pen animals if one assumes that this small amount of roughage helped to normalize milk synthesis.

Preliminary fat analyses carried out on samples taken at week 2 of lactation do not indicate a significant decline in the fat test of milk from ewes fed solely on wheat. Milk fat percentage ± the standard error of the mean for wheat/pen, wheat/paddock and roughage/paddock groups were 8.7 ± 0.4, 6.4 ± 0.4 and 7.9 ± 0.6; values similar to those reported by Corbett (1968) for ewes grazing improved pastures.

A number of studies have indicated a high correlation between the milk production of the ewe 'and Iiveweight increase of the lamb during the first six weeks of lactation when the lamb is largely dependent on the supply of nutrients from its dam (Peart 1968; Robinson, Foster, and Forbes 1969). The growth rates of lambs surviving to weaning from the three dietary groups follow the pattern of milk secretion rates measured on sample numbers of ewes from these groups.

Flatt et ***al.*** (1966) provide data on the milk production of dairy cows fed diets where the forage:grain ratios, on a dry matter basis, were 60:40, 40:60 and 20:80. The fat corrected milk yields and fat percentages were 20.8 kg, 18.8. kg and 14.8 kg, and 3.4 per cent, 3.0 per cent and 2.6 per cent respectively. Ratios of molar proportions of acetic to propionic acid (A:P) in the rumens of cows fed these diets were 3.04, 2.12 and 1.63 respectively.

Baumgardt (1967) in reviewing Flatt's study ascribes the trend for milk yield decline with an increasing grain component in the ration to the decrease in milk fat test. Such an explanation is incomplete even when A:P ratios are invoked, since the role of milk lipid synthesis in controlling milk yield has not been established. When the ruminal A:P ratio is lowered and the milk fat percentage depressed, milk yield also declines. These events are associated rather than the former necessarily explaining the latter. Our yard ewes fed at the two higher levels had been consuming entire rations of wheat for 6 months and were fat. The ewes fed low levels were in poor body condition. McClymont and Vallance (1962) have suggested an endocrine basis for poor lactation of animals on high propionate diets, arguing that the glucogenic response suppresses the mobilization of tissue fat for milk synthesis. It is possible that our yard fed ewes at the higher levels may similarly have failed in tissue fat mobilization; whilst our ewes fed at lower levels just did not have the fat to mobilize, given that their relative undernutrition had permitted adequate mammary gland development.

This report indicates that a diet consisting solely of wheat is unsuitable for lactating Merino ewes. Methods of improving the milk production of such ewes without having recourse to a 30 per cent roughage component as suggested by Baumgardt (1967) are currently being sought.

V. ACKNOWLEDGMENTS

This work was carried out with funds provided by Roche Products Pty. Ltd., the Conservation Society of N.S.W. and the Graziers' Association of N.S.W. while one of us (J.A.R.) was in receipt of a Roche Postgraduate Scholarship We wish to thank the Australian Wheat Board for donation of wheat, Southern Limestone for donation of limestone, and the New South Wales Public Health Department for carrying out fat analyses. Mr. D. Milverton gave valuable assistance in managing and handling the sheep.

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