MAIZE SILAGE AS A SUPPLEMENT FOR GRAZING DAIRY COWS

J.B. MORAN, C.R. STOCKDALE and T.E. TRIGG

SUMMARY

Five groups of cows and heifers in early lactation strip grazed irrigated spring pastures and were offered maize silage plus minerals at zero, 3 kg or 8 kg dry matter (DM)/day or maize silage plus minerals plus cottonseed meal at 3 or8 kg DM/day. Pasture allocations were the same for cows offered zero or 3 kg DM/day and were 33% less for those offered 8 kg DM/day of the supplements. Yields of milk and milk solids and changes in live weight and body condition were monitored for ten weeks and pasture intakeswere measuredin each group from pre and post grazing pasture heights.

There was little effect of either level of supplement or additional cottonseed meal on cow productivity but in the groups fed8 kg DM/day, cows with cottonseed meal produced the most while those without it produced the least milk of any of the five groups. All supplemented cows gained more weight and increased more in body condition than did cows offered pasture only. The differences in milk yields at the higher level of supplementation were attributed firstly, to higher DM intakes in cows with cottonseed meal and secondly, to lower total dietary protein contents in cows without cottonseed meal. (Key words : Dairy cows, maize silage, supplementary feeding, protein supplements).

INTRODUCTION

Supplementation of grazing dairy cows is often essential to fill the gap between pasture growth and animal requirements. Ensiled fodder crops are widely used for this purpose in Europe and the U.S. and they provide an alternative to conserved pasture or concentrates, particularly when grown under irrigation. New Zealand data (Hutton and Douglas 1975) indicate that maize silage supplements should not form more than 30 to 40% of the diet; above this level, production responses are limited by unsufficient true protein and some minerals. Other data collected over three years from farmlets (Campbell 1932) has shown increased milk fat production per ha as a result of maize silage supplements. Of the few Australian data that exist, Davison et al.(1982) showed cows grazing tropical grass/legume pasturesin northern Queensland responded to maize silage supplementation but when they were offered the silage free choice, additional protein improved the milk production response of the cows.

This paper reports the animal production responses of grazing cows in early lactation to supplements of maize silage with or without additional protein in the form of cottonseed meal.

MATERIALS AND METHODS

Forty-five crossbred Friesian cows were randomized into five equal groups on the basis of parity, stage of lactation (38 days post-partum) and live weight (424 kg) such that each group contained three first calf heifers and six cows in their second or later lactations. Following a period of uniform feeding, each group strip grazed the same paddocks of irrigated ryegrass/white clover to ten weeks from October to December1984. Groups 1, 2 and 3 were allocated 45 kg while groups 4 and 5 were allocated 30 kg pasture dry matter (DM)/cow/day; these were equivalent to grazing intensitites of 145 and 216 cows/ha respectively.

Kyabram Research Institute, Kyabram, Vic. 3620.

The unsupplemented Group 1 was returned to the pasture after each milking while groups 2 and 3 were group fed in yards between 0800 and 0900 h daily and offered 3 kg DM/cow/day of a maize silage supplement. Groups 4 and 5 were group fed in yards between 0800 and 1400 h daily and offered 8 kg DM/cow/day of the supplement then allowed to- graze after afternoon milking. The supplement consisted of 1% mineral pre mix with the remainder being maize silage for Groups 2 and 4 and 1% minerals, 16% cottonseed meal and 83% maize silage (on a DM basis) for Groups 3 and 5.

Milk yields for each cow were recorded twice daily and weekly subsamples from a morning and afternoon milking were analysed for milk fat and milk protein contents. The cows were weighed weekly and body condition scores were recorded during weeks 1 and 10. Pre and post grazing pasture yields were measured every day from weeks 3 to 10 using a rising plate meter (Stockdale 1934) to obtain an estimate of pasture intake for each group. Pasture and maize silage were regularly sampled for chemical analyses and in vivo digestibility measurements were made usingwether sheep. Pastureon offer contained 2.32% nitrogen(N), 49.2% neutral detergent fibre (NDF) and DM digestibility (DMD) was 69.4%. Maize silage harvestedatthe hard dent stage contained 30.9% DM, 1.02% N, 60.9% NDF and DMD was 61.0%; cottonseed meal contained 6.35% N. Crude protein contents of supplements offered to Groups 3 and 5 were 6.4% and to Groups 2 and 4 were 11.6%.

The data on yields of milk and milk solids (following covariate correction) and on live weight and condition score changes were subjected to factorial analyses of variance to test for the following factors and first order interactions; maturity (heifers v cows), supplementation (Group 1 v 2, 3, 4 and 5), level of supplement (Groups 2 and 3 v 4 and 5) and additional protein (Groups 2 and 4 v 3 and 5).

RESULTS

Data on intake and cow productivity are presented in the Table. The utilization of available pasture varied from 39% (Group 1) to 31% (Group 3). Supplemented cows ate more total DM than cows only offered pasture while Group 5 cows ate 8-11% more DM than any other supplemented group. Estimated dietary metabolizable energy (ME) contents (MAFF, 1975) were highest in Group 1 cows (10.3 MJ/kg DM) and similar in all other groups (9.5-9.6 MJ/kg DM). Dietary protein contents were also highest in Group1 cows but were lower in Group 4 cows than in any other supplemented group.

Although dietary treatments per se did not influence milk or milk protein yields, the interaction between level of supplement and additional protein was statistically significant for milk yield during both four week periods; Group 5 cows recorded the highest while Group 4 cows recorded the lowest milk yields of any of the groups. There was a significantresponseto additional protein in milk fat yields during weeks 7 to10 but this was mainly the result of higher milk yields since milk fat tests in cows fed protein were similar to those in cows not fed protein (ie., 4.3 v 4.2%). Live weight and body condition both increased more in supplemented animals while liveweight gains were greater at the higher level of supplementation.

Table 1 Measures of feed intake and productivity of grazing cows in response to maize silage supplements with or without additional protein (kg/day)

Group	1	2	3	4	5	Sig†	SE of mean (±)
Supplement	Nil	Low	Low +	High	High +		
Pasture DM intake	16.3	14.5	13.9	9.3	10.8		
Supplement DM intake	-	3.1	3.1	8.2	8.2		
Total DM intake	16.3	17.6	17.0	17.6	19.0		
% maize silage in total DM	0	17.6	15.3	46.6	36.6		
Dietary crude protein content (%)	14.5	13.1	14.1	10.7	13.3		
Daily milk yield							
Week 3-6	19.5	20.8	20.7	19.3	20.9	M,LxP	0.5
Week 7-10	17.5	18.7	18.6	17.4	19.3	M,LxP	0.5
Daily milk fat yield							
Week 3-6	0.93	0.86	0.90	0.85	0.89	M	0.03
Week 7-10	0.79	0.76	0.82	0.75	0.83	M,P	0.03
Daily milk protein yield							
Week 3-6	0.66	0.68	0.70	0.65	0.68	M	0.01
Week 7-10	0.56	0.59	0.60	0.58	0.62	M	0.01
Liveweight change	0.38	0.53	0.47	0.75	0.74	M,S,L	0.06
Body condition score change (units/10 wk)	-0.1	0.6	0.9	0.6	0.7	S	0.1

† Significant factors : M, maturity; S, supplementation; L, level of supplement; P, protein (see text for details)

DISCUSSION

Despite the lower feeding value of maize silage when compared to that of irrigated spring pasture, its use as a supplement at grazing maintained levels of milk production in cows in early lactation even when available pasture was restricted. Only when it was offered at very high levels, where it constituted 47% of the total DM intake, was there any evidence of a decreased milk yield.

Bryant and Cook (1977) found that with increasing grazing intensities, the addition of maize silage ad libitum (at levels of 37 to 54% of total DM intake) did not compensate for the nutritional deficiencies of reduced pasture intake.In both their trial and that of Hutton and Douglas (1975), mentioned in the Introduction, additional protein was not included in the maize silage. In the present trial Group 4 cows showed decreases in milk yield which were associated with reduced protein intakes. Intakes of ME in Group 4 cows were similar to those in Groups 2 and 3 whereas dietary protein levels were only 11% compared to 13 and 14% in Group 2 and 3 cows respectively. Such low levels of protein are known to limit milk yield in early lactation (Broster and Oldham 1981). It is likely then that the level of maize silage feeding above which decreases in milk yield would be expected depends on the protein content of the consumed pasture hence may vary with season, pasture species and locality. At the same level of supplement, Group 5 cows ate 1.4 kg more pasture DM and produced 10% more milk than Group 4 cows thus their additional protein stimulated pasture intake presumably through increased rate of digestion and passage of feed through the gut. Similar interactions between level of maize silage and extra protein with milk yields were reported by Davison et al. (1982) but pasture intakes were not measured in their study.

Despite similar yields of milk and milk solids, supplemented cows did in fact show evidence of improved nutritional status through their greater liveweight gains and improved body condition. Liveweight gains increased from 0.4 to 0.5 to 0.7 kg/day as cows were supplemented with nil, 3 and8 kg DM/day respectively. Rogers et al. (1979) found maize silage supplements improved the utilization of digested N in cows fed pasture silage while Bryant and Donnelly (1974) reported higher efficiency of utilization of digestible energy in pasture fed cows when supplemented with maize silage. Results of this nature are not entirely unexpected as pasture and maize silage may be complimentary in respect to rumen degradable nitrogen and available starch respectively.

Maize silage supplementation reducea pasture intake in all groups and ror those animals allocated 45 kg pasture DM/day, substitution rates were 0.58 (Group 2) and 0.77 (Group 3) kg reduction in pastured DM eaten/kg supplement DM intake. These can be compared to rates of 0.5 to 0.7 kg reduction in pasture/kg supplement DM through the use of concentrates (Alderman, 1983). Further studies are in progress at Kyabram to assess the effects of pasture quality and pattern of supplementation -of maize silage on its utilization by pasture fed cows.

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