THE EFFICACY OF SUBSTITUTING FIELD CROPS FOR PASTURE FOR FLUSHING EWES

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ABSTRACT

Groups of mixed age and two-tooth ewes were oestrus synchronised and fed 5 levels of nutrition from kale, turnips, or pasture for 4 weeks prior to mating. The proportion of multiple ovulations and number of ewes lambing and weaning more than one lamb was highest for field crops. Considerable losses occurred between ovulation and weaning. Field crops as the sole source of feed were a complete substitute for pasture for flushing ewes; two-tooths responding equally as well as mixed age ewes although at a lower scale.

Additional Key Words: mixed age, two-tooth, ovulation, flushing

INTRODUCTION

There is a century of observations showing that flushing the ewe flock by improving the level of nutrition prior to mating increases the number of lambs born. The response is due to increased ovulation rate (Cumming, 1977). Quantitative aspects of allocating different amounts and types of pasture for a flushing effect have been shown by Rattray *et al.* (1981). Until this programme no work had been done using field crops to flush ewes.

MATERIALS AND METHODS

Mixed age (MA) and two-tooth (2T) groups of ewes (Coopworth) were randomised by liveweight onto one of 5 levels of nutrition (allowance = 1, 2, 3, 4, or 5 kg DM/ewe/day) from either field crops (Maris Kestrel kale or York Globe turnips), or ryegrass-white clover pasture (total = 30 groups). There were 30 ewes in each group.

Feeding schedules commenced on 16 February 1983 when oestrus was synchronised using progestagen impregnated pessaries. Harnessed rams were joined 16 March (2 rams/group) and feeding schedules continued to laparoscopy for diagnosis of ovulation on 30 March. After laparoscopy, ewes were mobbed on their respective feeds for a further 2 weeks when the rams were removed. During pregnancy and lactation ewes were fed at pasture.

The reproduction of individual ewes was monitored and the proportion of ewes having multiple ovulations or lambs were analysed by logit models. The logit transformation is $\log_e (p/(1-p))$ where p = proportion of ewes with 2 or more *corpora lutea* or lambs. Only ewes that ovulated (100% MA; 98% 2T) or lambed were considered in the analysis of reproduction.

RESULTS

Feed composition

In vitro digestibility, N, and ligno-cellulose (MADF) of three samples of the feeds taken during the experiment are given in Table 1. Field crops, particularly turnips, had higher digestibilities and lower ligno-cellulose than pasture even though the latter was still good quality. The protein (Nx6.25) in pasture was higher than that for field crops.

TABLE 1: Feed composition

	In vitro digestibility (%)			N (%)			MADF* (%)		
Weeks	1	3	5	1	3	5	1	3	5
Kale	80	79	79	1.4	1.1	1.6	21	22	23
Turnips	84	87	88	2.0	1.5	1.7	18	17	15
Pasture	70	72	69	2.1	2.4	2.9	29	26	27

*modified acid detergent fibre = ligno-cellulose

Conception rate

Table 2 shows conception rates for the 4 weeks mating period. 2T groups had on average a lower conception rate than MA ewes.

TABLE 2: Conception rate (%)

Allowance (kg DM/ewe/day)	Kale MA	Kale T2	Turnips MA	Turnips T2	Pasture MA	Pasture T2
1	87	83	90	72	83	77
2	70	77	70	77	80	83
3	80	79	90	73	87	70
4	90	79	77	73	80	72
5	90	77	87	90	83	70

Feed utilization

Yield, utilization per grazing (1 week), and food intake for the 3 feeds are given in Table 3. With increasing level of nutrition, feed utilization per grazing is the inverse of food intake.

Treatment effects

The main treatment effects on mating liveweight and the proportion of ewes having multiple ovulations, lambs,

TABLE 3: Food yield (kg DM/ha), utilization (%), and intake (kg DM/ewe/day)

Allowance (kg DM/ewe/day)	Kale			Turnips			Pasture		
	Yield	Util^{n}	I	Yield	Util^{n}	I	Yield	Util^{n}	I
1	9393	95	0.97	11025	98	0.98	2833	82	0.84
2	9245	82	1.67	11666	75	1.50	3266	61	1.27
3	9649	63	1.90	11350	50	1.52	2816	39	1.45
4	9393	39	1.60	11616	42	1.67	3250	42	1.73
5	8824	29	1.50	9209	31	1.54	2716	33	1.81

and weaners are given in Tables 4, 5, and 6. It can be seen there are substantial losses between ovulation and weaning. Lamb production was substantially higher when ewes were flushed on field crops compared with pasture. There were no significant interactions.

TABLE 4: Effect of ewe age on reproductive performance.

	Mating Liveweight (kg)	Proportion of ewes with multiple Ovulations	Lambs	Weaners
MA	54.9	0.78	0.53	0.44
2T	49.9	0.69	0.34	0.23
S.E.D.	0.38	0.03	0.04	0.04
Significance	**	**	**	**

TABLE 5: Effect of feed on reproductive performance.

	Mating Liveweight (kg)	Proportion of ewes with multiple Ovulations	Lambs	Weaners
Kale	53.5	0.80	0.48	0.33
Turnips	53.2	0.75	0.50	0.42
Pasture	50.6	0.65	0.33	0.26
S.E.D.	0.46	0.04	0.04	0.04
Significance	**	**	**	**

TABLE 6: Effect of level of nutrition on reproductive performance.

Allowance (kg DM/ewe/day)	Mating Liveweight (kg)	Proportion of ewes with multiple Ovulations	Lambs	Weaners
1	48.5	0.52	0.34	0.26
2	52.1	0.74	0.45	0.33
3	53.7	0.78	0.37	0.28
4	54.1	0.83	0.53	0.41
5	53.8	0.80	0.50	0.40
S.E.D.	0.60	0.05	0.06	0.06
Significance	**	**	**	*

Liveweight change

The initial liveweight of the MA and 2T ewes averaged 50 and 47 kg respectively. Table 7 shows liveweight change to mating was significantly affected by all main treatments. There was significant interaction at the lowest level of nutrition where turnip-fed ewes faired better than those given kale and MA ewes gained less weight than 2T's compared with those at the higher levels of nutrition. More ewes would be required in a group to test the significance of this interaction on reproductive performance.

TABLE 7: Liveweight change (kg/ewe/4 weeks)

	Allowance (kg DM/ewe/day)	1	2	3	4	5
MA	Kale	0.0	5.6	7.3	7.7	7.3
	Turnips	0.9	5.3	7.0	7.5	6.7
	Pasture	-0.7	2.3	3.7	4.1	4.2
2T	Kale	1.2	4.7	5.8	7.3	6.4
	Turnips	1.7	4.5	6.1	6.1	6.4
	Pasture	-0.5	1.6	3.7	4.2	4.6
S.E.D.				0.46		

DISCUSSION

The original finding in this study is that relatively low protein field crops as the sole source of nutriment can substitute fully for pasture as a flushing feed for ewes. Field crops enhanced reproductive performance compared with good quality autumn pasture. Also, young sheep (2T's) responded equally as well to flushing on field crops and pasture although at a slighly lower level than MA ewes.

Covariance analysis showed mating weights and liveweight change to mating was closely related to initial liveweight. Thus, within each age group, improved reproductive performance with field crops and level of nutrition only amplifiès intrinsic differences in the range of initial liveweights within a group after randomisation. The static and dynamic effects on lambing performance of ewe liveweight at mating were thereby confirmed (Coop, 1966 a, b) as were the regularity of response for ewes of different initial weights (Kelly *et al.*, 1983). Had the ewes been nutritionally pre-conditioned prior to randomisation then tapering effects (Jagusch *et al.*, 1981) of the type found in the experiments of Rattray *et al.* (1980) might have been apparent.

The substantial loss of potential lambs between ovulation and weaning (Kelly and Knight, 1979) was also confirmed in this experiment. This represents a significant area where economic aspects of flushing ewes must be considered. Furthermore, the mechanism whereby flushing increases ovulation rate is still elusive. Scaramuzzi and

Radford (1984) suggest flushing could effect intraovarian mechanisms relating to growth, maturation, and sensitivity of potential ovulatory follicles.

ACKNOWLEDGEMENTS

The skilled management of Mr John Lange in running the experiment and laparoscopic diagnosis by Mr Lindsay McGowan and Dr John Smith.

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