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THE EFFECT OF GRASS SEED ON SHEEP PRODUCTION

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Summary

In a stocking rate experiment on natural pastures at Trangie in central western N.S.W., it was observed that Merino wethers suffered a marked reduction in liveweight in the spring of 1969 and 1970 coinciding with periods of heavy seed setting of barley grass ***(Hordeum** leporinum* Link) and spear grass ***(Stipa** variabilis* Hughes). The hypothesis that grass seed infestation caused liveweight loss in sheep is supported by significant correlations between liveweight loss and density of barley grass inflorescences (partial correlations of 0.84 and 0.75 in 1969 and 1970 respectively), and significant correlations between the incidence of spear grass in 1969 and liveweight loss and sheep mortality (partial correlations of 0.61 and 0.64 respectively). High densities of barley grass inflorescences on maturity were associated with reduced green pasture availability, which could have contributed to liveweight loss. Whereas stocking rate had no apparent effect on the 'incidence of spear grass, high stocking rates suppressed barley grass, and sheep in these treatments attained higher mean liveweights than sheep at lower stocking rates.

I. INTRODUCTION

Considerable research effort has been directed towards the control of ***Hordeum Zeporinum*** Link in Australia and the closely related species *Hordeum murinum* Link in New Zealand (Squires 1963, Meeklah 1964, Myers and Squires 1970). These species, both known as barley grass, are prolific seeding annual grasses. It has been widely accepted that sheep production, particularly growth rate in lambs, is impaired by the penetration of the awned florets of barley grass into the skin and eyes of stock. Observations have also been made on the damaging effect of the seed of *Stipa* **spp.** (Mulham and Moore 1970.) However, apart from some information on the rejection of lamb carcases and pelts damaged by grass seed (Loughnam 1964), there are no results demonstrating the adverse effect of grass seed on sheep production.

Barley grass and spear grass *(Stipa* ***variabilis*** Hughes) are important components of the natural pastures at Trangie, N.S.W. During an experiment designed to evaluate the optimal stocking rate of these pastures, it became apparent that the seed of both barley grass and spear grass was impairing sheep production in certain seasons. Results relating to this aspect of the experiment are presented and discussed in this paper.

II. MATERIALS AND METHODS

The data presented in this paper have been extracted from the results of a grazing experiment conducted at the Agricultural Research Station, Trangie,

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N.S.W. The experiment, which commenced in August, 1967, was designed to compare the productivity of natural annual pasture stocked continuously at rates of 2.5, 3.7 and 4.9 wethers/ha. In addition, the productivity of management systems comprised of two-thirds natural annual pasture and one-third supplementary pasture (lucerne or natural perennial pasture) was investigated at stocking rates of 3.7 and 4.9 wethers/ha. All treatments were replicated twice. Mean liveweights corrected for greasy wool weight, wool production (dyeband technique), and the density of barley grass inflorescences (60 quadrats of 20 x 20 cm in each paddock) have been presented for the set stocked treatments.

Multiple and partial correlations have been calculated using sheep Iiveweight loss and percentage mortality as dependent variables, with barley grass inflorescence density and the percentage cover of spear grass as independent variables. The correlations incorporate data from both the set stocked treatments and the natural annual pasture paddocks of the management systems (total of 14 paddocks of natural annual pasture). Measurement of each of the variables used in these correlations is described below.

The Iiveweight loss of sheep was calculated for all groups of sheep grazing natural annual pasture over a 15-week period in 1969 and a 10-week period in both 1968 and 1970. The liveweights of wethers that died or were moved from the paddocks (management systems) during these periods were omitted from the means. To eliminate any effects of initial Iiveweight on the amount of Iiveweight lost, the mean liveweight loss for each group was correlated to and corrected for the initial mean group Iiveweight at the beginning of each period. These corrected values of Iiveweight loss were then correlated to grass seed incidence.

While the natural annual pasture used in this experiment consists predominantly of annual species, it does contain a number of perennial species, particularly spear grass. The value of the percentage cover of spear grass used in these correlations is the mean of three recordings taken consecutively in July, October and January of the appropriate season. At each of these times the percentage cover of spear grass was determined by three observers each estimating the percentage of surface area occupied by green spear grass in 20 quadrats (each 20 cm x 20 cm) in each paddock.

III. RESULTS

During 1967 and 1968, rainfall was below average and the expected stocking rate response in liveweight became apparent, differences becoming most pronounced at July 4, 1968 (Table 1). In the autumn and winter of 1969 seasonal conditions were exceptionally good and liveweight differences between treatments were eliminated, all groups attaining approximately equivalent weights by August 28, 1969 (Table 1). During the subsequent 15-week period sheep in the low stocking rate treatments lost considerably more Iiveweight than sheep at high stocking rates, and so the normal stocking rate response was inverted. This difference had almost been eliminated by the following spring (September 10, 1970, Table 1), when again low stocking rate sheep lost more liveweight than those at high stocking rates. Seasonal wool production, 5 weeks prior to the dates at which liveweights have been presented, fluctuates in a similar manner (Table 2).

TABLE 1

Corrected mean liveweights (kg) of sheep in set stocked treatments

St. rate	4/7/68	17/10/68	30/12/68	28/8/69	11/12/69	10/9/70	30/11/70
2.5/ha	46.4	56.9	52.2	55.1	42.7	56.0	44.5
3.7/ha	41.0	53.4	48.8	54.7	49.1	58.4	51.0
4.9/ha	36.4	52.2	46.1	57.7	49.8	58.5	52.1

TABLE 2

Mean clean wool production (g/d) of sheep in set stocked treatments during the 5 weeks preceding stated date

St. rate	3/6/68	12/9/68	21/11 68	24/7/69	10/11/69	6/8/70	15/10/70
2.5/ha	14.1	14.3	11.7	15.8	5.1	17.7	14.9
3.7/ha	12.1	12.9	10.9	14.5	7.4	17.7	16.0
4.9/ha	10.0	12.0	9.7	14.8	8.7	18.6	15.1

TABLE 3

Barley grass inflorescence densities — (inflorescences/400 cm^2)

St. rate	16/9/68	5/9/69	13/10/70
2.5/ha	6.9	28.0	46.1
3.7/ha	1.0	6.6	37.2
4.9/ha	0.5	1.3	25.3

Increasing stocking rate reduced the density of barley grass inflorescences in the set stocked treatments (Table 3). A similar result was obtained in the natural annual paddocks of the management treatments. Stocking rate had no apparent effect on the amount of spear grass cover in different paddocks. Random variation in the amount of spear grass cover between paddocks produced values ranging from 0.2 to 3.6 per cent in 1968, 0.0 to 10.6 per cent in 1969 and 0.1 to 10.0 per cent in 1970. Significant correlations have been established between liveweight loss and the density of barley grass inflorescences in 1969 and 1970, and between the incidence of spear grass and liveweight loss and sheep mortality in 1969.

TABLE 4

Regression and correlation coefficients relating barley grass inflorescence density and spear grass cover to live weight loss and sheep mortality

y	a	b1	b2	r1	r2	R
Weight loss (kg)						
17/10/68 - 30/12/68	4.26	—0.06	—0.33	—0.11	—0.26	0.29
28/ 8/69 - 11/12/69	1.88	0.30	0.41	0.84**	0.61*	0.88**
10/ 9/70 - 30/11/70	—0.43	0.18	0.34	0.75**	0.48	0.76**
Sheep mortality (%)						
1/ 9/69 - 30/12/69	—5.04	0.63	2.11	0.49	0.64*	0.72*

a — Intercept
b — Regression coefficient: b1 — kg/barley grass inflorescence/400 cm2
— %/barley grass inflorescence/400 cm2
b2 — kg/1% spear grass cover
— %/1% spear grass cover
r — Partial correlation coefficient: *r*1 — barley grass
*r*2 — spear grass
R — Multiple correlation coefficient
* — Significant at 5% level
** — Significant at 1% level

IV. DISCUSSION

The reversal of liveweight and seasonal wool production responses in a stocking rate experiment is an unusual and unexpected result. A feasible explanation of this result is contained in the barley grass inflorescence densities of the set stocked treatments. Higher stocking rates suppressed barley grass, and consequently stock in these treatments apparently avoided the trauma associated with the penetration of barley grass into the eyes and skin. However, barley grass tended to mature earlier in spring than the natural medics and herbaceous species that replaced barley grass at high stocking rates. Thus the contribution of reduced green pasture availability on low stocking rate treatments caused by the maturation of barley grass, cannot be entirely discounted as a cause of liveweight loss. The hypothesis that grass seed infestation in sheep reduces production is further supparted by significant correlations between liveweight loss and the incidence of both barley grass and spear grass. The importance of spear grass seed as a determinant of animal production is emphasised in the correlation of sheep mortality to spear grass incidence.

Observations in 1969 and 1970 support the hypothesis that grass seed infestation impaired sheep production. Grass seed was evident in the wool (4 months growth), particularly on the legs, neck and belly. Heavily infested sheep were reluctant to move and lost condition, probably due to a combination of reduced intake and weight loss caused by the inflammation reaction to grass seed infestation. The susceptibility of grass seed infested sheep to flystrike in 1969 appeared to be an additional factor leading to an increased number of deaths.

There was no apparent adverse effect of grass seed in 1968. In this year conditions were relatively dry (spring rainfall of 48 mm compared to 345 mm in 1969 and 169 mm in 1970), and the pastures were grazed closely. Either barley grass densities were not sufficiently high to produce a response, or the difference in the nutritional level of stock at high and low stocking rates was great enough to counteract any effect of barley grass seed infestation. The estimations of percentage cover of spear grass used in the regression and correlation calculations do not give a direct assessment of spear grass seed production. Thus the partial correlations with spear grass as the independent variable could be expected, particularly in 1968, to be lower than with a more direct measure of seed production. Even a direct count of inflorescence density, as was done with barley grass, may not provide an accurate assessment of the seed problem, because the size and height of the inflorescences will affect the incidence of seed infestation in sheep. In this respect barley grass inflorescences were set close to the ground surface in 1968.

In the Trangie environment, as opposed to New Zealand, barley grass is an important component of the pastures, providing a large quantity of nutritious feed in its early stages of growth (autumn and winter). Consequently control measures need to be directed towards retaining the grazing value of barley grass in winter and then reducing the inflorescence density in spring. Alternatively, sheep need to be moved from a barley grass dominant pasture to an area free of barley grass when grass seed becomes a problem.

V. REFERENCES

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