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THE CONTRIBUTION OF LUPIN SEED TO THE PERFORMANCE OF ANIMALS GRAZING UNIWHITE LUPINS

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Summary

An experiment is described in which yearling cattle, wether or weaner sheep were grazed separately on various stands of dry Uniwhite lupins. These stands were unharvested (control), seed harvested (stubble), or seed harvested but fed back to the animals. Intake of lupin seed significantly increased liveweight gain in all animal classes and wool growth in sheep. Sheep, but not cattle, were efficient at harvesting seed.

I. INTRODUCTION

Newly developed sweet lupins have shown promise as crop plants in the higher rainfall areas of south-west Australia (Gladstones 1970). As dry standing feed they also provide high quality grazing for young sheep in summer (Arnold unpublished data). There are several ways in which a dry lupin stand could be utilized for grazing. These include:

(a) harvest the seed and graze the stubble;
(b) graze the whole standing crop;
(c) harvest the seed, graze the stubble, and feed back the seed to the grazing animals.

An experiment is now described where some of the relative biological merits of the grazing components of these alternatives were compared. The grazing animals were yearling cattle, weaner or wether merino sheep. Particular attention was paid to the contribution of seeds to the performance of these animals, as lupin seeds are very high in nutritive value (Gladstones 1970).

II. MATERIALS AND METHODS

Twelve ha of Uniwhite lupins (Gladstones 1967) were sown at CSIRO Yalanbee Experiment Station in autumn 1970. In early summer 197 1, when the crop had matured, the area was divided randomly into nine plots of 1.0 ha each (for cattle), nine of 0.1 ha (for weaner sheep) and nine of 0.2 ha (for wether sheep). Plots were allocated into three blocks on a visually estimated yield basis. Six of each set of nine plots were machine harvested for grain.

Animals were grazed on each plot for 100 days commencing in December 197 1. There were three cattle, five weaner sheep or five wether sheep on each of the appropriate plots. The animals on three of the grain harvested plots (stubble)

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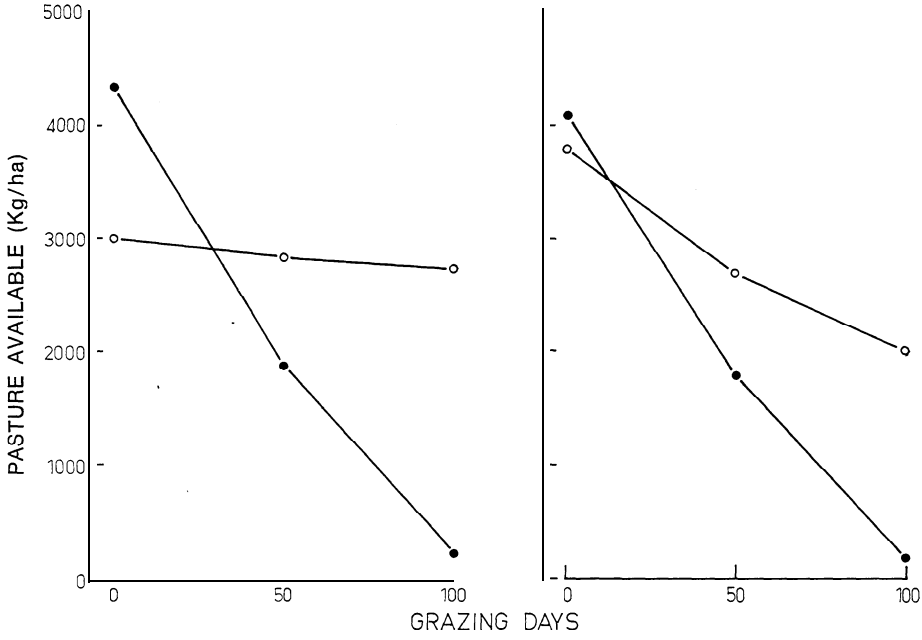

Fig. 1.—The changes in the available non-seed pools, A, cattle; B, sheep; ○———○, stem; ●———●, other.

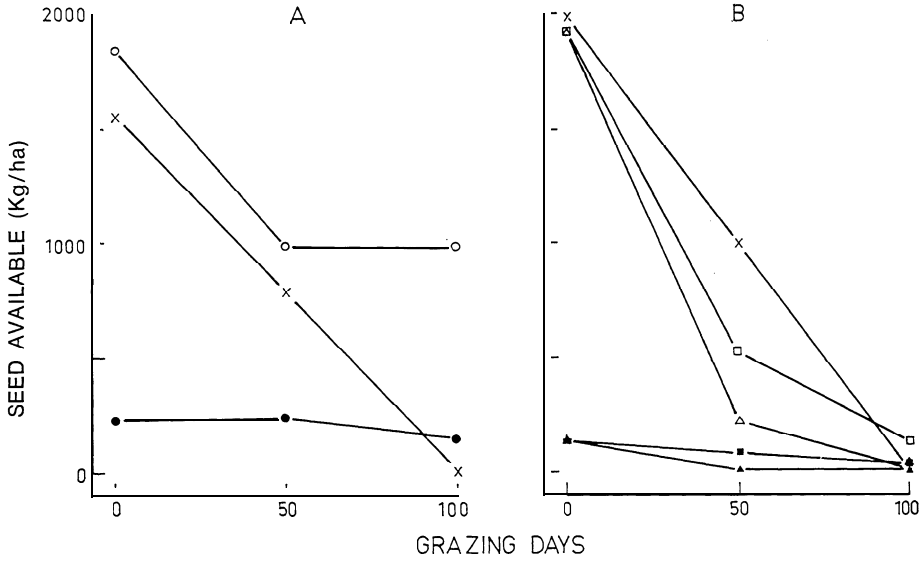

Fig. 2.—The changes in the available lupin seed pools, A, cattle; B, sheep; ○———○, cattle "control"; ●———● cattle "harvested"; △———△, weaner sheep "control"; ▲———▲, weaner sheep "harvested"; □———□, wether sheep "control"; ■———■, wether sheep "harvested"; ×———×, fed seed pool.

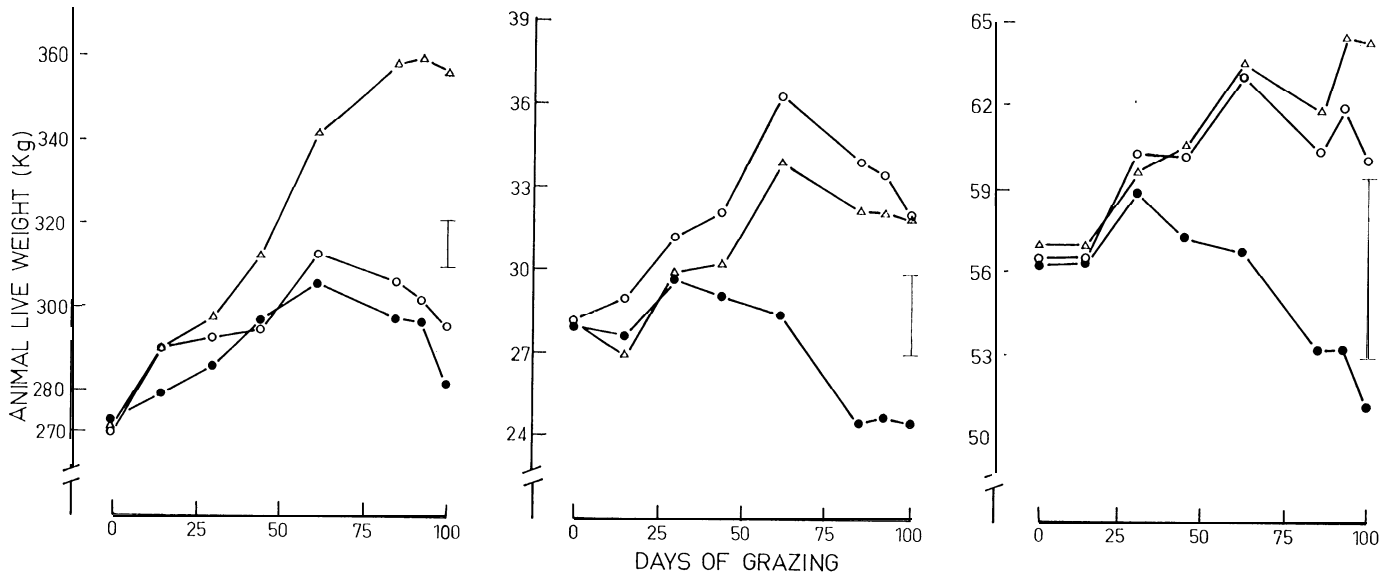

Fig. 3.—Liveweight changes in animals grazing on lupins. A, cattle (S.R. = 3/ha); B, weaner sheep (S.R. = 50/ha); C, wether sheep (S.R. = 25/ha); ○———○, control treatment; ●———●, stubble treatment; △———△, fed treatment.

= L.S.D.$_{0.05}$ at 100 days.

within each animal class were bin-fed the whole grain which had been harvested from the plot on a basis of 1 per cent of the total grain yield of that plot per day. These were nominated "fed plots".

Pasture samples were taken at days 0, 50, and 100. Two samples, each comprising the cuts from five randomly located half square metre frames were collected from each plot, and hand sorted into lupin seed, lupin stem, and "other" plant components. "Other" plant components consisted of lupin leaf and pod, and dry cape-weed, grasses and a little dry clover. Results are expressed on an air-dry basis.

All animals were weighed eight times at approximately 14 day intervals. Sheep were shorn 43 days before the start, and again after 79 days on the experiment. Wool weights were expressed as grams of greasy wool per day over the 122 day period. The weaner sheep were mulesed at the time of shearing.

Weaner sheep grazing stubble were fed lupin grain in the last 14 days of the experiment to maintain their liveweight above an arbitrary "critical" level.

III. RESULTS

At the start of the experiment, there was a mean of 1900 kg/ha of seeds available on control treatments, and 180 kg/ha on the harvested treatments (Figure 1) . Within the three animal classes there were no differences independent of the initial harvesting treatment in the amount of seeds remaining at 50 or 100 days. This means that the rate of removal of seeds from the plots was not affected by the feeding of grain in bins. In both sheep classes, available seed was reduced to very 'low values by the end of the experiment. With cattle, the only significant reduction in the amount of seed on the plot was seen after the first 50 days on the control treatment. Cattle ate all grain fed in bins after the first day of feeding. Both sheep classes rejected approximately one quarter of grain fed in the first week.

There were no treatment effects on the amount of stem or "other" present at any of the three harvest dates with either sheep or cattle (Figure 2). There were no interactions between sheep type and harvest treatment of the three plant fractions at the three harvest times.

There was a liveweight gain on all treatments where the stock ate appreciable amounts of lupin grain (Figure 3). The weight of wool removed at shearing was added to the post-shearing measurements of sheep liveweight. Shearing of sheep, and mulesing of weaners, at day 79, caused a set-back to the liveweights of the respective animal classes. The cattle on the fed treatments gained more weight than those on the control or on the stubble treatments. The sheep on the control and the fed plots gained more than those on the stubble treatment.

Mean greasy wool growths (g/head/day) for weaners were 12.6 for control 11.2 for fed, and 8.7 for stubble ($L.S.D._{0.95} = 0.7$). Corresponding figures for wethers were 17.5, 16.3 and 14.8 ($L.S.D._{0.95} = 1.5$).

IV. DISCUSSION

The seed fraction of lupin pastures was shown to be most important in determining the performance of the grazing animal. This was demonstrated particularly in the comparison between fed and stubble treatments, where live-

weight gain in all stock, and wool growth in sheep, was much higher in the fed plots.

The improvement in animal performance was found in sheep, both when seed was fed back, and when the sheep were left to harvest the seed from the plot (control treatment). The efficiency of seed harvesting by sheep was reflected in liveweight gain, wool growth and pasture measurements. In sheep, the animals on the control plots were at least equal in liveweight to those on fed plots.

Cattle were 'not efficient at harvesting seed in this experiment. The rate of liveweight gain on the control plots was much lower than that on the fed plots, and only in the first four weeks was it better than on the stubble plots. It was only in the first 50 day period that appreciable amounts of seed were removed from the control plots. This removal may have been associated with seed still intact in the pod on the plant.

Any relationship between decline of non-seed pasture components and animal performance is not clear from this experiment. The cattle maintained weight on the stubble, but the sheep lost weight after the first month. This may have been because the cattle were grazed at a lower stocking rate on a bodyweight (or on $BW^{0.75}$) basis, or because the cattle were more efficient than sheep on the low quality pasture. Playne (1970) has shown cattle to be more efficient than sheep in their ability to consume quantities of poor quality forage sufficient to maintain Iiveweight.

Further investigation is needed to determine the optimum forms of utilization of lupin pastures by grazing. Other systems of seed rationing may be more productive. The effects of seed treatment (e.g., cracking, rolling) are yet to be studied.

Systems which combine cattle and sheep may be most efficient. The 50 per cent of seed left by cattle on control treatments may have been subsequently utilized by sheep.

V. ACKNOWLEDGMENTS

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