ASSESSMENT OF FIELD BEAN STUBBLES AND SUPPLEMENTS FOR GRAZING CATTLE AND SHEEP

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SUMMARY

Sheep grazing bean stubbles grew faster and produced more wool and heavier, more profitable carcasses than those on barley stubbles. Likewise beef cattle made greater weight gains on bean than on barley stubbles. A bean supplement to sheep and cattle on barley stubbles induced significantly greater gains than similar amounts of barley grain. The greater production on the bean stubbles was associated with more residual grain and less herbage at the start of the experiment and a higher rate of consumption of the bean herbage residues.

Associated pen studies showed that bean crop residues (stem, leaf and pod) were more digestible than barley crop residues (straw, leaf and chaff) and mature ryegrass. The voluntary intake of bean crop residues was also greater than for mature ryegrass. When a bean supplement was added to a basal mature ryegrass diet the voluntary intake of the beef cattle was 10% greater than for animals receiving a similar supplement of barley.

INTRODUCTION

In an evaluation of grain legume crops for the dryland agricultural regions of southern Australia, it was reported that the field bean showed a great yield potential, some selections yielding as much as 8 t/ha in small plot trials on calcareous soils under favourable climatic conditions (Anon.1975). The bean crop (tickbean, broad bean, field bean = *Vicia faba*) has been fed to animals and humans for thousands of years and there is a large body of literature relating to the crop (Anon.1974). However, there is little information on the value of the stubbles of these crops when grazed by sheep or cattle, or of the value of beans when fed as a supplement to low quality summer pasture.

The object of the present study was to evaluate field bean stubbles and supplements for grazing sheep and cattle during the summer drought period in the Mediterranean environment of southern Australia. The barley crop or mature summer pasture were used to compare production responses, since they are common sources of sustenance for livestock during this period. The work was carried out at the Mortlock Experiment Station, Mintaro, South Australia between 1977 and 1979. The environment has been described by Pullman and Allden (1971).

EXPERIMENTAL

Preliminary pen studies

When barley crop residues (straw, leaf and chaff) containing 9.6g N/kg were compared with bean residues (12.3g N/kg) in a conventional digestibility trial with sheep, the beans had a higher D.M. digestibility (56.9% *vs* 44.4%, $P<0.01$). In a second study the voluntary intake of bean residues (14.8g N/kg, D.M. digestibility 60.4%) by sheep was 878g/day compared with 586g/day for mature ryegrass hay (7.0g N/kg, D.M. digestibility 46.9%), the intake and digestibility values beingsignificantly different.

In a subsequent metabolism study a basal diet of low quality ryegrass hay (digestibility 46.8%; N content 7.9g/kg) was fed to beef cattle in unlimited

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quantities; in addition animals received a similar amount of either a crushed beans or a crushed barley supplement (mean amount 820g/day). Those animals which received the beans supplement consumed significantly more than those given barley (5.8 *vs* 5.3kg/day, $P<0.05$). Although nitrogen balances for animals supplemented with beans were higher (8.6 *vs* -0.6 ± 3.9g/day) the results were variable and the difference was not significant ($0.2>P>0.1$). Indirect estimates of D.M. digestibilities of beans and barley were not significantly different, the coefficients being 90.7 and 86.9% respectively. These results suggested that under field conditions weight gains on bean stubbles would be greater than on either barley stubbles or pasture as a consequence of higher digestibilities and greater intake.

Experiments 1 and 2

Crops of barley and field beans were established in 1976 and 1977 in randomized blocks with three replications and after harvest the stubbles were grazed by weaner merino sheep from January 24 to April 14, 1977 (Experiment 1) and Dorset Horn – Merino cross store lambs from January 9 to February 20, 1978 (Experiment 2). A further group grazed on the dry herbage of sown pastures to provide a measure against which to compare the stubble treatments. In the 1977 experiment sheep grazed at 30/ha and weight gain and wool growth were measured; in the 1978 experiment the stocking rate was 20/ha and carcass weight and carcass values were compared in addition to weight gain. Estimates of herbage and seed available to the grazing animals were made by quadrat sampling.

Experiment 3

The aim of this study was to examine whether barley and beans fed to similar animals grazing a barley stubble induced comparable weight gains.

Three groups each of 10 Dorset Horn x Merino store lambs grazed a barley stubble as one group and each day from 21 February 1978 to 10 April 1978 were individually fed a supplement of either 280g of barley or beans or nothing. weight gains were determined at weekly intervals.

Experiment 4

Six groups each of six yearling Hereford and Hereford cross beef cattle grazed two crop stubbles (barley or field beans) and received three supplement treatments (nil or a daily allowance of 2.15kg of either barley or beans) in an experiment of factorial design during the six-weeks period from January 15 to February 27, 1979. Stocking rate was 10/ha and the duration of the experiment was limited by the amount of beans stubble available.

RESULTS AND DISCUSSION

Experiments 1 and 2

Figure 1 illustrates the weight changes of the treatment groups and the quantities of crop herbage and grain available to the grazing animals in Experiment 1 (left graph) and Experiment 2 (right graph). The significant feature of both graphs is the very rapid initial gains (160–190g/day) on the bean stubbles. In the first experiment rapid growth continued until 17 March, when the bean treatment was significantly greater than the other two treatments. By that time grain and herbage had been depleted on the bean plots so that in the last four weeks of the experiment, when weight losses were recorded, there was little feed available for sustenance; in contrast there was an abundance of crop herbage and greater amounts of grain on the barley plots and the weight trends of sheep on

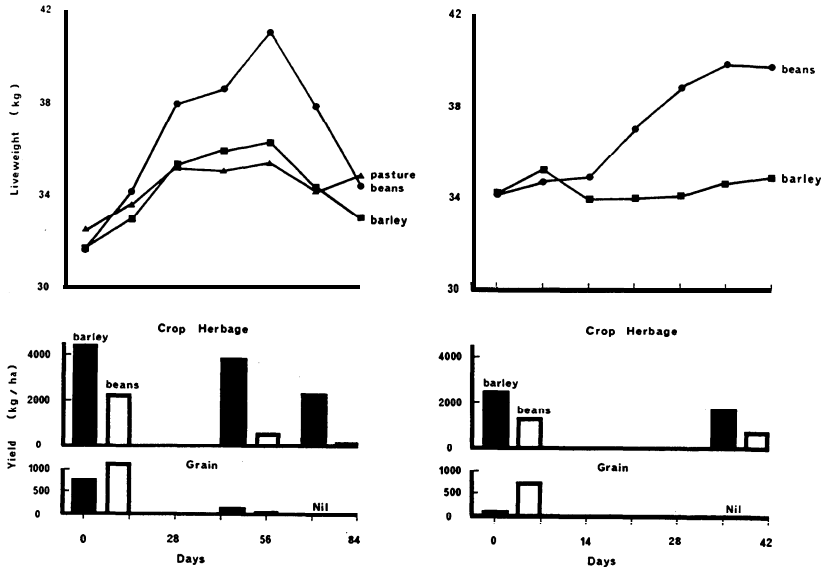

Fig.1. Weight changes of the experimental sheep and yields of stubble grain and herbage in Expt.1 (left) and Exp.2 (right).

those plots remained steady. Wool production on the bean stubbles was significantly greater than for the barley and pasture crop, with means of 9.12 ± 0.23, 7.40 ± 0.23 and 6.43 ± 0.47g clean wool/day respectively. The difference of 1.72g wool/day between the two stubble treatments was equivalent to 4.14kg clean wool/ha at the stocking rate adopted.

Figure 1 (right) illustrates that in Experiment 2 the bean groups made substantial weight gains for the first five weeks whereas the barley provided little more than a maintenance ration. At this stage the bean stubbles had virtually been eaten out, whereas there was adequate feed on the barley plots. The lambs grazing the bean stubble gained 4.87kg more than those on barley and their carcasses were 3.0kg heavier (both values being significant; $P<0.01$). At auction the carcasses commanded an 11¢/kg price advantage. At the stocking rate adopted (20/ha) the gross returns from the lambs on the bean stubbles was $93.60/ha greater than for the barley stubbles.

Experiment 3

Sheep grazing a barley stubble and receiving 280g/day beans supplement made significantly greater gains (1.7kg) than groups receiving a similar amount of barley (0.6kg loss) or no supplement at all (3.7kg loss). As the digestibilities of the grain supplements were similar, the results indicate that in barley stubbles devoid of green feed the beans supplement conferred an advantage over the barley in terms of weight gain.

Experiment 4

Table 1 illustrates that the weight gains of beef cattle grazing bean stubbles were significantly greater than for barley stubbles; supplementation with beans was superior to both barley and no supplement. A feature of Table 1

is the significant advantage of a beans supplement over a barley supplement on a barley stubble, a response which confirmed the result obtained with sheep in Experiment 3. Several cases of bloat were observed during the course of the study and a death was recorded in both beans and barley treatments. It was clear that feeding large quantities of either supplement to cattle could lead to management problems.

In this experiment and the two sheep studies on bean and barley stubbles two factors contributed to the better animal performance on beans. Firstly there were greater amounts of grain on the bean plots at the beginning of each experiment, although there was less herbage. Secondly, the apparent consumption and *in vitro* digestibilities of the bean herbage residues were at all times significantly greater than barley, thus confirming the results of the pen studies on intake and digestibility.

TABLE1 Weight gain (g/day) of cattle (initial weight 254.3kg) from January 15 to February 27, 1979

Stubble	Supplement			Stubble Means S.E.
	Nil	Barley	Beans	
Barley	207	98	545	283
Beans	470	550	670	563 ** 63.5
Supplement Means	338	324	607	
		NS	*	
S.E.		75.2		

N.S. = Not significant; *P<0.05; **P<0.01

In conclusion the results of the field experiments with beef cattle and sheep showed that field beans when provided as a supplement or as a stubble for grazing during the summer months induced rapid liveweight gains and enabled a rapid finishing of the young animals at a time when this is difficult to achieve in a Mediterranean environment. Should field beans be developed and selected for as a commercial crop in southern Australia the residues are likely to be of value in animal production systems which aim to provide growth of sheep and cattle during the dry summers.

ACKNOWLEDGEMENTS

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