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Phomopsis-resistant lupin stubbles as feed for weaner sheep

The risk of lupinosis in sheep is less on Gungurru and Yorrel stubble. These stubbles are highly nutritious for weaners.

By Colin McDonald, Research Officer, Geraldton, Keith Croker, Senior Research Officer, South Perth and Jeremy Allen, Principal Veterinary Toxicologist, South Perth

The breeding of sweet, narrow-leaved lupins with increased resistance to Phomopsis leptostromiformis, the fungus that causes lupinosis in sheep, is a breakthrough for the summer nutrition of weaner sheep.

The new resistant varieties, Gungurru for the medium (325 to 450 mm) rainfall areas and Yorrel for low rainfall areas (less than 325 mm), were released by the Department of Agriculture in 1988.

Research in the late 1970s indicated that, in the absence of lupinosis, weaners could achieve moderate to high growth rates when grazing lupin stubbles. However, there was a considerable risk of lupinosis.

Lupin stubbles of the 1990s are substantially different from those of earlier years.

Phomopsis-resistant varieties are now widely grown, and improvements in cultural techniques and harvesting efficiency mean the stubbles have fewer weeds and less split lupin seed. The growth responses of sheep on these 'old' and 'new' stubbles are also different.

This article discusses progress in a four-year project which is examining liveweight and wool production of weaners grazing Gungurru stubbles.

The research, which is funded by the Australian Wool Research and Development Corporation, is based on research station plots and on large paddocks on farmers' properties.

Gungurru is the recommended variety for most of the lupin growing areas, so the experiments have concentrated on that variety rather than Yorrel. Another two years' study remain.
Production responses

Weaners, from a common mob, grazed Gungurru stubbles over summer and autumn at a range of stocking rates at Badgingarra, Chapman and Wongan Hills Research Stations in 1989-90 and at five sites in 1990-91 (the same sites used in 1989-90 plus Merredin Research Station and a farm near Narrogin).

The amounts of spilt lupin seed available after harvest at the sites ranged from 125 to 360 kg/ha (96 to 270 seeds per square metre).

The sheep were weighed fortnightly and wool growth was estimated from monthly dye-bands. Snippets of wool from each dye-band were measured for fibre diameter. Examples of production responses recorded are shown in Figures 1 and 2.

Sheep were removed from the plots when, on average, their liveweight showed a decline. In Figure 1, which is from the Chapman site in 1989-90, this point came on about day 65 for the 25 sheep per hectare groups (equivalent to 1625 sheep grazing days) and day 100 (1500 sheep grazing days) for the 15 sheep per hectare groups. The 5 sheep per hectare groups were removed on day 160 (800 grazing days) because the increasing quantity of green feed would have contributed to weaner growth.

The results showed higher stocking rates may seem best because they gave more grazing days. However, sheep grazed at the lower stocking rates gained more weight and grew slightly more wool with a higher fibre diameter (Figure 2). At about day 110 there was a four micron difference in fibre diameter of the wool snippets from sheep stocked at 5 and 15 animals per hectare. This difference might not be as great when averaged over a 12-months full staple, but it would affect the value of the wool. All these factors will influence the choice of stocking rate.

At Chapman, the higher the stocking rate the quicker the available seed was eaten (Figure 3). For the 25 and 15 sheep per hectare groups, sheep began to lose weight when seed levels fell below 50 to 100 kg/ha (38 to 77 seeds per square metre). There was a similar effect at the other sites, although the critical level of seed appeared to be closer to 50 kg of seed per hectare than 100 kg/ha. If generally applicable, such a critical level would be a useful guide for farmers to decide when to de-stock a paddock, provided enough stubble material was left to protect the soil from wind erosion.

The decreases in quantity and quality of the leaves, stems and pods were also measured, but the amount of lupin seed left after harvest had the greatest influence on sheep performance.

Performance of late-born weaners on Gungurru stubbles

About three-quarters of the State's ewe flocks lamb during April, May or June. Many farmers have been reluctant to use later lambing times as they believe these times would result in lighter weaners which are less able to survive the summer and autumn.

If lupin stubbles presented little risk of lupinosis, they would provide an excellent source of feed for these late-born lambs. This management opportunity may increase whole-farm income as there would be less hand-feeding of lambing ewes during pregnancy and the lambs should survive the summer.

On Badgingarra Research Station a ewe flock was divided into two groups for joining at different times. Lambing started in the first week of June and in the first week of August 1989. In summer and autumn, a random selection of weaners from both lambings was grazed.
on Gungurru stubble, at a stocking rate of 15 sheep per hectare. This procedure was repeated in 1990-91, but at stocking rates of 5 and 10 sheep per hectare.

In both years, the growth rates of August-born lambs were similar to those of lambs born in June (Figure 4). The weaners born later did not catch up during the period on stubble. During 1989-90, weaners born in August almost reached the same weight as those born in June after being run together on pasture until shearing in September 1990.

In 1990-91, all weaners were grazed on Gungurru stubbles at lower stocking rates. These lower stocking rates would have given the August-born weaners the opportunity to catch up in weight to those born in June. However, the results were similar to those of 1989-90, showing similar growth rates for lambs born in August and June.

The principal aims of the project are to assess the potential of Gungurru lupin stubbles as a feed for weaner sheep, and to develop management strategies to make the best use of these stubbles. To achieve these aims we are:

- assessing the performance of weaners grazed on Gungurru stubbles at various stocking rates and sites in different years;
- comparing the performances of weaners born early (in the first week of June) and late (the first week of August) on these stubbles;
- assessing the benefits, if any, of familiarising lambs with lupin seed before grazing on lupin stubbles; and
- testing the effect of placement of watering points on the efficiency of sheep using lupin stubbles in large paddocks.

Most of this research is in the Department of Agriculture’s northern agricultural region, the major lupin growing area in Australia.

The “home base” for the work is Badgingarra Research Station, with counterpart trials at Chapman and Wongan Hills Research Stations.

In an on-farm study at Watheroo, we are examining strategies for providing water to sheep grazing large paddocks of lupins to achieve good stubble use with minimal risk of wind erosion.

To extend the scope of the findings to the rest of the agricultural areas, we are conducting experiments at Merredin Research Station and on a farm near Narrogin. There are plans for additional sites in the southern agricultural region during 1991-92 and 1992-93.

So far we have completed 14 experiments at five sites. Funds permitting, the project will conclude with on-farm evaluations of the experimental findings in each of the Department’s agricultural advisory regions.
Late-born lambs will grow well on Gungurru lupin stubbles. Although their bodyweights, by the end of the first summer, may not have caught up with those of lambs born earlier and which also graze on lupin stubbles, their weights should be similar by the end of the following spring.

**Recognising lupin seed**

We know that sheep need to learn to eat new feeds such as cereal grains, protein nuts and shipping pellets, and lupin seed is probably no exception. We hypothesised that weaners, which had been exposed to lupin seed before they were put on stubbles, would be less likely to develop lupinosis. They would tend to select out the seed from the possibly toxic stems and pods.

Lambing ewes were fed lupin seed twice weekly at a rate equivalent to about 400 g/head/day until the youngest lambs were four weeks old. This high rate was used to ensure the lambs had the opportunity to eat some seed and to see their mothers eating it. At the same time, another group of ewes, originally split off from the group which was fed lupins, was lambed down on a good pasture paddock and no lupins were fed.

The feeding behaviour of a random selection of weaners from these two groups was compared in summer when grazed on plots of lupin stubbles. The amount of seed in the plots declined at the same rate, suggesting that the training to recognise lupin seed had no beneficial effect.

However, because the amount of seed on the ground was measured at the end of each week, this would not have detected any differences in the amount of seed eaten in the first few days the weaners grazed the stubbles. Training, therefore, may be useful if stubbles are toxic.

**Large stubble paddocks, watering points and wind erosion**

Even if there is no lupinosis, weaners should still be removed from Gungurru lupin stubbles before ground cover is reduced to a level likely to cause soil erosion.

Paddocks in lupin growing areas tend to be more than 100 ha. Weaners, in particular, tend to concentrate their grazing in a radius around watering points. This is because sheep drink more water when grazing lupin stubbles than when grazing cereal stubbles. These areas rapidly become denuded and are an erosion risk, while the rest of the paddock feed may be under-used.

Extra troughs placed throughout the paddock, or a moveable trough, may help sheep make better use of stubbles and reduce the risk of soil erosion.

A 106 ha paddock of Gungurru stubble on undulating sandy soil in the Watheroo district was used in a preliminary study. The farmer stocked the paddock with about 960 Merino ewe weaners (at 9 sheep per hectare) on December 13, 1990. The paddock was about 1500 m long and of variable width, averaging about 700 m.

A 1000 L fibreglass tank and trough unit was placed about 250 m from the corner along the 1500 m fenceline. Lupin seeds were counted at various distances from the trough to estimate the quantities of seed per hectare. The level of ground cover was also estimated at one-month intervals. An identified sample of 100 weaners was weighed on each sampling day.

We planned to shift the trough when the ground cover fell to a level that posed a risk of wind erosion. It took about two months before we considered the average ground cover was getting too low.

The 100 sheep gained nearly 3 kg in the two months. The growth rate of about 50 g/head/day was less than expected, given the initial level of seed in the paddock was about 200 kg/ha (154 seeds per square metre).

On our plots weaners grew at 60 to 80 g/head/day when seed levels exceeded 50 to 100 kg/ha. In the big paddock it is possible that subclinical lupinosis or a muscle disease associated with lupinosis, or both, may have slowed their growth. The large mob, the different source of sheep and the single watering point in a large paddock may also have had an influence.

Seed counts and estimates of stubble eaten at Watheroo showed that the weaners had grazed out as far as 1350 m. However, most of the grazing had been concentrated within an 800 m radius of the trough.
After two months of grazing around the trough, the amount of ground cover was becoming an erosion risk, and the trough was moved 1000 m. The paddock was grazed for a further 30 days.

If the trough had not been moved, the paddock would have had to be destocked at the end of the second month. This third month of grazing would have been foregone. The weaners would have had to go onto cereal stubble or dry pasture and probably be supplemented with lupin seed.

In this case, the cost of a movable trough for 1000 animals was easily justified. We plan more work on this aspect of stubble use, as well as working with wind erosion scientists to provide estimates of when lupin stubbles are at risk from wind erosion.

**Kiev lupin stubbles**

Production from weaners stocked at 15 sheep per hectare on Kiev lupin stubbles was compared with that from Gungurru stubbles at Chapman Research Station.

Kiev, a broad-leaved lupin, grows better on heavier soils than the narrow-leaved types such as Gungurru. The seed of Kiev has a higher energy and protein content than that of Gungurru, and is more than three times as large. Kiev also has a high level of natural resistance to Phomopsis.

There was little difference in liveweight, wool growth or fibre diameter between sheep grazing the two types of lupin stubble in 1989-90. In 1990-91, weaners on Gungurru performed slightly better than those on Kiev. This was surprising in view of the superior nutritive value of Kiev seed. Nevertheless, the work showed that weaners can grow well on Kiev stubbles.

**Lupinosis warning**

At some sites, weaners developed lupinosis or an associated muscle disease, usually in mild forms. Gungurru and Yorrel lupins are Phomopsis-resistant, not Phomopsis-free. Sheep, especially weaners, can still develop lupinosis.

**Future studies**

Weaners grazed on Gungurru lupin stubbles can achieve excellent liveweight and wool production. Although not completely safe from lupinosis, sheep can graze Gungurru lupin stubbles for long periods, particularly in the northern agricultural region. We plan to gather information on weaner performance on Gungurru stubbles in the Great Southern and along the south coast.

Preliminary results indicate the growth of weaners in large paddocks of lupin stubble with limited watering points is poorer than that observed on small plots.

During the next two years we will examine the requirements for watering points which will allow weaners to make the best use of the available stubble. At the same time paddocks must retain enough ground cover to protect the soil from wind erosion.

The project will provide data for an economic evaluation of weaner production on Gungurru stubbles. This will include balancing the costs and benefits of increased liveweights, reduced death rates, improved staple strength and increased fibre diameter. Subsequently, it should be possible to develop management options for the best combination of these factors.

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