THE GROWTH OF WEANER SHEEP GRAZED ON SANDPLAIN LUPINS

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ABSTRACT
The grazing potential of stands of sandplain lupins (a self regenerating naturalised plant in the West Midland region of Western Australia) was evaluated. In the absence lupinosis, Merino weaner sheep either gained, or lost small amounts, of liveweight when grazed on these pastures for up to four months at stocking rates of 5 and 10 sheep/ha. It appears that the understorey of these pastures (volunteer grasses and broad-leaved weeds) made an important contribution to the nutrition of the sheep because there was not enough lupin plant material available to sustain the sheep.

KEYWORDS
Sheep, weaners, bitter lupins, sandplain, grazing, liveweights, lupinosis

INTRODUCTION
Sandplain lupins (*Lupinus cosentinii*) grow wild on about 0.5 m ha of extremely infertile sands in the West Midland area of Western Australia. They are a hard seeded, self regenerating plant. The farmers who use them successfully for summer grazing maintain that they do not have major losses of sheep from either alkaloid poisoning or lupinosis which can develop after toxic pods or lupin stalks are eaten (Gardiner, 1967).

The experiment described here was conducted to measure the performances of Merino weaner sheep grazed on stands of sandplain lupins at different stocking rates. In addition, the contribution of the understorey to the nutrition of weaners was examined.

MATERIALS AND METHODS
The experiment was sited on deep, white, non-wetting siliceous sand with a clay content < 5%. The site was fertilised with 100 kg superphosphate/ha in June 1995. The climate is Mediterranean with the average rainfall for the seven years from 1989 to 1995 being 627 mm (85% of the rain fell between April and October).

Experimental design. There were five randomly sited replicates of three stocking rates (5, 10 and 20 sheep/ha). The plots were grazed with five weaners (total of 75 weaners). New weaners were used for each grazing period.

Sheep. The weaners (June-July born, about six months of age) were allocated to experimental groups based on stratified liveweights. They were subjected to the normal husbandry practices before being put onto the plots.

Grazing. The plots were only grazed in summer-autumn, grazing starting soon after senescence of the lupin and other plants, from early in December in three concecutive summers (Summer 1, 1993/94; Summer 2, 1994/95; Summer 3, 1995/96). The weaners were taken off the plots when the average liveweights of the plots fell to 90%, or less, of the heaviest weight measured; or when lupinosis developed or the season broke.

OBSERVATIONS
Sheep. The sheep were weighed every 14 days until it was close to when grazing was to be finished. Some plots were then weighed at seven day intervals. Blood samples were collected from all sheep when grazing ended, and plasma activities of glutamate dehydrogenase (GLDH) and gamma-glutamyl transferase (GGT) determined.

Plants. Seed bank - in the spring and following the break of the next growing season, ten cm diameter cores taken to a depth of ten cm were collected on each plot. This material was bulked for each plot and the lupin seeds counted and weighed to estimate the seed reserves (kg/ha).

Dry material - the above ground material, excluding the lupin seed, was collected from ten 0.25 m^2 quadrats sited at equal intervals and then bulked for each plot. After drying at 60°C for 48 hours, the material was weighed.

RESULTS
At the start of grazing there was 3.3 t/ha, or more, of DM on the plots with no statistically significant differences between stocking rates any years (Table 1). Only about 5% of the DM was lupin material, including seed, with the remainder being grasses and broad-leaved weeds. The levels of seed were very low (range 54-256 kg/ha, Table 1).

At the end of grazing the amount of DM available had decreased to between 1.6 to 2.9 t/ha (Table 1), but there were inconsistent changes in the residual seed levels on the plots. Only small amounts of seed, if any, were eaten in Summers 1 and 2, while in Summer 3 72-80% of the seed was eaten even though the length of grazing was shorter (40 cf to 78-98 and 93-131 days for Summers 3, 1 and 2, respectively).

At the start of grazing the average liveweights for the weaners were 30.5 ± 0.34 (±SE), 30.2 ± 0.38 and 31.5 ± 0.4 kg in Summers 1, 2 and 3, respectively. The rates at which the liveweights changed while the weaners were on the plots appeared to be related to stocking rate (Table 2) with those at 5/ha doing the best. At 5/ha, the sheep gained liveweight for longer periods, although this was only statistically significant in Summer 1.

Plasma GLDH and GGT activities indicated that weaners grazed at the two lower stocking rates in Summer 2, and virtually all the sheep grazed in Summer 3, had developed lupinosis by the end of grazing (Table 2).

DISCUSSION
This study shows that on very poor soils, where it is difficult to grow productive improved pastures, weaner sheep can be grazed on regenerated stands of sandplain lupins and other volunteer species, at a low stocking rate, for three to four months without any supplementary feeding. Therefore, these pastures could be an extremely valuable feed resource during the summer-autumn period when other paddock feed supplies are usually limited and supplementation of sheep with cereal grain or legume seeds is necessary.

Very little lupin seed was eaten during Summers 1 and 2 which suggests that the understorey in self regenerating stands of sandplain lupins makes an important contribution to the performance of sheep.

The results from Summer 3 showed that the development of lupinosis can severely reduce the length of grazing on stands of sandplain lupins. Development of toxicity in the lupins restricts the extent to which they can be used as a summer-autumn feed.

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REFERENCES
Gardiner, M.R. 1967. Lupinosis. Adv. Vet. Sci. **11**: 85-138.

Table 1
The amounts of dry matter (DM) and lupin seeds before and after grazing of sandplain lupins at different stocking rates (SR) (means of 5

	Summer 1 (1993/94)				Summer 2 (1994/95)				Summer 3 (1995/96)			
SR	DM (t/ha)		Seed[1] (kg/ha)		DM (t/ha)		Seed[1] (kg/ha)		DM (th/a)		Seed[1] (kg/ha)	
(sa/ha)	start	end	start	end	start	end	start	end	start	end	start	end
5	3.7	2.9	105	70	4.5	2.3	62	56	4.8	3.5	215	45
10	3.8	2.6	94	73	4.5	2.4	74	86	4.8	3.4	256	50
20	3.3	1.9	97	98	3.6	1.6	59	35	4.7	2.6	200	56

There were no statistically significant differences between stocking rates for any of these measurements
[1]Amount of seeds available estimated from core samples (therefore on the ground and to a depth of 10 cm)

Table 2
The average performances of weaner sheep grazed on sandplain lupins at different stocking rates (SR) and the activities of plasma gltamate dehydrogenase (GLDH, U/L) and gamma-glutamyl1 transferase (GGT, U/L) at the end of grazing m(means of 5 replicates)

	Summer 1 (1993/94)					Summer 2 (1994/95)					Summer 3 (1995/96)				
SR	Grazing[1]	Days to	Wt change[3]	GLDH	GGT	Grazing[1]	Days to	Wt change[3]	GLDH	GGT	Grazing[1]	Days to	Wt change3	GLDH	GGT
(sh/ha)	(days)	heaviest	(g/hd/day)			days)	heaviest	(g/hd/day)			(days)	heaviest wt[2]	(g/hd/day)		
5	95	81[a]	36[a]	12.3	69.3	112	74	10[a]	39.5[a]	121[a]	40	17	-16[a]	37.4	159
10	98	18[b]	-1[b]	9.8	66.0	131	30	-18[b]	94.1[a]	108[b]	40	13	-39[a]	26.2	134
20	78	14[b]	-23[b]	11.2	58.2	93	21	-38[b]	12.8[b]	82[b]	40	8	-66[b]	27.2	137

Values within columns with different superscripts differ significantly at the 5% level of probability
[1]The number of days the sheep were on the plots
[2]The number of days taken to reach the heaviest weight recorded (where there was no increase in weight above the initial weight, this was recorded as 0)
[3]Change in wight while on the plots.