

THE USE OF GOATS FOR CONTROL OF SAFFRON THISTLE, *CARTHAMUS LANATUS* L.

J.R. Peirce
 Department of Agriculture, Baron-Hay Court,
 South Perth W.A. 6151

Summary. An experiment was commenced at Arrino some 350 km north-east of Perth to determine the effect of four grazing treatments on the control of saffron thistle, *Carthamus lanatus* L. The grazing treatments were: high stocking rates of sheep or goats; low stocking rate of goats; and a combination of sheep and goats. Measurements in the first two years of the experiment indicated that the high stocking rate of goats removed at least 81% of newly formed saffron thistle heads within a month after flowering; all heads were removed by three months. Low stocking rates of goats had some effect on seed head removals, while sheep and combinations of goats and sheep were ineffective. Feeding tests with whole saffron thistle seeds indicated that less than one percent of the seed passed through the digestive tracts of sheep or goats, and that the seed recovered from the faeces failed to germinate.

INTRODUCTION

Saffron thistle is a widespread weed in cropping and some grazing districts in the south-west of W.A. (8). The prickly nature of the weed restricts grazing during seasons when dense vigorous stands of the weed develop. In grain producing districts particularly those in the south-eastern areas, crops are often infested with the weed and the saffron thistle seeds contaminating the grain, incur a financial dockage.

Despite the availability of suitable herbicides (2, 4, 6, 7) little effort is made by farmers to control saffron thistle. This is mainly because of its staggered germination in cereal crops and farmers are reluctant to spend money on pasture treatments because at present there is no economic benefit associated with the treatments (11). In addition, the treatment has to be repeated over a number of consecutive years because of the long dormancy of saffron thistle seeds (9).

Recent results of grazing experiments to control troublesome weeds in the eastern states of Australia and in New Zealand have highlighted the value of goats to reduce the density of several troublesome weeds (1 3, 5). An experiment was initiated in 1985 to investigate the potential of goats to control saffron thistle in pasture over a period of several years.

METHODS

The experiment was located at Arrino some 350 km north-east of Perth. Four paddocks 2.5 ha each were fenced within a dense infestation of saffron thistle, and the grazing treatments in the first two years were as follows:

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|------|---|
| 1985 | 1. Sheep @ 2.4/ha and increased to 20/ha at flowering |
| | 2. Goats @ 2.4/ha and increased to 20/ha at flowering |
| | 3. Goats @ 2.4/ha |
| | 4. Goats @ 2.4/ha and sheep @ 2.4/ha |
| 1986 | 1. Sheep @ 7.2/ha |
| | 2. Goats @ 7.2/ha |
| | 3. Goats @ 2.4/ha |
| | 4. Goats @ 2.4/ha and sheep @ 2.4/ha. |

Grazing commenced on 9 August 1985 and higher stocking rates were introduced to treatments 1 and 2 on 18 October 1985. In 1986, grazing commenced on 9 July 1986. In addition, five sheep/ha were placed on the two goat treatments (2 and 3) for one month in September to assist grazing of the heavy stand of grasses present (primarily annual rye grass, *Lolium rigidum* Gaudin. On 13 October 1986, all treatments commenced as set out for 1986.

In late December of both years, 32 quadrats of 1 m² each were sampled on a fixed grid pattern in each treatment. In each quadrat the number of plants was recorded as well as the number of heads of saffron present, and the number of heads removed (eaten).

Six categories representing different percentages of saffron thistle heads removed were used and the numbers of samples in each recorded. A chi-square analysis was used to determine if any significant differences existed between the grazing treatments.

An experiment was also conducted to determine what proportion of saffron thistle seeds passed through the digestive tract of sheep and goats. Animals were daily fed a measured weight of saffron thistle for a given period of time, and the faeces collected and examined for whole saffron thistle seeds. Germination tests were conducted on the recovered seeds.

RESULTS AND DISCUSSION

Over both years the heavy stocking rate of goats removed significantly more heads of saffron thistle than the other treatments (Table 1). Goats plus sheep were the least effective treatment.

Table 1. Effect of different grazing treatments on the removal of saffron thistle seed heads

Treatment	Year	Distribution of samples of different percentages of saffron thistle heads eaten					Percentage of saffron thistle heads eaten	
		0%	1-40%	41-70%	71-90%	91-96%		97-100%
High stocking rate of sheep	1985-86	9	4	3	5	0	10	54
	1986-87	10	22	0	0	0	0	9.7
High stocking rate of goats	1985-86	2	4	0	8	6	11	75
	1986-87	1	1	5	14	7	3	87
Low stocking rate of goats	1985-86	11	2	2	1	1	11	51
	1986-87	9	12	4	2	0	0	19
Sheep and goats	1985-86	18	1	1	0	0	0	2.9
	1986-87	12	16	0	0	0	0	3.2

Goats withstood the harsh grazing conditions better than sheep (Table 2). Their body weights increased over the summer months on all treatments. Sheep declined in weight in the first year by some 22% and managed to maintain body weight in the second year under high stocking rate conditions.

Table 2. Percentage changes in average animal body weights on the different grazing treatments (August-February)

	1985-86	1986-87
High stocking rate of sheep	-22	0
High stocking rate of goats	27	23
Low stocking rate of goats	50	29
Sheep and	-16	23
Goats	43	40

The ability of animals to accept the thistles as feed may be partly influenced by their previous conditioning to the weed. The sheep used during 1986-87 were obtained from districts in the south-west where no thistles were present, while those used in 1985-86 were from the property where the saffron thistle had been present for some years. It appears that these sheep were accustomed to grazing the thistles, because they removed 54% of seed heads while the new sheep only removed 10%.

Plants counts indicated that saffron thistle seedling emergence in the second year did not decrease on treatments that successfully removed the saffron thistle heads during the previous season. This could be primarily due to the presence of a large bank of dormant seed. Saffron thistle seed can remain viable for at least six years in the soil (9), although the bulk of dormant seed will germinate within three years after formation. A similar emergence pattern has been recorded after variegated thistle was grazed by goats (1).

No health problems were observed with the goats, except in the first year when new goats introduced onto the experiment suffered from an attack of scabby mouth. However, after a period on oaten grain and hay they recovered fully. Once the goats have contracted and recovered from this disease, they are usually immune from a recurrence (12). The presence of scabby mouth in 1985 would also have decreased the ability of the goats to feed on prickly material because of lip and muzzle lesions.

No explanation can be offered for the poor performance by the mixed group of sheep and goats in the two years of the experiment. The number of animals in this group was twice that of the lower stocking rate of goats and both groups were introduced onto their respective treatments on the same date.

The success of the treatment depends on several factors, the most critical being the ability to adjust the grazing pressure to match weed density and the availability of other pasture species. It would seem that management skill is just as critical for success as it is with the alternative "spray-grazing" technique (7). Limited observations also indicate that goats will selectively graze saffron thistle treated with sub-lethal doses of 2,4-D amine. The only difference in this technique when using goats is that spraying appears to be more successful when done at early flowering, rather than at the early stem elongation stages, as recommended for sheep.

Feeding tests indicated that both sheep and goats readily accept saffron thistle in their diet and few entire seeds are passed. After 14 days of feeding, 450 g of saffron thistle seed (approximately 22,400 seeds) was consumed per animal. On average only 4.7 g was recovered from sheep faeces and 2.1 g from goat faeces. Recovered seed failed to germinate when tested

for germination.

The experiment will continue for several more seasons using sub-treatments involving cropping and pasture establishment.

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