EFFECT OF SCOTCH THISTLES ON SHEEP GROWTH RATES

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SUMMARY

The effect of various densities of Scotch thistles *(Cirsium vulgare)* in pasture on sheep live weight gains was measured. There was a significant negative correlation between thistle density and live weight gain. MCPA applied for thistle control also reduced live weight gain by as much as Scotch thistles at a density of 1.67/m². MCPB did not depress sheep live weight gains.

INTRODUCTION

Much time, effort and money is spent annually on the control of pasture weeds without any information on the effect these weeds are having on farm production. Many of the herbicides used can damage clovers and have an adverse effect on pasture production. It is necessary, therefore, to know what weeds are costing the farmer and to look at this in relation to the effect of weed control measures.

It is not possible to assess the effect of weeds in pasture by pasture dry matter yields only, because mowing itself may act as a weed control measure. Also, some weeds may be palatable and contribute to the usable production of the pasture. The grazing animal is the best measure of the effect of weeds. Some work has been done with Californian thistles *(Cirsium avense)* (Hartley and James 1979; Hartley and Thomson 1982) but Californian thistle is rather an unusual weed because of its perennial root stock and clonal growth habit.

For the work reported here Scotch thistle was chosen as typical of a sizeable, unpalatable annual/biennial weed. It can be regarded as similar to a range of other thistles, including nodding thistle *(Carduus nutans)* and winged thistle *(C. tenuiflorus)*. The object of this trial was to establish different Scotch thistle densities in several paddocks, to set-stock each paddock with sheep and measure the relationship between sheep live weight gain (LWG) and thistle density.

METHOD

The trial was conducted on the Hauorongo Research area, near Palmerston North. A 2 ha paddock, which had been in pasture for 2 years was divided by electric fencing into fifteen 0.12 ha paddocks connected by a race to a weighing/holding area. The whole area was topdressed with 250 kg superphosphate/ha prior to subdivision.

During summer 1979/80, Scotch thistle seed was collected by hand harvesting individual ripe seed heads and drying them in net onion bags. The bags retained the pappus and remaining flower heads but allowed the seed to be shaken out.

Different rates of thistle seed were sown in each of 15 paddocks. In one paddock no seed was sown whilst the number of seeds sown in the other paddocks followed a geometric progression so that each rate was 1.7 times higher than the rate in the previous treatment. The lowest rate sown was 120 seeds per paddock and the highest was 96,000 seeds. The paddocks to receive each thistle density were chosen at random. The thistle seed was sown in March 1980 before the fences were erected. The paddocks were grazed hard before the seed was broadcast by hand. Stock was kept on for a few days to tread the seed in and during this time some rain fell. The paddocks were then shut up for about 4 weeks.

Thistle establishment was monitored on five fixed transects in each paddock. Initially thistle seedlings were counted in fifty 0.5 m² quadrats/paddock and later, when larger, on 1 m wide transects (100 m²/pdk). At the spring 1981 count, approximate thistle diameters were also recorded.

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The trial was set-stocked with dry two-tooth sheep. Each paddock had a basic four sheep with others added in equal numbers on all paddocks as necessary to maintain a reasonably tight grazing pressure. When feed was inadequate to maintain four sheep, all paddocks were spelled.

There were more paddocks of very low thistle density than needed for the trial, so in May 1981 two paddocks were sprayed with MCPA (1.5 kg/ha) and two with MCPB (2.0 kg/ha) to simulate treatment for thistle control. In May 1982 all four paddocks were sprayed with MCPA (1.5 kg/ha): the paddock (No. 15) in which no seed had been sown initially was sprayed with MCPB (2.0 kg/ha) in 1982.

RESULTS

A regression analysis of thistle seedling numbers in spring 1980 against number of sown seeds showed a 4.5% establishment of sown Scotch thistle seed and a basic natural population of 343/paddock. The introduced Scotch thistle seedlings grew slowly and remained small until the spring of 1981. Sheep LWGs were therefore not recorded till October 1981.

TABLE 1: Relationship between thistle numbers and LWG over two seasons.

	1981-82				1982-83	
Pdk	No.thistles /100 m²	LWG (kg) 2/10-3/11	11/11-31/3	Total 2/10-31/3	No.thistles /100 m²	LWGs 8/10-21/3
2	104	10.6	7.2	17.8	33	15.3
4	146	11.4	5.2	16.8	26	16.7
6	12	10.6	8.6	19.2	84	14.3
8	83	11.9	5.3	17.2	10	12.0
9	60	10.9	6.4	17.3	12	14.5†
10	69	12.0	6.6	18.6	2*	14.7
11	42	11.3	7.3	18.6	0*	12.2
12	28	11.2	6.5	17.7	66	15.6
13	117	10.7	6.0	16.7	91	10.1
14	42	10.8	6.8	17.6	70	15.1
15	0	11.7	7.9	19.6	0	15.2
Mean		11.2	6.7	17.9		14.2
1	MCPA	8.9	5.4		MCPA	11.5†
7	MCPA	10.6	7.2		MCPA	11.4
Mean		9.8	6.3	16.1		
3	MCPB	9.3	11.4		MCPA	14.1
5	MCPB	11.7	9.2		MCPA	13.0
Mean		10.5	10.3	20.8		12.5

* thistles eaten by sheep † only three sheep in mean as one seriously declining in wt.

Table 1 shows the mean LWG and number of mature thistles per paddock for two seasons. In 1981-82 there was a significant correlation between thistle numbers and LWG. The correlation between area occupied by thistles and LWG was generally similar but no better than that between numbers and LWG so for convenience thistle numbers have been used.

The regression equation for the period 11.11.81 — 30.3.82 was

$$Y = 7.8 - 1.68x \qquad r^2 = 57$$

Where Y = LWG (Kg) and x = No. thistles/m²

The use of MCPA in 1981 resulted in a substantial depression of LWG (1.8 kg below mean of all thistle paddocks) whereas paddocks treated with MCPB had the highest LWG (2.9 kg above mean) (Table 1). In 1982-83 the mean LWG for the four MCPA paddocks was 1.7 kg below the mean of the untreated thistle paddocks. Stocking rate in 1981-82 was initially 42/ha, reduced to 33/ha from November onwards. In 1982-83 it was 50/ha reduced to 33/ha in November.

DISCUSSION

In 1981-82 when the correlation between thistle numbers and LWGs was significant each thistle/m² reduced LWG by 1.68 kg over the period measured, at a stocking rate of 33/ha. At a lower stocking rate, if surplus feed were available the effect would probably be less. On the other hand if there was a shortage of feed or if stocking rates were higher, the effect of thistles could be greater. In 1982-83 no significant correlation was obtained. This may have been due to; generally lower thistle numbers and hence smaller differences between paddocks; the sheep being a year older and possibly less responsive; or a better growing season with more feed available. Pasture yield on Hauorongo was 3523 and 4126 kg DM/ha for the November-February period for 1981-82 and 1982-83 respectively (G. Smith pers comm).

However, the data for 1982-83 served to show that the paddocks that gave high LWGs in 1981-82 did not necessarily do so in 1982-83. They were not, therefore, inherently high yielding paddocks. However, to obtain a statistically significant result thistle numbers may need to be high and grazing fairly intense.

The biennial behaviour of Scotch thistle in pasture means that any one pasture tends to have two separate populations flowering in alternate years. It was also observed that a paddock or part of a paddock that had a particularly high flowering population one year tended to be low in flowering thistles the next year, indicating that a heavy infestation one year suppressed the alternate population. The fact that most Scotch thistle in grazed pasture are biennial means that one autumn/winter spray should give reasonable control of flowering thistles for 2 years.

MCPA temporarily reduces the clover content of pasture and this caused a reduction of LWGs in treated paddocks. The mean LWG of sheep in the two MCPA paddocks (1981-82) was compared with the fitted correlation curve and was found to be equivalent to the LWG achieved in the presence of 1.67 thistles/m². This indicates that a very high thistle density could be tolerated before spraying with MCPA can be justified. It is likely that any other clover damaging herbicide would be equally harmful. Paddocks treated with MCPB gave very high LWGs.

MCPB can be very effective for Scotch thistle control when applied at the right time and it does not damage white clover. MCPB is slightly more expensive than MCPA but, in light of the depression caused by MCPA, MCPB should always be used for Scotch thistle control. The use of MCPA in May 1982 changed the previously high yielding MCPB paddocks to below average performance while the use of MCPA for a second year appeared to cause an even greater depression than caused in the first year.

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