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EFFECT OF EPTC ON EMERGENCE AND GROWTH OF LUCERNE

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SUMMARY

The effect of EPTC (S-ethyl N, N-dipropyl (thiocarbamate) on emergence and growth of lucerne (*Medicago sativa* L.) was investigated. The herbicide at all rates had no effect on the emergence of lucerne, but did cause injury and stunting to the seedlings. After a period of time, which depended upon the rate of herbicide used, the plants grew out of the affected stage. Following the first cutting, all plants grew normally.

I. INTRODUCTION

Weed control during lucerne establishment is very important, because the small-seeded legume offers little competition against weeds at this critical stage. EPTC is a pre-plant, soil-incorporated herbicide recommended by the U.S. Department of Agriculture (1972) for controlling annual grasses and some broad-leaved weeds in lucerne. It can provide 2 to 4 weeks suppression of nut grass (*Cyperus rotundus* L), which is sufficient to enable the seedling lucerne to gain a competitive advantage (W. H. Hazard, personal communication 1974). The main use for EPTC in Queensland is expected to be for nut grass suppression during lucerne establishment.

Varying degrees of damage to lucerne from the use of EPTC have been reported from the U.S.A. Linscott, Seaney and Hagin (1967) stated that, in one of their experiments, EPTC used at 2·24 and 3·36 kg ha^{-1} significantly reduced the stand of lucerne cv. Narrangansett. The effect on lucerne cv. Du Puits was not so marked, but it was still significantly decreased by the 3·36 kg ha^{-1} application. Linscott and Hagin (1968), who were working with lucerne cv. Cayuga, found that EPTC at 3·36 kg ha^{-1} caused temporary stunting. Peters and Stritzke (1970) reported that EPTC at 3·36 kg ha^{-1} controlled weeds and increased yields of lucerne cv. Du Puits and cv. Vernal but sometimes injured seedlings of cv. Ranger, reducing yields.

On the other hand, Ascheman (1967) and Peters (1967) have reported good control of grass weeds with no lucerne damage using EPTC at 3·36 kg ha^{-1}. Control of weeds by EPTC at 4·48 kg ha^{-1} was found by Wakefield and Skaland (1965) to have increased the yields and size of root crowns with no effect on plant numbers of lucerne cv. Narrangansett.

The aim of the present experiment was to examine the effect of EPTC on the emergence and growth of two lucerne cultivars grown in Queensland.

II. MATERIALS AND METHODS

Lucerne was grown in 13 cm diameter pots in the glasshouse at the Biloela Research Station in central Queensland. EPTC, as 'Eptam' 72% w/v, was applied at six rates (0, 1, 2, 3, 4 and 5 kg ha^{-1}) to two cultivars (Hunter River and Siro Peruvian).

The top 15 cm horizon of a dark-grey clay loam was obtained from the flood plain of the Callide Creek and was sieved through a 1 cm mesh. Plastic bags were placed inside the pots which were then filled to a depth of 8 cm with air-dried soil. A second plastic bag was placed in the pot on top of the bottom layer of soil and was filled with the soil to a depth of 6 cm. The purpose of this arrangement was to separate the two layers of soil.

Six pots (the six replicates of one treatment) were placed in the centre of a 5 m x 1 m marked area. Using an Oxford Precision Sprayer, the calculated amount of EPTC was then sprayed over this area of 5 m^2. Immediately after spraying, the plastic bags with the top 6 cm of soil were removed from each pot and shaken thoroughly for 30 s to incorporate the EPTC. The soil was then emptied back into the pots.

On the following day, 40 inoculated seeds were planted in each pot at a depth of 10 mm. The soil was then watered up to field capacity and throughout the experiment was not allowed to fall below 75% of field capacity. After emergence, plant counts were taken and each pot was thinned to five plants. Plant heights were recorded each week, measuring from ground level to the tip of terminal growth of the main stem of each plant.

The experiment was harvested when the plants began to flower and produce lateral branches. At the first harvest, the plants were cut leaving a 5 cm stubble. At the second harvest, the plants were cut at ground level to give the top portion, and then the roots were separated from the soil by washing with a hose to give the root portion.

III. RESULTS AND DISCUSSION

Results of percentage emergence and dry-matter yields of plant material at the first and second harvest are given in table 1. Dry-matter yields as percentage of untreated control appear in brackets alongside each value.

The herbicide EPTC had no effect on seedling emergence in either cultivar. However, the subsequent growth of the seedlings was markedly affected by EPTC. The cotyledons were unaffected, but the unifoliates and the first few trifoliates were often distorted in shape, fused together, and smaller than normal. This resulted in overall stunting of the plants. The plants were more affected at the higher rates of EPTC. After 3 weeks, the plants treated with the lower rates of EPTC were producing completely unaffected leaves and had begun to grow rapidly. The plants treated with the higher rates of EPTC were still badly affected at this stage. By the time of the first harvest, practically all of the plants were growing normally.

As a result of the initial injury and stunting of the seedlings, the dry-matter yields of the EPTC-treated plots at the first harvest were significantly lower than the untreated plots. The two factors (rates of EPTC and cultivars) were not independent. Hunter River was affected more at the higher rates of EPTC than was Siro Peruvian. After the first harvest, all plants grew normally. At the second harvest, the dry-matter yields of the top portion were not significantly affected by EPTC. However, there were some significant reductions in the weight of the root portions at the higher rates of EPTC.

TABLE 1

PERCENTAGE EMERGENCE AND DRY-MATTER YIELDS OF PLANT MATERIAL (GRAMS) AT HARVEST 1 AND 2

—	Cultivar	Rate of EPTC (kg ha^{-1}). D.M. Yield as Percentage of Untreated Control in Brackets					
		0	1	2	3	4	5
a Percentage Emergence ..	Siro Peruvian ..	59·3	57·0	65·0	58·3	54·3	53·3
5% LSD = 12·4	Hunter River ..	45·3	47·7	46·3	50·7	47·7	45·7
b Top Portion, Harvest 1 (g)	Siro Peruvian ..	3·12 (100%)	2·55 (81·7%)	2·57 (82·4%)	2·47 (79·2%)	2·03 (65·1%)	1·83 (58·7%)
5% LSD = 0·35	Hunter River ..	3·02 (100%)	2·63 (87·1%)	2·15 (71·2%)	1·98 (65·6%)	1·27 (42·1%)	1·12 (37·1%)
c Top Portion, Harvest 2 (g)	Siro Peruvian ..	2·95 (100%)	2·84 (96·3%)	2·62 (88·8%)	2·59 (87·8%)	2·73 (92·6%)	2·98 (101·0%)
5% LSD = 0·28	Hunter River ..	2·80 (100%)	2·75 (98·2%)	2·71 (96·8%)	2·87 (102·5%)	2·74 (97·9%)	2·69 (96·1%)
d Root Portion, Harvest 2 (g)	Siro Peruvian ..	6·95 (100%)	6·25 (89·9%)	6·39 (92·0%)	5·67 (81·6%)	6·01 (86·5%)	5·55 (79·9%)
5% LSD = 1·41	Hunter River ..	6·83 (100%)	7·28 (106·6%)	5·52 (80·8%)	5·47 (80·1%)	4·98 (72·9%)	4·35 (63·7%)

As the experiment was carried out in pots, the lucerne roots were confined to a much smaller volume of soil than they would be in the normal field situation. Consequently a greater proportion of roots was exposed to the herbicide-treated soil and this probably resulted in a greater reaction to the herbicide than might be expected in the field situation.

In this pot trial, EPTC had no effect on the emergence of the two lucerne cultivars, but did cause temporary injury and stunting to the seedlings. This resulted in yield reductions at the first harvest but not the second harvest. Further investigation is warranted to see how the herbicide will react under field conditions.

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