RESPONSE OF GLYCINE JAVANICA TO THE APPLICATION OF A SUBSTITUTED PHENOXYBUTYRIC ACID HERBICIDE

In recent years, Tinaroo strain of *Glycine javanica* has achieved some prominence as a pasture legume on the Atherton Tableland and other parts of coastal and sub-coastal Queensland. On the Atherton Tableland weed growth is prolific and, in the case of newly established pastures, some means of weed control is necessary. On recently cleared rain-forest country, and where slopes are too steep for the passage of tractors equipped with mowers or slashers, some method of chemical control is desirable. When a pure grass stand is established, hand spraying is usually carried out. Both 2,4–D and mixed esters of 2,4–D and 2,4,5–T provide good control of wild tobacco (*Solanum auriculatum* Ait.), lantana (*Lantana camara* L.), inkweed (*Phytolacca octandra* L.), stinking roger (*Tagetes minuta* L.), wild hops (*Nicandra physaloides* Gaertn.), and bluetop (*Ageratum houstonianum* Mill.).

The incorporation of *Glycine javanica* in the pasture mixture, although very desirable, is made difficult owing to its susceptibility to these phenoxyacetic acid herbicides.

The butyric acid derivatives of 2,4–D and MCPA have opened up a new field for selective control of broad-leaved weeds in pasture legumes and leguminous crops. In Australia most of the investigational work with 2,4–DB has been carried out with temperate legumes. Smith (1960) showed that mature lucerne was only slightly affected by 2,4–DB applied at 1 lb acid equivalent per acre. He also showed that stage of growth was important with seedling lucerne and that for best results spraying should be carried out after the 2-leaf stage and before the 8-leaf stage of growth is reached. Annand and Macey (1960) demonstrated that the application of 2,4–DB at ¼, ½ and 1 lb per acre to a weedy stand of red and white clover produced greater increases in clover yield than MCPB applied at equivalent rates. Rawson (1960), experimenting with the Virginia Bunch variety of peanuts, showed that the post-emergence application of 2,4–D and MCPA at sufficient rates to provide effective weed control may cause serious reduction in yield, while similar applications of 2,4–DB and MCPB had little effect on yield.

Method and Materials

The experiment reported here was commenced in March 1962. Soil taken from an existing area of *Glycine javanica* was placed in 9-in. plastic pots and sown with uninoculated seed at the rate of 20 seeds per pot. After germination, each pot was thinned to 4 plants by removal of the largest and smallest plants. Pots were watered regularly to field capacity.

The treatments used were 2,4–DB at 0, ½ lb, 1 lb and 1½ lb acid-equivalent per acre applied at each of four stages of growth, namely cotyledon +; 3–4 trifoliate leaves; 5–6 trifoliate leaves; and runners 1 ft long. The 16 treatments were replicated three times.

The spray material used was "Bexone" (40% w/v 4–(2,4–dichlorophenoxy-butyric acid) as the potassium salt). The spray was applied with an atomizer at the rate of 2½ ml per pot (equivalent to 50 gal per ac). No wetting agent was added. Harvesting was carried out six weeks after treatment. Plants were cut at ground level and the trifoliate leaves counted. The harvested material was then oven-dried and weighed.

Results and Discussion

Slight wilting of the leaves occurred after spraying. This symptom, however, disappeared in 1–2 days. No distortion of existing leaves occurred, although in some treatments they became slightly harsher in texture and a darker green in colour. In all treatments, the growing tip of the plant was damaged and no further growth appeared for varying periods. Some thickening and malformation occurred at the base of the stems. These observations have also been noted in a field spraying (Gartner, unpublished data). No plants were killed. Plant behaviour is summarized as follows:—

First Spraying (*Cotyledon* +).—Plants receiving ½ lb 2,4–DB per ac commenced to grow again 2–3 weeks after treatment. The new leaves were pale in colour and slightly distorted, but gradually recovered. At 1 lb per ac most plants commenced re-growth in 4–5 weeks, while at 1½ lb no further growth had occurred at harvesting.

Second Spraying (3–4 *leaves*).—At the 3–4 leaf stage of growth, only those plants receiving ½ lb 2,4–DB per ac commenced to grow again. This occurred 3–4 weeks after treatment.

Third Spraying (5–6 *leaves*).—Results were similar to those obtained at the second spraying.

Fourth Spraying (*runners* 1 *ft long*).—When these treatments were applied some plants had commenced to flower. Treated plants did not produce further flowers, nor did flowering plants produce any seed.

At harvesting some of the plants receiving ½ lb 2,4–DB per ac were producing new lateral shoots from the main stem.

Leaf counts showing number of trifoliate leaves are summarized in Table 1 and yields of oven-dry material in Table 2.

TABLE 1

NUMBER OF TRIFOLIATE LEAVES 6 WEEKS AFTER SPRAYING (SUMMARY—MEANS)

Rate (lb/ac)	Cotyledon +		3–4 Leaves		5–6 Leaves		Runners 1 ft long	
	Mean	Equiv. No.	Mean	Equiv. No.	Mean	Equiv. No.	Mean	Equiv. No.
0	4·78	22	7·56	57	8·49	72	10·89	118
½	3·61	13	3·89	15	5·78	33	5·35	28
1	2·59	6	3·67	13	4·48	20	5·45	29
1½	1·00	0·5	3·76	14	4·21	17	4·88	23
s.e.	±0·290		±0·130		±0·167		±0·422	
Necessary differences for significance 5%	1·00		0·45		0·58		1·46	
Necessary differences for significance 1%	1·52		0·68		0·87		2·21	
	0>½>1≫1½ 0≫1		0≫½, 1, 1½		0≫½≫1, 1½		0≫½, 1, 1½	

$\sqrt{x + \frac{1}{2}}$ transformation was used for these analyses.

TABLE 2

TOTAL WEIGHT OF PLANTS 6 WEEKS AFTER SPRAYING EXPRESSED

(Grams oven-dry)

Rate (lb/ac)	Cotyledon +	3–4 Leaves	5–6 Leaves	Runners 1 ft long
0	0·641	2·739	3·586	9·675
½	0·198	1·056	2·002	2·188
1	0·141	0·714	1·457	2·606
1½	0·074	0·844	1·482	1·562
s.e.	±0·0454	±0·1768	±0·3007	±0·7732
Necessary differences for significance 5%	0·157	0·612	1·041	2·676
Necessary differences for significance 1%	0·238	0·927	1·576	4·053
	0>½, 1, 1½	0≫½, 1, 1½	0≫½, 1, 1½	0≫½, 1, 1½

In terms of leaf number, it was found that ½ lb acid-equivalent per acre was less damaging than 1 lb, which in turn was less damaging than 1½ lb at the cotyledonary stage. The absolute reduction in leaf number was greater with the older plants but the relative reduction was of comparable order throughout all stages.

2,4–DB depressed growth at all stages of treatment and at all rates tested. The absolute yield depression is greater in the older plant series but this may be simply a reflection of greater growth capacity.

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