DISTRIBUTION AND CONTROL OF MILKWEED, *EUPHORBIA HETEROPHYLLA*, IN NORTH QUEENSLAND

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Summary. Milkweed, *Euphorbia heterophylla* L., is a pan-tropical weed species, which has been established in south-east Queensland since the early 1970's. It is now widespread in north Queensland, although each infestation is of limited area. The total area of infestation north of Sarina is approximately 400 ha. Field trials confirm the effectiveness of 2,4,5-T, 2,4,5-T+metribuzin, and 2,4-D/picloram as knockdown herbicides of milkweed. A further eight herbicides (2,4-D/ioxynil, dichlorprop acid, ethidimuron, fluroxypyr, glyphosate+ammonium sulphate, triclopyr, and triclopyr+picloram) gave control of mature plants in non-crop situations; 2,4-D acid, amine, and ester formulations controlled plants in the vegetative and flowering stages. Best residual control was achieved with ethidimuron, picloram, and triclopyr+picloram, although the identification of additional and more-effective residual herbicides is expected from future trials.

INTRODUCTION

Milkweed is an annual with a life cycle of 6 to 16 weeks (10). It grows to a height of 0.2 to 1.5 m, and the seed probably has little dormancy in Queensland (Tilley, pers. comm., 1987). *E. heterophylla* is often included under *E. cyathophora* Murray (3,4,5). However, *E. cyathophora* (painted spurge or wild poinsettia) has distinctive bright red patches surrounding the fruits on each cyathial bract, whereas *E. heterophylla* has cream or yellow to green inner bracts, and occasionally has irregular patches of brownish red on leaves and bracts. There are differences in leaf and seed morphology, too (8,11). Some of the world literature on *E. heterophylla* possibly refers to *E. cyathophora* (e.g. 2), or is reported under a synonym, such as *E. geniculata* (11).

Milkweed originated in tropical and sub-tropical America, but now has a pan-tropical distribution, and even extends into warm temperature climates (11). It has been established in south-east Queensland since the early 1970's (Queensland Herbarium records), particularly 10,000 ha in the Bundaberg region (Tilley, pers. comm., 1986). Milkweed can be a competitor in a wide range of crops, including cereals, cocoa, cotton, sugar cane, and various legumes (9, 10, 11). Both mechanical and herbicidal control is often unsatisfactory (1, 6, 7, 10, 11). Over the last two to three years, there has been an apparent spread of milkweed in north Queensland.

The objective of this project was to determine the distribution of milkweed in north Queensland, and to develop chemical control measures for non-crop situations.

METHODS

North Queensland was taken to be the area north of latitude 22° south. The distribution of milkweed was collated from field inspections and discussions with officers of the Cane Pest and Disease Control Boards, Bureau of Sugar Experiment Stations (B.S.E.S.), Rural Lands Protection Board, and the Department of Primary Industries. The survey was conducted between July 1986 and April 1987.

Three herbicide trials were laid out on field populations of milkweed (Table 1). Plants were sprayed using hand-held sprayers with variable hollow-cone nozzles to the "point of runoff", equivalent to a spray volume of 2500 L ha^{-1}.

Table 1. Density, height, and stage of growth of milkweed at three trial sites at the time of spraying

Trial No.	Site	Date sprayed	Density[a] (plants m^{-2})	Height[a] (mm)	Stage of growth
1.	Clare	2/ 9/86	726 (45)	355 (15)	Mature, fruiting
2.	Brandon	14/10/86	83 (21)	406 (9)	Mature, fruiting
3.	Abergowrie	17/ 3/87	25 (4)	675 (31)	Lush, vegetative, some flowering

[a] Values in brackets are standard errors.

Wetting agent (Nufarm Nonionic Surfactant^{R}) was added to all tank mixtures to give a final concentration of 0.06% (v/v). All trials were assessed using an injury rating based on a visual estimate of biomass reduction (0=0%, 1=1-20%, 2=21-40%, 3=41-60%, 4=61-80%, 5=81-95%, 6=96-100%). Trials 1 and 2 were assessed for herbicide residual activity based on subsequent seedling emergence.

RESULTS AND DISCUSSION

The distribution of known occurences of milkweed in north Queensland is shown

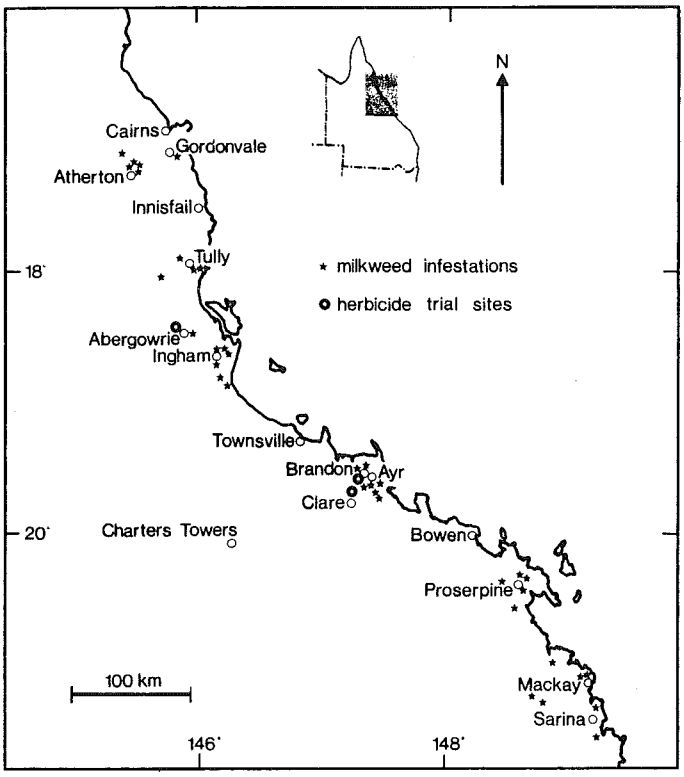

Figure 1. Locations of milkweed in north Queensland. Each location may represent more than one infestation. Trial sites are indicated

in Fig. 1. Since the time of the survey some of the infestations shown have been eliminated. Milkweed was first recorded between Mackay and Sarina in 1970, and near Atherton in 1972 (Queensland Herbarium records). It is spreading in the wet tropics, and in the Ayr district (Table 2). Milkweed plants can produce approximately 55,000 seeds m^{-2} (Bolton, unpublished data). The fruits explode when dry, throwing the seeds distances of up to 4 m. The seeds are sticky and may adhere to rail, road, and farm machinery enabling dispersal. Movement of produce and soil also helps to distribute milkweed.

Table 2. Estimated areas of milkweed infestations by district, in north Queensland (July 1986 to April 1987)

District	No. of Sites	Approximate area (ha)		
		Non-crop	Crop	Total
Atherton	>12	50	150	200
Gordonvale	1	0	3	3
Ingham (N of)	11	5	0	5
Ingham (S & W of)	49	6	3	9
Ayr/Home Hill	31	9	24	33
Mackay	27	15	40	55
Proserpine	5	0	5	5
Sarina	2	1	0	1
Tully	16	33	47	80
Totals	>154	119	272	391

Three of the B.S.E.S. recommendations for post-emergence spraying of milkweed were used in our trials (Table 3). Using 2,4,5-T at the recommended 0.11% (w/v) was not as reliable as at 0.15%. The addition of metribuzin to 0.11% 2,4,5-T improved the residual control of seedlings, but many seedlings survived to progagate the next generation. Picloram/2,4-D gave good knockdown, and limited residual activity.

While 2,4,5-T was by far the cheapest effective chemical identified, several other herbicides (in addition to the B.S.E.S. recommendations) could be useful, particularly near susceptible crops. The minimum effective rates (% w/v) of triclopyr/picloram (0.2/0.07%), 2,4-D/ioxynil (0.12/0.02%), fluroxypyr (0.2%) were reasonably low, and are hence recommended for control of mature plants. Glyphosate+ammonium sulphate (0.4+2.0%), triclopyr (0.4%), and dichlorprop acid (0.4%) were also effective on mature plants, but the rates required were high. On vegetative plants, 2,4-D acid, amine, or ester (all at 0.2%) were all effective, but lower effective rates are possible. The addition of ammonium sulphate enhanced the activity of glyphosate by one injury rank (approx. 20%). The (low volatile) 2,4-D/ioxynil worked quickly and reliably at low rates.

The 'residual activity' of a herbicide was a function of selectivity for broadleaves, as well as persistence of the herbicide in the soil. With the selective herbicides, the remaining monocot species competed with new milkweed seedlings, although seedling suppression was never complete. Seedling suppression was evident in unsprayed control plots, due to competition from legumes, grasses, and senescing milkweed plants. This may be an important consideration for control in non-crop situations.

Atrazine/2,4-D sodium salt gave inadequate knockdown and residual activity against milkweed, perhaps due to the dry conditions for several weeks after spraying. Atrazine was also found to be unsatisfactory as a pre-emergence herbicide for milkweed in cane (10). At some milkweed sites near Tully the

Table 3. Results of herbicide trials on milkweed. Low and high rates have been omitted from the table where the remaining data is adequate

Herbicide (s)	Conc. (% w/v)	Biomass reduction[a] Trial no. (Weeks after treatment) 1(6)	2[c] (4)	3[d] (4)	Residual activity[b] 1(6)	2(17)
2,4,5-T+metribuzin	0.11+0.14[e]	5	5	–	S	G/VG
2,4-D/picloram	0.16/0.04[e]	6	–	–	F	–
2,4-D acid	0.2	–	–	5.5	–	–
2,4-D dimethylamine	0.2	–	–	6	–	–
2,4-D ester	0.2	–	–	6	–	–
2,4,5-T ester	0.11[e]	–	5.5	4	–	P
	0.15	–	–	5.8	–	–
2,4-D/ioxynil	0.03/0.005	–	–	3.5	–	–
	0.12/0.02	5	–	6	N	–
2,4-D/atrazine	0.2/0.3	–	3.5	–	–	F/G
dichlorprop acid	0.3	–	4.5	5.3	–	F
	0.4	6	–	–	N	–
ethidimuron	0.13	5	–	–	S	–
	0.25	6	–	–	G	–
fluroxypr	0.1	–	–	4.5	–	–
	0.2	–	5.5	5.5	–	S
glyphosate	0.4	–	4.5	–	–	N
glyphosate+ammonium	0.2+2.0	–	4.5	–	–	N
sulphate	0.4+2.0	–	5.5	–	–	N
picloram (granules)	(8 kg ha^{-1})	6[f]	–	–	G[f]	–
triclopyr	0.2	–	4.5	–	–	F
	0.4	–	5.5	–	–	P
triclopyr/picloram	0.2/0.07	–	6	–	–	G/VG
unsprayed control	–	–	–	–	–	F/G

[a] Rating on a scale of 0 to 6, as described in Methods
[b] N = none, P = poor, S = slight, F = fair, G = good, VG = very good
[c] l.s.d. (n=2, P=0.05) = 1.2; [d] l.s.d. (n=2, P=0.05) = 2.4
[e] B.S.E.S. recommendations for spot spraying
[f] Assessed 11 weeks after application

ground was blue with atrazine, and milkweed seedlings were still emerging. However, 2,4-D/atrazine controls milkweed in cane around Mackay (G. McMahon, pers. comm., 1987). Atrazine gave good pre-emergence control in glasshouse experiments on milkweed (D. Hawton, pers. comm., 1987).

Our trials showed the following herbicides provided some, although insufficient, residual control of milkweed (% w/v) (Table 3): 2,4,5-T+metribuzin (0.11+0.14%), ethidimuron (0.25%), and triclopyr+picloram (0.2+0.07%); picloram granules at 8 kg ha^{-1} also gave some control. Picloram enhanced the knockdown and residual activity of triclopyr.

REFERENCES

1. Anon, 1985. B.S.E.S. Bull. No. 9, pp. 4-6.
2. Bannon, J.S., Baker, J.B. and Rogers, R.L. 1978. Weed Sci. 26, 221-225.
3. Everist, S.L. 1981. Poisionous Plants of Australia. (Angus & Robetson: Sydney) 684 pp.
4. Faust, W. and Stang, R.M. 1983. Important Weeds of the World. (Weed Sci. Soc. America: Leverkusen) 711 pp.
5. Hartley, W. 1979. A Checklist of Economic Plants in Australia. (CSIRO: Melbourne) 214 pp.
6. Jones, P. 1979. Cane Growers Qtrly Bull. 43, 34-35.
7. Nester, P.R., Harger, T.R. and McCormick, L.L. 1979. Weeds Today. 10, 24-25.
8. Stanley, T.D. and Ross, E.M. 1983. Flora of South Eastern Queensland. Qld. Dept. of Primary Industries Misc. Publ. 81020. Vol. 1, p. 545.
9. Remison, S.U. 1978. J. Ag. Sci. 90, 523-530.
10. Tilley, L.G.W. 1983. B.S.E.S. Bull. No. 2, pp. 14-15.
11. Wilson, A.K. 1981. Trop. Pest. Man. 27, 32-38.