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Summaries of Herbicide Trials for Pasture, Range, and Non-Cropland Weed Control—2001

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The tables herein summarize herbicide trials for the control of pasture, range, and non-cropland weeds conducted by the College of Tropical Agriculture and Human Resources, University of Hawaii at Manoa; the Hawaii Department of Agriculture; the Division of Forestry and Wildlife of the Hawaii Department of Land and Natural Resources; and other cooperators. These preliminary data are published to assist applicators experimenting with herbicides for weed control. The herbicide applicator is cautioned to confirm that any herbicide use, rate, or method of application conforms to the product label.

Rating weed response to herbicides

Weed response to treatment is evaluated by different methods. Plant injury may be scored on a 0–100 scale in which the score is a subjective evaluation of the severity of injury:

0	No symptoms
10–30	Insignificant to poor weed control; little or no defoliation
40–60	Inadequate weed control; moderately severe symptoms; less than 70% defoliated
70	Adequate weed control; severe symptoms; all leaves chlorotic or more than 70% defoliated
80	Good weed control; very severe symptoms; 80% defoliated
90	Excellent weed control; very severe symptoms; 90% defoliation
100	Complete control; no sign of life

In addition to the scale described above, efficacy of treatments may be determined by estimation of defoliation or its opposite, remaining weed cover. The method used depends on the growth habit of the weed. Response may also be measured by counting the number of surviving plants or stems, by measuring weed height, or a combination of these.

Methods of herbicide application

Several methods of herbicide application were used in the trials described here, including foliar, cut-surface, basal bark, stump bark, and soil applications (See CTAHR publication WC-4, 1999, *Woody plant control for the home, pasture, and forest*. Also, low-volume and very low-volume variants of foliar application (drizzle method) and basal bark and stump bark treatments were evaluated (see Motooka, P., G. Nagai, and L. Ching, 1983, "The 'magic wand' method of herbicide application," Proc. Ninth Asian Pacific Weed Sci Soc. Conf., Suppl. Vol., p. 550–553; and Motooka, P., J. Powley, M. DuPonte, L. Ching, G. Nagai, and G. Kawakami, 1999, "Drizzle herbicide application for weed management in forests," Proc. West. Soc. Weed Sci. 52:136–139).

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Materials tested

Herbicides	Trade name and manufacturer
Clopyralid	Transline (Dow Agrosciences)
2,4-D	Amine salt formulation, various brands Ester formulation, various brands
Dicamba	Banvel (BASF)
Glyphosate	Rodeo (Monsanto) Roundup (Monsanto)
Hexazinone	Pronone Power Pellets (DuPont) Velpar L (DuPont)
Imazapyr	Stalker (Syngenta)
MCPA	MCP Amine (Clean Crop)
Metsulfuron	Escort (DuPont)
Triclopyr	Garlon 4 (Dow AgroSciences) Remedy (Dow AgroSciences)) Redeem (Dow AgroSciences) Pathfinder II (Dow AgroSciences)
Tebuthiuron	Spike 20P (Dow AgroSciences)

Weeds

Bamboo (*Phyllostchys niger* (Lodd.) Munro var. *henionis* (Mitf.) Rendle)
Bushy beardgrass (*Schizachyrium condensatus* (Kunth) Nees)
Christmasberry (*Schinus terebinthifolius* Raddi)
Downy rosemyrtle (*Rhodomyrtus tomentosa* (Aiton) Hassk.)
Fayatree (*Myrica faya* Aiton)
Fountaingrass (*Pennisetum setaceum* (Forssk.) Chiov.)
Guava (*Psidium guajava* L.)
Huehue (*Cocculus trilobus* (Thunb.) DC)
Huehue haole (*Passiflora suberosa* L.)
Madagascar ragwort (formerly fireweed) (*Senecio madagascariensis* Poiret)
Shoebutton ardesia (*Ardesia elliptica* Thunb.)
Spiny emex (*Emex spinosa* (L.) Campd.)
Strawberry guava (*Psidium cattleianum* Sabine)

Observations

Downy rosemyrtle and fayatree are among the species tolerant to triclopyr. To determine if the cause of the this tolerance was lack of uptake, downy rosemyrtle was treated with triclopyr ester in crop oil. One set of treatments was the application of triclopyr with oil as the only carrier to ensure uptake increase. Although there was initial brownout with the oil carrier, recovery was rapid indicating that the high uptake caused translocation of the herbicide to cease before enough migrated into the stem and roots. The lower oil concentrations caused greater though still temporary injury (Table 1). The tolerance of downy rosemyrtle is apparently not related to uptake of triclopyr. Oil increased efficacy of triclopyr in drizzle applications on fayatree. However, three applications over nearly 3 years did not kill the plants although it did cause severe injury (Table 2). Fayatree was very susceptible to basal bark application of triclopyr in crop oil but not to basal bark application of glyphosate augmented with the adjuvant Quiksorb (Monsanto) (Table 3). Though basal bark treatment with glyphosate has not been traditionally used, such use is being developed on the mainland for thin-stemmed plants.

Fountaingrass was susceptible to drizzle applications of glyphosate in drizzle applications (Table 4). However the fountaingrass must be in good condition at treatment. Drought stricken fountaingrass did not succumb to drizzle application of glyphosate (see Summaries 2000). Drizzle application of glyphosate was also effective on the vines huehue and huehue haole (Table 5).

The fast spreading Madagascar ragwort or fireweed was tolerant to herbicides in rank stages of growth (The Weed Science Society of America has adopted the common name Madagascar ragwort). Although herbs are usually sensitive to herbicides, ragwort has proved tolerant to triclopyr and higher rates of hormone type herbicides were required to kill rank ragwort. It is important that the weed be succulent and that environmental conditions be suitable for plant growth when it is treated. MCPA and triclopyr were ineffective under droughty conditions (Table 6). Madagascar ragwort was very susceptible to clopyralid (Table 7, 8). However because of the high cost of clopyralid, MCPA even at 2 lb/A would be much more economical (Table 7, 8).

Shoebutton ardesia, though severely injured by drizzle applications of 2,4-D and triclopyr, was not killed

by two applications of each of these herbicides (Table 9). Conventional spraying may still be required.

Spiney emex, despite flooding followed by drought after treatment, was susceptible to dicamba in drizzle application (Table 10). The *Polygonaceae*, the family to which emex belongs, is very sensitive to dicamba and will succumb to 0.25 lb/acre or 0.5 pint/acre with conventional spraying.

Strawberry guava proved susceptible to very-low volume basal bark application of triclopyr/oil applied in horizontal streaks (Table 11) and two vertical streaks to the base of the trunk (Table 12). Strawberry guava trees can be killed more efficiently in remote areas since smaller volumes of the oil carrier need to be transported.

Table 1. Downy rosemyrtle response to triclopyr applied with water and oil carrier (G00-11).
Date installed: 08/24/00. Date rated: 01/30/01. Location: Wailua. Investigators: Lincoln Ching, Philip Motooka. Notes: Oil as carrier applied only for research purposes, impractical in normal use.

Triclopyr rate (lb/acre)	Adjuvant/carrier (%)	Weed cover (%)
0	0	87
2	3.9	29
4	7.8	16
2	100	72
4	100	60

Table 2. Response of fayatree to triclopyr applied by the drizzle method with water or with oil (K99-9).
Date installed: 05/28/99. Location: Keauhou Ranch, Volcano. Investigators: M. du Ponte, P. Motooka. Notes: Retreated 11/09/99, 08/02/00, 03/06/01.

Triclopyr rate (lb/acre)	Carrier	Defoliation (%)			
		(11/09/99)	(08/02/00)	(03/06/01)	(09/06/01)
0.5	Water	38	32	55	61
0.5	Oil	53	42	71	83
1.0	Water	42	48	78	82
1.0	Oil	59	60	95	90

Table 3. Response of fayatree to low-volume basal bark applications of glyphosate and triclopyr (K00-3X).
Date installed: 08/02/00. Date rated: 03/07/01. Location: Keauhou Ranch, Volcano. Investigators: M. duPonte, P. Motooka. Notes: Glyphosate as Rodeo was applied at 40% plus 10% surfactant in water, triclopyr amine was applied at 25% plus 10% Quiksorb in water. Fayatrees dbh 4–6 inches. Seven replicates in blocks. Average volume per tree, 3.0 fl oz.

Herbicide	Conc. (%)	Surfactant	Defoliation (%)
Check	0	0	0
Glyphosate	40	Excell NF 90	24
Glyphosate	40	Quiksorb	28
Triclopyr Amine	25	Quiksorb	39
Pathfinder II	100	None	100

Table 4. Fountaingrass control with drizzle application of glyphosate (K00-4).
Date installed: 12/14/00. Location: Puuanahulu. Investigator: P. Motooka.

Glyphosate rate (lb/acre)	Defoliation (%) (01/12/01)	(03/28/01)
0	0	0
1	85	92
2	91	99
3	92	99

Table 5. Huehue and huehue haole control by drizzle application of glyphosate (K01-08).
Date installed: 06/20//01. Location: MacFarms. Investigators: T. Lilly, P. Motooka.

Glyphosate rate	Defoliation (%) (07/25/01)		(10/17/01)	
(lb/acre)	Huehue	H. haole	Huehue	H. haole
2	68	99	85	100
3	82	98	92	100

Table 6. Madagascar ragwort (fireweed) control with MCPA and triclopyr (K01-03).
Date installed: 01/28/01. Date rated: 03/28/01. Location: Waikii Ranch. Investigators: G. Fukumoto, P. Motooka. Notes: Drought after application.

Herbicide	Rate (lb/acre)	Adjuvant	Defoliation (%)
Check	0	0	2
MCPA	1	NF90	12
MCPA	2	NF90	28
Triclopyr E	0.5	NF90	10
Triclopyr E	0.5	FCO	18
Triclopyr E	1.0	NF90	10
Triclopyr E	1.0	FCO	24

Table 7. Madagascar ragwort (fireweed) response to MCPA and clopyralid (K01-5).
Date installed: 05/02/01. Location: Kamuela. Cooperator: M. Yamasaki. Investigator: P. Motooka. Note: Average initial fireweed cover 31%.

Herbicide	Rate	Fireweed cover (%)			
	(lb/acre)	(05/16/01)	(06/21/01)	(07/03/01)	(07/31/01)
Check	0	29	31	23	23
MCPA	1	20	11	6	8
MCPA	2	10	5	6	9
Clopyralid	0.5	20	0	1	0
Clopyralid	1	12	0	0	0

Table 8. Madagascar ragwort (fireweed) control with clopyralid, dicamba, MCPA, and metsulfuron (K01-09).
Date installed: 07/03/01. Location: Honokaa. Investigators: M. du Ponte, P. Motooka. Cooperator: Antone DeLuz. Note: Average initial fireweed cover 19%.

Herbicide	Rate (lb/acre)	Fireweed cover (%) (07/31/01)	(09/05/01)
Check	0	11	25
Clopyralid	0.12	8	9
Clopyralid	0.25	7	2
Clopyralid	0.5	5	0
Dicamba	0.5	15	12
Dicamba	1.0	5	6
MCPA	2.0	2	0
Metsulfuron	0.4 oz/acre	4	7

Table 9. Response of shoebutton ardesia to drizzle applications of herbicides (G00-8)
Date installed: 03/09/00. Location: Princeville Ranch. Investigators: L. Ching, G. Nagai, P. Motooka. Notes: Herbicides applied at 1 lb/acre. Reapplication 01/31/01.

Treatment	Defoliation (%)		
	(07/18/00)	(01/31/01)	(09/24/01)
0	0	0	0
2,4-D ester/water	65	52	55
Triclopyr ester/water	72	50	75
Triclopyr ester/oil	60	30	58

Table 10. Spiny emex control with drizzle application of dicamba (K00-3).
Date installed: 12/14/00. Date rated: 03/28/01). Location: Waimea, Hawaii. Cooperator: S. Bannister Sr. Investigators: P. Motooka, A. Kawabata. Note: Drought and flooding after application.

Dicamba rate (lb/acre)	Emex cover (%)
0	65
0.25	44
0.5	12
1.0	9

Table 11. Strawberry guava response to vertical streak very-low volume application of triclopyr/oil. (G01-07)
Date installed: 05/07/01. Date rated: 09/25/01. Location: Kokee. Investigators: L. Ching, G. Kawakami, P. Motooka. Notes: Triclopyr ester, 20% in crop oil, applied in two vertical streaks from ground to waist height.

Treatment	Defoliation (%)
Check	0
Triclopyr	97

Table 12. Very-low volume basal bark treatment of strawberry guava with triclopyr/oil (V98-6)
Date installed: 12/01/98. Date rated: 02/27/01. Location: Waihee Ridge Trail, Maui. Investigators: J. Powley, P. Motooka.

DBH (inches)	Streaks/side	No. of trees	Defoliation (%)
1–4	2	18	89
± 6	6	4	88
± 10	8	7	66
± 18	10	2	82

Table 13. Results of demonstration trials.

Weed	Herbicide	Rate/Conc.	Method	Control (%)	Reps	Duration (mo)	Site
Bamboo	Imazapyr	9%	Basal	90	1	16	Kainaliu
Bushy beardgrass	Hexazinone	4 lb/acre	Soil	99	1 plot	20	Nualolo Crossover Trail
Faya tree	Hexazinone	4 lb/acre	Soil	0	3	20	Nualolo Crossover Trail
Guava	Triclopyr	20%	Basal bark	85	1	20	Nualolo Crossover Trail
Guava	Tebuthiuron	2 lb/acre	Soil	89	18	20	Nualolo Crossover Trail
Madagascar ragwort	Clopyralid	1 lb/acre	Drizzle	88	2	1.5	Kamuela
Strawberry guava	Triclopyr	20%	VLV basal	75	30	20	Nualolo Crossover Trail
Strawberry guava	Hexazinone	2 lb/acre	Soil	95	2	20	Nualolo Crossover Trail
Strawberry guava	Tebuthiuron	2 lb/acre	Soil	82	4 plots	20	Nualolo Crossover Trail