BROADLEAF WEED CONTROL RESEARCH UPDATE

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Herbicide Screening 1984-1986

Fourteen herbicides were tested on six broadleaf weed species: white clover, Canada Thistle, wild violet, yellow woodsorrel, slender speedwell, and germander speedwell. Application dates ranged from mid-July to mid-August. Percent control ratings (Table 1 and 2) were taken approximately eight weeks after treatment. Canada Thistle treatments were applied twice - August 20 and September 16, 1985.

White clover was controlled by Super Trimec in 1985 and 1986 and by triclopyr ester, MCPP, Trimec, Turflon amine, and Weedone DPC in 1986. Weedone DPC provided good yellow woodsorrel control in 1984, but in 1985, best results were obtained with triclopyr ester, Super Trimec, Turflon D, and Weedone DPC + Buctril. Double applications made on Canada Thistle in 1985 produced good control by several herbicides. Super Trimec, Turflon D, Weedone DPC + Buctril, MCPP, and 2,4-D amine were all rated at better than 90% weed control. Wild violet proved fairly resistant to the herbicides tested. The best treatments, Buctril, triclopyr ester, and Turflon D, provided only marginal control around 67%.

Two species of speedwell (Veronica spp.) were included in herbicide trials in 1985 and 1986. Several treatments controlled nearly 100% of slender speedwell (V. filiformis) in 1985, but 1986 data produced very different results. In 1986 Super Trimec was the only herbicide that controlled weeds by more than 90% followed by Weedone DPC, MCPP, and Weedone DPC + Buctril in the mid-70 to mid-80% range. The difference between years may be related to the difference in environmental conditions at each site. The 1985 test was conducted in a heavily shaded area, thus weeds present may have developed very thin leaf cuticles and subsequently absorbed unusually large amounts of herbicide. Conversely, the 1986 site was located in full sun and probably contained weeds with thicker cuticles, thus overall herbicide uptake may have declined from the previous year.

Germander speedwell (V. chamaedrys) proved difficult to control in 1985 with the best treatment, Dacthal, controlling 87% of the weeds present. Herbicide performance improved somewhat in 1986; triclopyr ester and Dacthal ranked in the high 90's while Turflon amine, Turflon D, and Buctril resulted in 81-87% control.

Late Fall Weed Control

As the cool weather of fall sets in, work available for lawn care companies tends to drop off, creating a lag period that lasts until the onset of wintertime snow removal. One solution to this situation may include lengthening the broadleaf weed control timing window later into the fall. A weed control study was initiated in 1986 to determine how late in the year standard broadleaf herbicides can be applied and still result in good control.

Starting in late September of 1986, label rates of Formula 40, Esteron 99, Trimec, and Super Trimec were applied to Kentucky bluegrass turf with a

high percentage of dandelion. The same treatments were applied on several dates throughout the fall until mid-November. Percent control ratings indicated that treatments applied on 9/24 produced greater than 90% weed control by 11/17, and the control levels of subsequent applications dropped dramatically with each date (Table 3). The following spring however, this trend reversed; the September application had less than acceptable control while mid and late October treatments generally resulted in the best dandelion control. Dandelion seedlings germinating in September and early October avoided earlier herbicide applications and thus contributed to the lack of control in the spring. Formula 40 controlled somewhat fewer weeds than other herbicides, with less than 90% control from the mid and late October application dates.

In the fall of 1987, we repeated the same study and increased the number of application dates into December. Thus far, percent control data appears similar to that of the 1986-87 study (data not shown). Ratings taken in the spring will reflect the final performance of these late season herbicide treatments.

The 1986-87 study suggests that good dandelion control can result from herbicides applied through late October, even when the plants are not actively growing. The 1987-88 study may confirm this conclusion and indicate what can be expected from herbicide applications made as late as mid-December.

Non-phenoxy Herbicides

The recent linking of 2,4-D to non-Hodgkins lymphoma in agricultural workers (1) has prompted the EPA to re-examine the herbicide for possible health risks. These events, in addition to negative public opinion toward 2,4-D, have contributed to the need for alternative means of broadleaf weed control in turf. 2,4-D, along with 2,4-DB, dicloroprop, MCPP, and MCPA are all phenoxy-carboxylic acid herbicides, a group whose primary mode of action involves a "growth regulating" effect in plant shoots. Researchers are now channeling efforts into developing "non-phenoxy" herbicides as possible replacements for 2,4-D, should its registration be cancelled.

In August of 1987, a trial was established at the Fairview Driving Range to compare the efficacy of several common herbicides containing 2,4-D to that of some experimental and newly registered non-phenoxy herbicides on buckhorn plantain (Plantago lanceolata L.). Visual estimates of weed cover were taken prior to treatment and bi-weekly thereafter to evaluate percent weed control.

Eight weeks after treatment, all phenoxy herbicides resulted in at least 95% weed control (Table 4). Several non-phenoxy herbicides also performed well including fluroxypyr at 0.5 lb ai/A, clopyralid at 0.5 lb ai/A, and BAS 514 at 1.0 lb ai/A all of which controlled better than 93% of the plantain. Triclopyr ester was not effective, reducing weed cover by only 17%. Break-thru also failed to produce acceptable results when mixed with dicamba or triclopyr, but addition of 0.1 or 0.125 lb ai/A clopyralid produced 98-100% control.

An additional non-phenoxy herbicide study was conducted in cooperation with Dow Chemical Company and dealt with dandelion and white clover control. Four herbicides were examined in various combinations: triclopyr amine, clopyralid, dicamba, and Break-thru. In general, peak dandelion control

occurred at six weeks after application with the highest rated treatments, triclopyr amine + clopyralid at .38 + .25 and .5 + .25 lb ai/A, attaining about 95% control (Table 5). Nearly all treatments resulted in 100% white clover control with the exception of Break-thru + triclopyr amine and Break-thru + clopyralid (Table 5).

Results from these preliminary studies suggest that several non-phenoxy herbicides provide the same degree of weed control as phenoxy products. With respect to buckhorn plantain, dandelion, and white clover, excellent results were obtained with clopyralid and combinations of clopyralid, triclopyr, and dicamba. Additional research in this area is warranted, particularly if registration for 2,4-D is cancelled. Future studies will include screening of these and any new experimental non-phenoxy herbicides on a range of common turf weeds.

Reference

1. Hoar, Sheila K. et. al., 1986. Agricultural herbicide use and risk of lymphoma and soft-tissue sarcoma. J. Amer. Med. Assoc. 256:1141-1147.

TABLE 1. Control of four broadleaf weed species.

Herbicide	Rate (lbs ai/A)	White Clover 1985	White Clover 1986	Yellow Woodsorrel 1984	Yellow Woodsorrel 1985	Canada Thistle 1985	Common Blue Violet 1985
		% control					
Buctril	2.0	0	50	59	49	75	67
2,4-D ester	1.0	17	8	-	33	88	39
2,4-D amine	1.0	21	2	0	23	91	24
Triclopyr ester	0.5	63	90	73	90	84	67
MCPP	1.5	41	96	-	64	92	44
Super Trimec	.75 + .75 + .18	99	100	-	97	97	48
Trimec	1.0 + 0.5 + .12	-	99	0	-	-	-
Turflon amine	0.5 + 1.3	13	90	41	32	93	53
Turflon amine	.38 + 1.0	40	69	18	48	85	39
Turflon D	1.0 + 0.5	60	77	-	96	99	66
Weedon DPC	1.0 + 1.0	54	99	91	70	86	48
Weedone DPC + Buctril	.75 + .75 + 0.5	50	85	-	96	93	60
check	-	20	15	0	22	43	21
$LSD_{.05}$		61	24	27	51	16	20

TABLE 2. Control of two speedwell species.

Herbicide	Rate (lbs ai/A)	Slender speedwell 1985	Slender speedwell 1986	Germander speedwell 1985	Germander speedwell 1986
		control			
Buctril	2.0	84	43	57	81
Dacthal 50WP	10.5	92	67	87	96
2,4-D ester	1.0	95	8	12	0
2,4-D amine	1.0	90	17	0	0
Triclopyr ester	0.5	65	11	60	98
MCPP	1.5	100	75	5	22
Super Trimec	.75 + .75 + .18	100	91	7	16
Trimec	1.0 + 0.5 + .12	-	73	-	4
Turflon amine	0.5 + 1.3	72	42	14	87
Turflon D	1.0 + 0.5	99	0	70	83
Weedone DPC	1.0 + 1.0	95	87	9	2
Weedone DPC + Buctril	.75 + .75 + 0.5	100	79	20	20
check	-	0	0	5	0
$LSD_{.05}$		19	32	38	28

TABLE 3. LATE FALL DANDELION CONTROL 1986-87.

TREATMENTS (lbs ai/A)	% CONTROL 11/17/86	5/4/87	5/28/87
9/24/86*			
Formula 40 (1.0)	93	8	44
Esteron 99 (1.0)	97	49	54
Trimec (1.0 + 0.5 + 0.12)	97	56	70
Super Trimec (0.75 + 0.75 + 0.18)	97	69	74
10/6/86			
Formula 40	69	53	70
Esteron 99	84	84	88
Trimec	72	75	77
Super Trimec	79	93	96
10/17/86			
Formula 40	11	81	87
Esteron 99	15	95	94
Trimec	38	92	92
Super Trimec	45	97	96
10/22/86			
Formula 40	13	78	85
Esteron 99	4	91	91
Trimec	23	92	92
Super Trimec	4	94	93
10/30/86			
Formula 40	2	85	84
Esteron 99	5	94	92
Trimec	4	94	94
Super Trimec	0	92	91
11/10/86			
Formula 40	13	85	90
Esteron 99	0	83	78
Trimec	4	87	93
Super Trimec	1	94	90
control	4	0	7
$LSD_{.05}$	20	17	16

*application date

TABLE 4. Phenoxy versus non-phenoxy herbicides: Narrow leaf plantain control

Herbicide (lbs ai/A)	% Control 2 WAT*	4 WAT	6 WAT	8 WAT
Turflon D 1 + .5	21	68	87	100
Triclopyr ester + clopyralid .25 + .25	69	96	97	100
Break-thru + triclopyr + clopyralid .125 + .125 + .1	77	98	100	100
Break-thru + clopyralid .125 + .125	39	77	98	100
Weedone DPC amine 2.0	63	79	83	99
Super Trimec .75 + .75 + .18	63	88	91	99
Weedone DPC amine 1.5	39	79	83	98
Break-thru + clopyralid .125 + .1	49	82	87	98
Turflon II amine 1 + .5	34	66	71	96
Weedestroy triamine .5 + .5 + .5	59	49	83	96
Clopyralid .5	27	74	94	96
Trimec 1 + .5 + .12	0	62	85	95
Break-thru + triclopyr .125 + .125	31	44	51	72
Break-thru + dicamba .125 + .125	11	57	71	65
Triclopyr ester .5	21	25	25	17
Check	4	4	0	0
$LSD_{.05}$	37	33	23	16

*Weeks after treatment
Treatments applied 8/31/87; 9:30 am; 67°F; NW wind 0-5 mph; 58% RH; sunny.

TABLE 5. Non-phenoxy herbicides: dandelion and white clover control.

Herbicide	Rate (lbs ai/A	% dandelion control				% white clover control			
		2 WAT*	4 WAT	6 WAT	8 WAT	2 WAT	4 WAT	6 WAT	8 WAT
Triclopyr amine + clopyralid	0.38 + .062	19	13	21	0	0	96	95	100
	0.38 + 0.125	7	80	82	0	6	100	100	100
	0.38 + 0.25	14	63	96	87	15	100	100	100
	0.5 + .062	10	63	50	0	11	96	100	100
	0.5 + .125	32	83	73	42	22	100	100	100
	0.5 + 0.25	59	93	94	88	11	100	100	100
Triclopyr + clopyralid + dicamba	0.5 + 0.3 + 0.1	43	98	95	84	18	98	100	100
Triclopyr + clopyralid + dicamba	0.25 + .125 + 0.1	11	56	17	0	33	93	98	100
Triclopyr + Breakthru	.125 + .125	17	17	13	0	0	96	78	84
Triclopyr + Breakthru + dicamba	.125 + .125 + .125	30	54	56	0	22	99	100	100
Breakthru + dicamba	.125 + .125	32	72	65	10	8	99	87	95
Breakthru + clopyralid	.125 + .125	0	0	0	0	3	87	78	47
Control	---	0	6	0	0	13	43	44	33
$LSD_{.05}$		34	43	37	20	40	12	13	18

*weeks after treatment

Herbicides applied 6/25/87; 8:30 a.m.; 74°F; RH 71%; wind S 0-8 mph; partly sunny