THE EFFECT OF THREE PRE-EMERGENCE HERBICIDES ON GERMINATION AND GROWTH OF 24 EROSION RESISTANT PLANT MATERIALS FOR POSSIBLE USE ON ROADSIDE EROSION CONTROL

By

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CHAPTER I

INTRODUCTION

A need for the successful and economical establishment of vegetative ground covers exists on many acres of highway rights-of-way to prevent soil erosion and to enhance the safety and pleasure of the motoring public. It is important that a good stand of adapted grass be established as quickly as possible before erosion becomes severe. Seeding perhaps affords the greatest opportunity for roadside stabilization at the lowest cost, especially when the desirable species can be successfully established in the initial seeding. One of the most common causes of failures in stand establishment of roadside seedings is the competition from weeds. Stand establishment may be greatly increased by the use of a herbicide. The type of plant seeded may play an important part in producing a good stand. If this is found, a compatible herbicide to use with adapted plant species for most areas might be possible.

This investigation was initiated to investigate the phytotoxicity of three pre-emergence herbicides at two rates on germination and growth of 24 seeded erosion resistant plant materials for possible use on highway rights-of-way for control of soil erosion. The effects of the herbicides on the number and species of weeds present were also studied.

CHAPTER II

LITERATURE REVIEW

A survey of grass plantings within the Great Plains States from 1960 to 1962 by the Great Plains 6 Technical Committee, 1966 (7) revealed that 18 percent of these were failures. Lee (12) stated that an estimated 15 to 20 percent of the new grass seedings in western Oregon are plowed up before seed production because of weed competition. Bryan and McMurphy (3) found weed competition to severely retard and weaken grass species tested, and the production of all species was reduced 28 to 70 percent of the production from weed free plots during the second year's growth. Competition from weeds in new grass seedings often causes such severe retardations and weakening of the crop plants that the stand may be lost or it may take several years before a crop is hardy enough to withstand an application of herbicide for weed control, according to Lee. Lee also found that without competition from weeds grass plants soon filled vacant spots and made a solid row. Bryan and McMurphy found it was necessary to reduce competition in order that maximum production might be achieved from native and introduced species. According to Hull et al. (10) it is necessary to establish a firm seedbed free from weed competition in order to obtain maximum production and cover. Brooks, Shoop, and Martin (2) noted that Blaser et al. favor the use of indigenous grasses or mixtures of adapted grasses and legumes where grasses are needed to stabilize slopes. The species to be used and their seeding rates for establishment and cover vary in different geographic regions.

Richardson and Diseker (16) (17) found that highway rights-of-way were effectively stabilized by seedings of adapted species. In two studies by Richardson and Diseker, weeping lovegrass germinated rapidly giving good cover, and of the warm season perennials weeping lovegrass ranked second to common bermuda as the most desirable ground cover plant. Richardson, Diseker, and Sheridan (18) achieved success with lovegrass on both the clay soils of north Georgia and on sandy soils of the coastal plains. They also found lovegrass to be valuable as a nurse crop for establishing lespedeza. Weeping lovegrass, according to Zak and Bredakis (24), in Massachusetts became well established during all of the seasons; however, fall seedings of weeping lovegrass established a better lovegrass turf than spring and summer seedings.

Cummings (4) investigated seedings of 22 grasses and leguminous cover plants. Of the 22 plants tested, weeping lovegrass seedings produced the best protective cover for bare, exposed sites on infertile strongly acid subsoils. Results of the test indicate that weeping lovegrass cover can be obtained from seedings on bare, exposed sites. With elimination of competition this cover should provide ample site protection. Richardson, Diseker, and Sheridan (18) found that sericea lespedeza was better when seeded alone. A satisfactory stand was obtained when seeded in mixtures with lovegrass; however, stands and vigor were retarded by excessive lovegrass growth.

Youngner (22) stated that chemical control is seldom completely successful, which may be the result of poor timing of herbicide application. For adequate control the herbicide must be in the soil at the time of seed germination.

Work done by Flanagan (5) revealed that the phytotoxic action of propazine did not appear to be affected by the state of growth of plants at rates in excess of 10 pounds per acre. The only species to survive were yellow wood sorrel (Oxalis stricta) and a few wild carrots (Daucus carota). In the same experiment propazine demonstrated a high degree of foliage toxicity. Flanagan found the minimum dosage rate of propazine alone to be 10 pounds per acre with a sharp decrease in activity on perennial plants occurring with lesser rates. Work done at the Forest Research Institute (6) revealed that the safest treatment that gives effective control of most weeds is to apply propazine at 1 lb ai/a at sowing. Some tip-burn which appeared three weeks after emergence did not affect survival. Van Dorsser (23) related the phytotoxic effect of herbicides to soil temperature and moisture.

In the experiments carried out by Leiderman and Dos Santos (13) propazine sprayed pre-emergence the day after planting gave satisfactory weed control on most weeds but did not control Digitaria sanguinalis and Galinsoga parviflora. Antonyuk (1) of the USSR achieved complete control of annual and of some perennial weeds with propazine at 7-10 Kg/ha. In Hedderwick's (9) review he noted that no toxic residue accumulation has been noted after three years' spraying with propazine at 6 lb total ai/a. per year. Splittstoesser and Hopen (19) pointed out that when using siduron it must be in contact with the germinating seed in order to control crabgrass effectively. In Kerr's (11) experiment he found that weed control was impaired by incorporating siduron in soil unless such treatment put the herbicide and germinating seed in closer proximity. Kerr also noted that selectivity of siduron cannot be assumed for all species of a genus or all varieties within a species.

Splittstoesser and Hopen noted that root growth was inhibited more than shoot growth and once established the herbicide had little effect upon subsequent root and shoot growth. However, by placement in soil roots could be arrested but shoots still produce viable seed. Work done by Mazur, Jagschitz, and Skogley (15) indicate that root lengths of wheat, oats, and intermediate wheatgrass were reduced by siduron at 1 ppm. Further reduction was detected between 1, 10 and 100 ppm. In the same study they noted that siduron was not detected at any of the depth ranges (0-7.6 cm.) in the soil at a rate of 13.5 Kg/ha, which may indicate a short residual life at usual field rates. However, siduron does persist and move through the soil at higher rates. In 1970 Young and Evans (21) found that, under semiarid environmental conditions of the Great Basin, physiologically selective control of medusahead and downy brome in intermediate wheatgrass seedbeds is restricted to sites with above average soil moisture and moderately dense weed communities. According to Lewis and Gilbert (14) siduron cannot be safely used at seeding time for weed control in common bermudagrass.

CHAPTER III

METHODS AND MATERIALS

In May, 1972, a firm seed bed was prepared on a Kirkland silt loam soil located on the Agronomy Research Station at Stillwater, Oklahoma.

The investigation was arranged in a split-plot design in which the main plots were the herbicides (treatments) and were in a randomized block having three replications. The sub-plots were the seeded plant materials. Each sub-plot consisted of three rows, three feet long, one foot apart and replicated three times. The plots were planted May 15, 1972, with a one row Planet Junior. The plant species and planting rates for each, which were included in this study, are listed in Table I. The herbicides, chemical names, formulations, and the rates expressed as kilograms of active ingredients (a.i.) per hectare and pounds per acre used in this study are shown in Table II.

All herbicides were applied immediately after planting. The herbicides used were sprayed on each treated plot in an equivalent rate of forty gallons water per acre with a TKSS 3 nozzle at 30 psi mounted on an International Harvester "Cub" tractor traveling at three mph. After seeding, all plots were kept moist by sprinkler irrigation for a period of three weeks to aid germination. Care was exercised not to water to the point of run-off to prevent contamination of adjacent plots. Following this initial moistening period no further irrigation was provided. The counts for seeded plants were taken at one month

TABLE I

NAMES AND RATE OF PLANTING FOR 24 SEEDED MATERIALS USED IN THIS INVESTIGATION

Common Name	Scientific Name	Bulk Planting Rate Lbs/Acre
Weeping lovegrass	Eragrostis curvula	6
Bermudagrass	Cynodon dactylon	18
Buffalograss	Buchloe dactyloides	36
Serecia lespedeza	Lespedeza cuneata	40
Sideoats grama	Bouteloua curtipendula	33
Switchgrass	Panicum virgatum	16
Indiangrass	Sorghastrum nutans	32
Crested wheatgrass	Agropyron cristatum	17
Smooth bromegrass	Bromus inermis	39
Kentucky 31 fescue	Festuca arundinacea	33
Caucasian bluestem	Andropogon caucasicus	38
KR bluestem	*Bothriochloa ischaemum var. songarica	38
Blue grama	Bouteloua gracilis	25
L-Blend Asiatic bluestem	*Bothriochloa intermedia var. indica	38
T-Blend Asiatic bluestem	*Bothriochloa intermedia var. indica	38
H-Blend Asiatic bluestem	*Bothriochloa intermedia var. indica	38**
S-Blend Asiatic bluestem	*Bothriochloa ischaemum var. ischaemum	38
J-Blend Asiatic bluestem	*Bothriochloa intermedia var. montana	38
K-Blend Asiatic bluestem	*Bothriochloa intermedia var. montana	38
B-Blend Asiatic bluestem	*Bothriochloa intermedia var. indica	38
Plains bluestem (M-Blend)	*Bothriochloa ischaemum var. ischaemum	38
Sudangrass	Sorghum vulgare var. sudanensis	28
Wheat	Triticum aestivum	120
Rye	Secale cereals	112

*See Harlan, Jack R., Richardson, W. L., and DeWet, J. M. J. (8) for discussion of blends.

**H-Blend was a semi-processed seed when planted while the other blends were combine run, rough, chaffy seeds.

TABLE II

HERBICIDES, CHEMICAL NAMES, FORMULATIONS, AND RATES USED TO DETERMINE PHYTOTOXICITY ON 24 SEEDED PLANT MATERIALS

			Application Rates	
Herbicide	Chemical Name	Formulation*	Kg. a.i./ha	lb. a.i./a
Siduron	1-(2-methylcyclohexyl)-3-phenylurea	WP	0.56, 1.12	0.5, 1.0
Propazine	2-chloro-4, 6-bis (isopropylamino)-5-triazine	WP	0.56, 1.12	0.5, 1.0
**A-820	(Not Available)	EC	1.12, 2.24	1.0, 2.0
Check	- - -	--	-- --	-- --

*WP-wettable powder EC-Emulsifiable concentrate

**An experimental formulation of a dinitroanaline identified by Amchem as A-820.

intervals (June 15, July 15, and August 15) beginning 30 days after planting from a random six inch section of each row of each plot. The weeds were counted by randomly placing a one square foot quadrant in each plot and counting the enclosed weeds.

The data were analyzed statistically. In order to locate difference among means a Duncan's multiple range test (20) was used. Differences among treatment means were studied for each type of variable plant. A special standard error of the mean had to be calculated since comparisons were made between two sub-plot means which were in different main plots (20).

CHAPTER IV

RESULTS AND DISCUSSION

The statistical analyses of the data obtained in this study clearly indicate the effectiveness of these pre-emergence herbicides as related to treatment and plant material. The analysis of variance of the data at each of the three count dates showed a significant difference among treatments, variety, and treatments x variety. Consequently, each treatment will be discussed separately. The analyses of variances are shown in Table III.

TABLE III

MEAN SQUARES FOR VARIABLE PLANTS FOR THREE COUNT DATES

		Count Dates		
Source	df	June 15	July 15	August 15
Rep	2	4738.67	4016.96	3688.79
Trt	6	2849.80**	2242.97**	2042.97**
Error A	12	454.45	369.05	291.93
Var	23	2222.52**	2076.04**	1888.43**
Trt x Var	138	304.82**	301.22**	232.83**
Error B	322	107.67	100.43	77.09
Total	334	120.13	110.08	84.80

*, **Significant at the 0.05 and 0.01 levels of probability, respectively.

Data for count one are shown in Appendix Table XV. As shown in Table IV at count one, 30 days after treatment, propazine at either rate was not different from its check in seedling number of weeping lovegrass, switchgrass, caucasian bluestem, and plains bluestem.

Siduron at either rate caused no significant reduction from the check plots in seedling number for sideoats grama, crested wheatgrass, smooth bromegrass, Kentucky 31 fescue, K-Blend Asiatic bluestem and wheat. The experimental herbicide A-820 applied up to 2 lb/A caused no significant reduction in seedling number when compared to the check of crested wheatgrass, smooth bromegrass, and wheat.

At the first count of bermudagrass the check plot was found to have more seedlings than those plots treated with a herbicide. This indicates possible phytotoxicity from all materials included in the investigation. Siduron at 1/2 lb/A was no different than the check plot effect on serecia lespedeza. The effects of the remaining herbicides were significant reductions in seedling number when compared to the check plots. As shown in Table V, rye, buffalograss, indiangrass, KR bluestem, blue grama, sudangrass and the Asiatic bluestem blends L, T, S, J, and B showed that the seedling numbers in the herbicide treated plots were not statistically different from the check plot for that variable plant.

Data for count two are shown in Appendix Table XVI. As shown in Table VI, in count two, sixty days after planting, propazine at either rate when compared to the check plots for that variable plant caused no significant reduction in seedling number of weeping lovegrass, switchgrass, H, J, and K-Blend Asiatic bluestem. However, in plains and caucasian bluestem the high rate of propazine seemingly caused the

TABLE IV

EFFECT OF THREE PRE-EMERGENCE HERBICIDES ON GERMINATION AND GROWTH OF 13 PLANT MATERIALS THAT SHOWED STATISTICAL DIFFERENCES AT COUNT ONE, THIRTY DAYS AFTER PLANTING

	Treatments						
Plant Material	Siduron ½ lb ai/a	Siduron 1 lb ai/a	Propazine ½ lb ai/a	Propazine 1 lb ai/a	A-820 1 lb ai/a	A-820 2 lb ai/a	Check*
Weeping lovegrass			78.3 a	74.3 a			81.3 a
Bermuda							47.6 a
Serecia lespedeza	36.6 a						29.6 a
Sideoats grama	24.6 a	18.3 a	7.6 a		7.0 a		22.6 a
Switchgrass	40.6 a		47.3 a	38.3 a			48.3 a
Crested wheatgrass	31.6 a	22.6 a	13.3 a		18.0 a	16.0 a	30.3 a
Smooth brome	32.3 a	37.6 a			32.3 a	24.3 a	38.0 a
Ky 31 fescue	39.6 a	22.6 a			21.3 a		33.6 a
Caucasian bluestem			42.0 a	25.3 a			37.3 a
H-Blend			50.6 a	35.0 a			39.3 a
K-Blend	14.0 a	10.3 a	10.0 a	12.3 a	6.0 a		23.6 a
Plains bluestem			27.3 a	15.0 a			23.3 a
Wheat	24.0 a	22.3 a			27.0 a	19.6 a	39.0 a

Standard Error of the Mean = 116.37

*Only those means which were equal to the check plot means are shown.

seedling number to be significantly lower than its check plot.

TABLE V

EFFECT OF THREE PRE-EMERGENCE HERBICIDES ON GERMINATION AND GROWTH OF 11 PLANT MATERIALS THAT SHOWED NO STATISTICAL DIFFERENCES AT COUNT ONE, THIRTY DAYS AFTER PLANTING

Treatments	
Rye	No Difference
Buffalograss	No Difference
Indiangrass	No Difference
KR bluestem	No Difference
Blue grama	No Difference
L-Blend	No Difference
T-Blend	No Difference
S-Blend	No Difference
J-Blend	No Difference
B-Blend	No Difference
Sudangrass	No Difference

At the same time siduron at either rate showed no phytotoxicity to seedlings of bermuda, sideoats grama, crested wheatgrass, smooth bromegrass, J and K-Blend Asiatic bluestem and wheat. A-820 at either rate produced no visible damage in count two to the seedlings of crested wheatgrass and smooth bromegrass. However, A-820 at the high rate seemingly caused a significant reduction in seedling number in wheat. In Table VII it can be seen that sixty days after planting seedlings of buffalograss, indiangrass, Kentucky 31 fescue, KR bluestem, blue grama, sudangrass, rye, L, T, S, and B-Blend Asiatic bluestems showed no phytotoxicity from the herbicide treatments.

TABLE VI

EFFECT OF THREE PRE-EMERGENCE HERBICIDES ON GERMINATION AND GROWTH OF 13 PLANT MATERIALS THAT SHOWED STATISTICAL DIFFERENCES AT COUNT TWO, SIXTY DAYS AFTER PLANTING

	Treatments						
Plant Material	Siduron ½ lb ai/a	Siduron 1 lb ai/a	Propazine ½ lb ai/a	Propazine 1 lb ai/a	A-820 1 lb ai/a	A-820 2 lb ai/a	Check*
Weeping lovegrass			80.3 a	72.3 a			74.3 a
Bermuda	29.3 a	11.3 a	12.6 a				29.0 a
Serecia lespedeza	39.0 a						24.0 a
Sideoats grama	24.6 a	12.6 a	6.6 a		6.0 a		20.0 a
Switchgrass	42.6 a		47.3 a	39.3 a			40.0 a
Crested wheatgrass	27.0 a	17.0 a			8.0 a	12.6 a	16.6 a
Smooth brome	27.6 a	37.0 a			24.3 a	21.6 a	34.3 a
Caucasian bluestem			48.6 a				
H-Blend			52.0 a	34.6 a			37.0 a
J-Blend	11.3 a	4.0 a	21.3 a	16.6 a	17.0 a		8.0 a
K-Blend	14.6 a	5.3 a	10.0 a	12.3 a	4.3 a		21.3 a
Plains bluestem			34.6 a				22.6 a
Wheat	23.3 a	22.3 a			28.3 a		36.6 a

Standard Error of the Mean = 111.62.

*Only those means which were equal to the check plot means are shown.

TABLE VII

EFFECT OF THREE PRE-EMERGENCE HERBICIDES ON GERMINATION AND GROWTH OF 11 PLANT MATERIALS THAT SHOWED NO STATISTICAL DIFFERENCES AT COUNT TWO, SIXTY DAYS AFTER PLANTING

Treatments	
Buffalograss	No Difference
Indiangrass	No Difference
Ky 31 fescue	No Difference
KR bluestem	No Difference
Blue grama	No Difference
L-Blend	No Difference
T-Blend	No Difference
S-Blend	No Difference
B-Blend	No Difference
Sudangrass	No Difference
Rye	No Difference

Data for count three are shown in Appendix Table XVII. Ninety days after planting, count three, propazine treated plots at either rate when compared to their check plots, exhibited no significant reduction in seedling number of weeping lovegrass, switchgrass, L, H, J, and K-Blend Asiatic bluestems as shown in Table VIII. Likewise, siduron at either rate caused no phytotoxicity to the seedlings of smooth bromegrass, blue grama, and K-Blend Asiatic bluestem. However, in bermudagrass and J-Blend Asiatic bluestem siduron seemingly caused a significant reduction in seedling number.

A-820 at either rate produced no noticeable damage to the seedlings of smooth bromegrass and crested wheatgrass, which is consistent with the sixty day count.

No herbicide phytotoxicity was observed the last 30 days of this experiment in the seedlings of buffalograss, indiangrass, Kentucky 31

TABLE VIII

EFFECT OF THREE PRE-EMERGENCE HERBICIDES ON GERMINATION AND GROWTH OF 14 PLANT MATERIALS THAT SHOWED STATISTICAL DIFFERENCES AT COUNT THREE, NINETY DAYS AFTER PLANTING

	Treatments						
Plant Material	Siduron ½ lb ai/a	Siduron 1 lb ai/a	Propazine ½ lb ai/a	Propazine 1 lb ai/a	A-820 1 lb ai/a	A-820 2 lb ai/a	Check*
Weeping lovegrass			67.0 a	60.0 a			61.6 a
Bermuda	27.3 a						28.0 a
Serecia lespedeza	36.3 a						24.3 a
Sideoats grama	24.3 a	11.6 a					23.3 a
Switchgrass	39.3 a		43.0 a	37.3 a			37.0 a
Crested wheatgrass	27.0 a	16.3 a				12.0 a	16.3 a
Smooth brome	27.0 a	33.3 a			26.0 a	19.0 a	33.0 a
Caucasian bluestem			43.3 a				31.3 a
Blue grama	11.0 a	10.3 a					17.3 a
L-Blend	6.6 a		19.3 a	9.0 a			5.3 a
H-Blend			46.3 a	32.3 a			35.3 a
J-Blend	10.6 a		20.3 a	16.0 a	17.0 a		7.0 a
K-Blend	12.3 a	4.3 a	8.6 a	12.0 a			20.6 a
Plains bluestem			34.6 a				20.0 a

Standard Error of the Mean = 84.04

*Only those means which were equal to the check plot means are shown.

fescue, KR bluestem, T, S, B-Blend Asiatic bluestem, sudangrass, wheat, and rye as shown in Table IX.

TABLE IX

EFFECT OF THREE PRE-EMERGENCE HERBICIDES ON GERMINATION AND GROWTH OF 10 PLANT MATERIALS THAT SHOWED NO STATISTICAL DIFFERENCES AT COUNT THREE, NINETY DAYS AFTER PLANTING

Treatments	
Buffalograss	No Difference
Indiangrass	No Difference
Kentucky 31 fescue	No Difference
KR bluestem	No Difference
T-Blend	No Difference
S-Blend	No Difference
B-Blend	No Difference
Sudangrass	No Difference
Wheat	No Difference
Rye	No Difference

It should be noted that by midsummer seedlings in the weedy plots were smaller, less robust, less vigorous, and shorter than the seedlings in the plots where the weeds were controlled. Signs of moisture stress in the form of leaf wilting in the seedlings having weed competition were observed. No signs of moisture stress in the seedlings with no weed competition were observed. A possible explanation for this is that a total of 2.86 inches of precipitation was received in July as compared to a 30 year average of 3.69 inches for the month. The daily rainfall for the months of May, June, July, and August, 1972, at

Stillwater, Oklahoma*, is presented in Table X.

As shown in Table XI there were eight grasses, namely buffalograss, indiangrass, KR, T, S, and B-Blend Asiatic bluestems, sudangrass, and rye, which showed no differences in treatments throughout the experiment.

It should also be noted that at the time of the ninety day count (August 15, 1972) the wheat and rye seedlings were dead. This probably is a result of the high temperatures and low precipitation that prevailed prior to this time.

The analysis of variance of weeds present (Table XII) showed significant differences at all counts. The weeds present for the period of this experiment are listed in Table XIII. As shown in Table XIV, at the time of count one, all the herbicides used except propazine at 1/2 lb. were statistically equal on grassy type weeds while propazine at both rates were statistically equal and achieved the best broadleaf weed kill.

At the second counting date, those herbicides giving the greatest kill of both grassy and broadleaf weeds remained the same as the 30 day count, as shown in Table XIV. At the 90 day count (Table XIV) the herbicides achieving the greatest kill remain consistent with the 30 and 60 day counts.

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*U. S. Department of Commerce, Environmental Science Services Administration, Climatological Summary 1938-1967.

TABLE X

PRECIPITATION RECORD FOR THE MONTHS OF MAY, JUNE, JULY, AUGUST, 1972, AT STILLWATER, OKLAHOMA

May, 1972		June, 1972		July, 1972		August, 1972	
	Precipitation		Precipitation		Precipitation		Precipitation
Day	Inches	Day	Inches	Day	Inches	Day	Inches
1	0.26	1		1	0.31	1	
2		2		2	1.25	2	
3	0.06	3		3	0.50	3	
4		4		4		4	
5	0.02	5		5	0.21	5	0.07
6	0.16	6		6		6	
7	0.14	7		7		7	
8		8		8		8	
9		9		9	0.09	9	
10		10		10		10	
11		11		11		11	
12	0.85	12		12	0.05	12	
13		13		13	0.11	13	
14		14	0.11	14		14	
15		15		15		15	
16		16		16		16	
17		17		17		17	
18	0.09	18		18	0.03	18	
19		19		19	0.23	19	
20		20	0.82	20		20	
21		21		21		21	
22	0.73	22		22		22	0.17
23		23	1.34	23		23	
24		24	1.36	24		24	
25		25		25		25	1.46
26		26		26		26	
27		27		27		27	
28	0.20	28	0.04	28		28	
29		29		29	0.08	29	0.08
30	0.03	30		30		30	0.75
31				31		31	0.49

TABLE XI

EFFECT OF THREE PRE-EMERGENCE HERBICIDES, PROPAZINE, SIDURON, AND A-820, ON GERMINATION AND GROWTH OF 8 PLANT MATERIALS

Date Planted	Date Counted		
May 15, 1972	June 15, 1972	July 15, 1972	August 15, 1972
Buffalograss	No Difference	No Difference	No Difference
Indiangrass	No Difference	No Difference	No Difference
KR bluestem	No Difference	No Difference	No Difference
T-Blend	No Difference	No Difference	No Difference
S-Blend	No Difference	No Difference	No Difference
B-Blend	No Difference	No Difference	No Difference
Sudangrass	No Difference	No Difference	No Difference
Rye	No Difference	No Difference	No Difference

TABLE XII

MEAN SQUARES FOR GRASSY AND BROADLEAF WEEDS PRESENT FOR THREE COUNT DATES

		Count Dates					
		June 15		July 15		August 15	
Source	df	Grassy	Broadleaf	Grassy	Broadleaf	Grassy	Broadleaf
Rep	2	4.44	241.45	52.73	162.86	43.61	100.79
Trt	6	170.06*	985.16**	299.83**	556.94**	205.35**	340.71**
Error A	12	40.19	91.95	39.49	36.86	26.51	62.42
Var	23	3.17	8.60	7.19	6.05	7.96**	5.45
Trt x Var	138	3.30	8.56	4.02	5.83	2.72	4.35
Error B	322	3.79	8.40	4.97	5.83	4.05	4.99
Total	334	5.10	11.41	6.21	6.95	4.86	7.05

*, **Significant at the 0.05 and 0.01 levels of probability, respectively.

TABLE XIII

COMMON AND SCIENTIFIC NAMES OF WEEDS
PRESENT IN THIS EXPERIMENT

Scientific	Type	Common
Hibiscus trionum	Broadleaf	Flower-of-an-hour
Digitaria sp.	Grassy	Crabgrass
Mullugo verticillata	Broadleaf	Carpet weed
Euphorbia supina	Broadleaf	Prostrate spurge
Solanum carolinense	Broadleaf	Horsenettle
Cyperus esculentus	Broadleaf	Yellow Nutsedge
Setaria glauca	Grassy	Yellow foxtail
Eriochloa contracta	Grassy	Prairie cupgrass
Polygonum avicularа	Broadleaf	Prostrate knotweed

TABLE XIV

AVERAGE MEANS OF WEED COUNTS AND STATISTICAL RANGE FOR
THREE COUNTING DATES ON COMBINED GRASSY AND
BROADLEAF WEEDS PRESENT IN THE STUDY

	Treatment*						
Plants and Count	Sid-uron ½ lb ai/a	Sid-uron 1 lb ai/a	Propa-zine ½ lb ai/a	Propa-zine 1 lb ai/a	A-820 1 lb ai/a	A-820 2 lb ai/a	Check
Count #1							
Grassy	1.0a	0.8a	3.2ab	2.2a	1.5a	1.4a	5.1b
Broadleaf	7.9bc	8.3bc	1.8a	1.1a	6.3b	7.8bc	11.5c
Count #2							
Grassy	1.5a	0.9a	5.5bc	2.7a	3.3ab	1.7a	6.2c
Broadleaf	6.7bc	7.0bc	2.0a	0.7a	5.8b	5.2b	8.4b
Count #3							
Grassy	1.2a	0.5a	4.4b	2.1a	2.5a	1.1a	4.8b
Broadleaf	5.6c	4.0bc	1.5ab	0.4a	4.1bc	4.2bc	6.7c

*All numbers followed by the same letter are not statistically different at the 5% level as determined by Duncan's Multiple Range Test.

CHAPTER V

SUMMARY AND CONCLUSIONS

In May of 1972 an investigation for the evaluation of three herbicides on the effect of 24 erosion resistant plant materials for possible use on erosion control of highway rights-of-way was initiated. Treatments consisted of two herbicide levels on each of the 24 plant materials.

The analyses of the data indicate that the plant population of all except eight species is greatly affected by the presence or absence of at least one rate of one of the pre-emergence herbicides used and the kind of plant material seeded.

Propazine was found to be the least phytotoxic of the herbicides investigated for the largest number of species included in this experiment; however, it should be noted here that propazine showed a detrimental effect on the cool season grasses: smooth bromegrass, crested wheatgrass, and Kentucky 31 fescue and the cereals, wheat and rye. Siduron and A-820 appeared to be acceptable for use on the cool season grasses. Serecia lespedeza was reduced in seedling number by all herbicide treatments with the one exception of siduron at 1/2 lb/acre. Siduron was the second best herbicide, with A-820 being the most phytotoxic to the species seeded in this experiment.

The analyses of data on the weed population counts indicate that the application of one of these herbicides significantly reduced the number of weeds present in the plots. The analyses showed that propazine at either rate was best at all counting dates for use on broadleaf weeds present, while all herbicides except propazine at 1/2 lb/A were statistically equal at all counting dates on control of the grassy type weeds present in the test.

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APPENDIXES

TABLE XV

AVERAGE MEANS FOR VARIABLE PLANTS FOR COUNT ONE

Treatment/ Grass	Siduron ½ lb. ai/a	Siduron 1 lb. ai/a	Propazine ½ lb. ai/a	Propazine 1 lb. ai/a	A-820 1 lb. ai/a	A-820 2 lb. ai/a	Check
Weeping lovegrass	48.6	31.6	78.3a	74.3a	24.0	0.0	81.3a
Bermuda	30.0	13.6	9.3	1.3	6.3	2.3	47.6a
Buffalograss	20.3	15.6	15.3	8.3	9.3	5.0	21.3
Serecia lespedeza	36.6a	18.0	8.3	0.0	15.6	12.6	29.6a
Sideoats grama	24.6a	18.3a	7.6a	0.0	7.0a	1.3	22.6a
Switchgrass	40.6a	22.6	47.3a	38.3a	24.0	17.0	48.3a
Indiangrass	16.3	10.6	10.0	4.6	12.0	3.6	18.6
Crested wheatgrass	31.6a	22.6a	13.3a	0.0	18.0a	16.0a	30.3a
Smooth bromegrass	32.3a	37.6a	5.6	0.3	32.3a	24.3a	38.0a
Kentucky 31 fescue	39.6a	22.6a	10.3	14.0	21.3a	16.3	33.6a
Caucasian bluestem	12.0	0.0	42.0a	25.3a	22.0	8.0	37.3a
KR bluestem	3.6	0.0	3.0	2.3	0.0	0.0	9.6
Blue grama	10.6	13.3	1.3	0.0	0.0	1.6	16.0
L-Blend	8.3	4.3	17.0	13.0	4.3	2.0	5.3
T-Blend	6.6	4.0	11.6	5.0	0.3	0.0	11.6
H-Blend	22.0	14.6	50.6a	35.0a	8.3	6.3	39.3a
S-Blend	3.6	6.3	3.3	17.3	4.6	1.3	15.3
J-Blend	12.3	6.3	20.6	16.3	17.0	0.6	18.0
K-Blend	14.0a	10.3a	10.0a	12.3a	6.0a	0.3	23.6a
B-Blend	3.0	3.6	3.3	3.0	0.0	7.3	6.0
Plains bluestem	6.0	1.3	27.3a	15.0a	5.3	0.0	23.3a
Sudangrass	15.0	15.6	15.0	23.6	9.0	9.6	21.3
Wheat	24.0a	22.3a	13.3	6.3	27.0a	19.6a	39.0a
Rye	13.6	11.6	6.6	9.6	13.6	21.6	6.3

TABLE XVI

AVERAGE MEANS FOR VARIABLE PLANTS FOR COUNT TWO

Treatment/ Grass	Siduron ½ lb. ai/a	Siduron 1 lb. ai/a	Propazine ½ lb. ai/a	Propazine 1 lb. ai/a	A-820 1 lb. ai/a	A-820 2 lb. ai/a	Check
Weeping lovegrass	47.6	29.6	80.3a	72.3a	25.6	1.3	74.3a
Bermuda	29.3a	11.3a	12.6a	1.3	6.3	2.3	29.0a
Buffalograss	20.6	15.6	13.3	9.0	10.6	5.0	20.0
Serecia lespedeza	39.0a	17.0	7.6	0.3	15.0	9.6	24.0a
Sideoats grama	24.6a	12.6a	6.6a	0.0	6.0a	1.3	20.0a
Switchgrass	42.6a	21.3	47.3a	39.3a	19.0	17.0	40.0a
Indiangrass	11.3	10.6	10.3	5.0	8.6	2.6	16.0
Crested wheatgrass	27.0a	17.0a	6.3	0.0	8.0a	12.6a	16.6a
Smooth bromegrass	27.6a	37.0a	4.3	0.3	24.3a	21.6a	34.3a
Kentucky 31 fescue	20.0	21.0	5.6	8.3	14.6	13.0	20.3
Caucasian bluestem	12.3	0.3	48.6a	25.6	22.6	7.0	31.0
KR bluestem	3.0	0.0	0.6	2.3	0.0	0.0	8.6
Blue grama	11.0	9.6	0.0	0.3	0.0	1.6	17.6
L-Blend	7.3	3.3	19.3	10.3	1.6	2.0	7.3
T-Blend	9.0	3.3	10.0	3.0	0.0	0.0	12.0
H-Blend	24.0	11.3	52.0a	34.6a	1.6	4.0	37.0a
S-Blend	3.6	2.3	3.3	16.6	4.0	1.3	16.0
J-Blend	11.3a	4.0a	21.3a	16.6a	17.0a	0.6	8.0a
K-Blend	14.6a	5.3a	10.0a	12.3a	4.3a	1.3	21.3a
B-Blend	1.3	2.0	3.0	1.0	0.0	7.3	6.0
Plains bluestem	6.6	1.3	34.6a	14.6	3.3	0.0	22.6a
Sudangrass	14.6	15.3	15.0	23.0	10.0	8.3	22.0
Wheat	23.3a	22.3a	9.0	3.0	28.3a	17.3	36.6a
Rye	14.0	9.6	2.3	11.3	8.6	19.6	4.0

TABLE XVII

AVERAGE MEANS FOR VARIABLE PLANTS FOR COUNT THREE

Treatment/ Grass	Siduron ½ lb. ai/a	Siduron 1 lb. ai/a	Propazine ½ lb. ai/a	Propazine 1 lb. ai/a	A-820 1 lb. ai/a	A-820 2 lb. ai/a	Check
Weeping lovegrass	42.3	27.0	67.0a	60.0a	24.3	0.6	61.6a
Bermuda	27.3a	10.3	12.0	0.0	4.0	2.0	28.0a
Buffalograss	20.3	15.3	14.0	7.0	11.0	4.6	18.3
Serecia lespedeza	36.3a	16.6	6.6	0.0	12.6	9.0	24.3a
Sideoats grama	24.3a	11.6a	3.6	0.0	4.6	0.3	23.3a
Switchgrass	39.3a	21.0	43.0a	37.3a	18.0	18.0	37.0a
Indiangrass	11.3	7.3	10.0	5.0	7.6	1.6	16.3
Crested wheatgrass	27.0a	16.3a	5.0	0.0	7.6	12.0a	16.3a
Smooth bromegrass	27.0a	33.3a	2.6	0.0	26.0a	19.0a	33.0a
Kentucky 31 fescue	19.6	18.0	4.0	6.3	14.0	12.0	19.6
Caucasian bluestem	10.6	0.0	43.3a	25.0	22.6	6.6	31.3a
KR bluestem	3.0	0.0	0.0	1.6	0.0	0.0	8.6
Blue grama	11.0a	10.3a	0.0	0.0	0.0	0.0	17.3a
L-Blend	6.6a	0.0	19.3a	9.0a	1.6	1.3	5.3a
T-Blend	6.6	1.6	10.0	1.6	0.0	0.0	12.6
H-Blend	19.6	11.0	46.3a	32.3a	1.6	3.6	35.3a
S-Blend	2.0	0.3	3.0	15.0	3.6	1.3	15.3
J-Blend	10.6a	3.0	20.3a	16.0a	17.0a	0.0	7.0a
K-Blend	12.3a	4.3a	8.6a	12.0a	3.3	1.3	20.6
B-Blend	0.0	2.0	3.0	0.0	0.0	6.6	4.3
Plains bluestem	7.0	0.0	34.6a	14.0	3.3	0.0	20.0a
Sudangrass	14.0	14.3	14.3	21.0	8.3	5.6	21.3
Wheat	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rye	0.0	0.0	0.0	0.0	0.0	0.0	0.0

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