

SUGARBEET

WEED MANAGEMENT RESEARCH:

1988

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Summary and Annual Report of Experimental Field Plot Testing for

WEED MANAGEMENT IN SUGAR BEETS--1988

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SYNOPSIS

Ten experiments were initiated in the 1988 season, but only 8 were completed. Barnyardgrass that germinated 4 weeks and longer after beet germination did not cause loss of crop yield. Increasing density of barnyardgrass caused increasing severity of competition (up to 98% reduction in yield) but level of competition was not altered by irrigating every 7 or 14 days, or by 0 or 75 lb/A of additional nitrogen fertilizer. Sugarbeet yield was not altered by irrigation of N in the absence of weeds. A comparison of several preplant incorporated and a postemergence herbicide treatment in spring-seeded beets showed that with a mixed barnyardgrass/redroot pigweed/common purslane weed spectrum the preplant treatments were superior to the postemergence treatment. The best weed control and highest yields were obtained with diethatyl alone or in mixture with cycloate or ethofumesate. A series of postemergence treatments were evaluated on the above-noted weed spectrum. Sethoxydim controlled barnyardgrass. Phenmedipham + desmedipham (phen+desm; 'Betamix') as a split application controlled purslane but achieved no better than 80% control of redroot pigweed. Phen+desm tank-mixed with sethoxydim did not antagonize the activity of sethoxydim in this trial; adding a low rate of cycloate to this mixture did not alter weed control activity. A new herbicide from Dow Chemical, XRM-3972, did not provide adequate control at the rates evaluated. Sethoxydim was applied at 6, 12, 24 or 48 gal/A to barnyardgrass, yellow foxtail and 'volunteer' wheat at 4 different stages of growth. Control of the weed grasses was very good, but that of wheat ranged from good to poor. Decreasing spray volume increased activity of the herbicide; this was particularly evident at either lower application rates or when treating older weeds. Older weeds were universally more difficult to kill; older yellow foxtail and wheat were harder to kill than older barnyardgrass. A limited evaluation showed that fluazifop provided better control of wheat than sethoxydim, but was weaker on the other two grasses. Split applications of phen+desm applied to redroot pigweed or common purslane gave greater control than single applications at the same rate. Safety to the beets was improved by split applications because lower herbicide rates achieved equal control. Split applications were superior to single applications when applied to weeds at older growth stages, but control achieved did not equal that attained when applications were made at the 'labeled' growth stage. Split applications of phen+desm, in a trial in San Joaquin county, achieved improved control of common knotweed in comparison with single applications, but the best control was only 58%. A single trial evaluated postemergence herbicides for control of velvetleaf. Phen+desm had no activity on this weed, even when applied as a 3-way split. The best control (77%) was achieved with a mixture of ethofumesate plus split (8 days) phen+desm; a single

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2.0 lb/A treatment of endothall was essentially equally effective.

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California growers who donated land, crop, and time.

Introduction

It is strongly urged that this section be read prior to reading the rest of the report, as it explains the format used and what the various types of data represent.

The following is a list of all herbicides which were applied during the 1984 season and is arranged alphabetically by WSSA common name or company code number. The pages of experiments in which a particular herbicide was tested are indicated at the right.

Common name of code number	Trade name	Manufacturer	Page number(s)
Cycloate	RoNeet	ICI	11, 13
Diethatyl	Antor	Nor-Am Chemical Co.	11
Endothall	Herbicide 273	Pennwalt Corp.	24, 27
Ethofumesate	Nortron	Nor-Am Chemical Co.	11, 27
Fluazifop-P	Fusilade 2000	ICI	15
XRM 3972	-	DOW Chemicals	13
Phen. + Desm.	Betamix	Nor-Am Chemical Co.	11, 13, 19, 24, 27
Pyrazon	Pyramin	BASF Corp.	27
Sethoxydim	Poast	BASF Corp.	11, 13, 15
	Bayleton	Mobay Chem. Corp.	6, 8

The following spray adjuvants were also used:

No Foam Herbicide Activator	Creative Marketing & Research Inc., Fresno.
Pace spray adjuvant O.C.	Rhone-Poulenc.

DATA - What they mean!

All ratings were made using the following scale.

Crop stand: 0 = no stand; 10 = full or normal stand.

Crop or weed vigor: 0 = no vigor, dead; 10 = full or normal vigor.

Crop phytotoxicity is given in some instances; it represents combined on stand vigor and is rated as: 0 = no effect; 10 = killed.

Weed control: 0 = no control; 10 = complete weed control.

Weed and crop counts have been made in some cases, and the data should be self explanatory, similarly where yield data are presented.

Metric conversion: 1 lb/A = 1.12 kg/ha; 1 lb = 0.454 kg; 1 acre = 0.4047 ha.

All quantities of chemical applied are expressed as pounds active ingredient per acre, abbreviated to lb/A, except where commercial products names are used, and the rate is then pounds per acre of product.

Pace spray adjuvant was used in many treatments; it is noted under the treatment column as 'oil,' and was applied at 1 qt./A. If other adjuvants were used, they are noted directly on the tables.

In some instances, data from statistical analyses are presented. The analyses employed all utilized Duncan's multiple range test, or LSD values.

WEED NAMES

Weeds occurring in the trials herein are identified only by common name in the text. Listed below, alphabetically by common name, are the species frequently encountered in California field crops, and their Latin names. The 5 letter code ahead of the Latin name is a computer code used by the Weed Science Society of America (see Weed Sci. 32(Suppl. 2):1-137, 1984). This code number is used to identify weeds on the data tables. In addition to these weed codes, the letters "SB" are used for sugarbeets, "BL" for mixed broadleaved species, and "GR" for mixed grass species.

Common name.	<u>GRASSES</u>	
	Code	Latin name.
Barnyardgrass (watergrass) (BY)	ECHCG	<u>Echinochloa crusgalli</u>
Jungle rice (JR)	ECHCO	<u>Echinochloa colonum</u>
Bluegrass, annual (AB)	POAAN	<u>Poa annua</u>
Canarygrass (CY)	PHACA	<u>Phalaris canariensis</u> & <u>P. minor</u>
Johnsongrass (JG)	SORHA	<u>Sorghum halapense</u>
Ryegrass, annual (AR)	LOLTE	<u>Lolium temulentum</u>
Ryegrass, Italian (IR)	LOLMU	<u>Lolium multiflorum</u>
Ryegrass, perennial (PR)	LOLPE	<u>Lolium perenne</u>
Wild oats (WO)	AVEFA	<u>Avena fatua</u>
Yellow foxtail (bristlegrass) (YF)	SETLU	<u>Setaria lutescens</u>
Nutsedges (NS)	CYPRO & CYPES	<u>Cyperus rotundus</u> & <u>C. esculentus</u>

BROADLEAF SPECIES (BL)

Bull thistle (BT)	CIRVU	<u>Cirsium lanceolatum</u>
California bur clover (BC)	MEDPO	<u>Medicago hispida</u>
Chickweed, common (CC)	STEME	<u>Stellaria media</u>
Chickweed, mouse-ear (MC)	CERVU	<u>Cerastium vulgatum</u>
Corn spurry (SY)	SPRAR	<u>Spergula arvensis</u>
Curly dock (CD)	RUMCR	<u>Rumex crispus</u>
Fat hen (FH)	ATXHA	<u>Atriplex hastata</u>
Fiddle-neck (FN)	AMSIN	<u>Amsinkia intermedia</u>
Field bindweed (per. morningglory)(FB)	CONAR	<u>Convolvulus arvensis</u>
Goosefoot (GF)	CHEMU	<u>Chenopodium murale</u>
Groundcherry, Tomatillo (GC)	PHYIX	<u>Physalis ixocarpa</u>
Groundsel (GL)	SENVU	<u>Senecio vulgaris</u>
Knotweed, common (CK)	POLAV	<u>Polygonum aviculare</u>
Lambsquarters (LQ)	CHEAL	<u>Chenopodium album</u>
London rocket (LR)	SSYIR	<u>Sisymbrium irio</u>
Mallow, little (Cheeseweed) (MS)	MALPA	<u>Malva parviflora</u>
May weed (Dogfennel) (MW)	ANTCO	<u>Anthemis cotula</u>
Milk thistle (MT)	SLYMA	<u>Silybum marianum</u>
Miner's lettuce (ML)		<u>Montia perfoliata</u>
Mustard (MD)	BRS	<u>Brassica sp.</u>
Nettle, annual or burning (AN)	URTUR	<u>Urtica urens</u>
Nightshades (NI)	SOL	<u>Solanum spp.</u>
Pale smartweed (SM)	POLLA	<u>Polygonum lapathifolium</u>
Pigweed, redroot (RP)	AMARE	<u>Amaranthus retroflexus</u>
Pigweed, prostrate (PP)	AMABL	<u>Amaranthus blitoides</u>
Pineapple weed (PW)	MATMT	<u>Matricaria suaveolens</u>
Prickly lettuce (PL)	LACSE	<u>Lactuca serriola</u>
Puncture vine (PV)	TRBTE	<u>Tribulus terrestris</u>
Purslane (PU)	POROL	<u>Portulaca oleracea</u>
Red maids (RM)	CLNOM	<u>Callandrinia caulescens</u>
Red stem filaree (RF)	EROCI	<u>Erodium cicutarium</u>
Shepherdspurse (SP)	CAPBP	<u>Capsella bursa-pastoris</u>
Sowthistle, common (CS)	SONOL	<u>Sonchus oleraceus</u>
Sowthistle, prickly (CP)	SONAS	<u>Sonchus asper</u>
Spikeweed, common (CP)	HEZPU	<u>Centromadia pungens</u>
Spiny cocklebur (SC)	XANSP	<u>Xanthium spinosum</u>
Swine cress (SW)	COPDI	<u>Coronopus didymus</u>
Velvetleaf (VL)	ABUTH	<u>Abutilon theophrasti</u>
Wild beets (WB)		<u>Beta maritima</u>
Wild radish (WR)	RAPRA	<u>Raphanus sativus</u>
Yellow sweet clover (YS)	MEUIN	<u>Melilotus indica</u>

COMPETITIVE EFFECT OF DELAYED BARNYARDGRASS COHORT INITIATION IN SUGARBEETS (SB-5-88). The objective of this trial was to determine the impact of successive barnyardgrass plantings on sugarbeet yields and on barnyardgrass growth and reproductive output.

Detail of experimental procedures:

LOCATION: UCD Farm, Yolo County

SOIL TYPE: Reiff very fine sandy loam SOIL CONDITION: small clods

VARIETY: SSE 1

PLANTING DATE: 5/4/88

EXPERIMENTAL DESIGN: Randomized block design

PLOT SIZE: 4 beds (3.0m) x 5m

REPLICATIONS: 4

IRRIGATION TYPE: Rainfall

DATES: 6/5 and 6/6/88 AMOUNT: 0.25"

Furrow:

every 7-10 days as needed.

Drip irrigation:

used to insure adequate moisture
barnyardgrass establishment.

CULTIVATION: 5/20/88 and 6/11/88 furrows and shoulders; bed tops hand weeded.

WEED SPECIES: Barnyardgrass (ECHCG), hand seeded at 1 per meter on the specified dates; all other weeds removed by hand.

TREATMENTS: All sugarbeets planted 5/4/88;
barnyardgrass planted 1 per meter as follows:

1. 5/5/88
2. 5/12/88
3. 5/19/88
4. 5/26/88
5. 6/2/88
6. 6/9/88
7. 6/16/88
8. 6/30/88
9. 7/14/88
10. 7/28/88
11. 8/11/88
12. No insertion

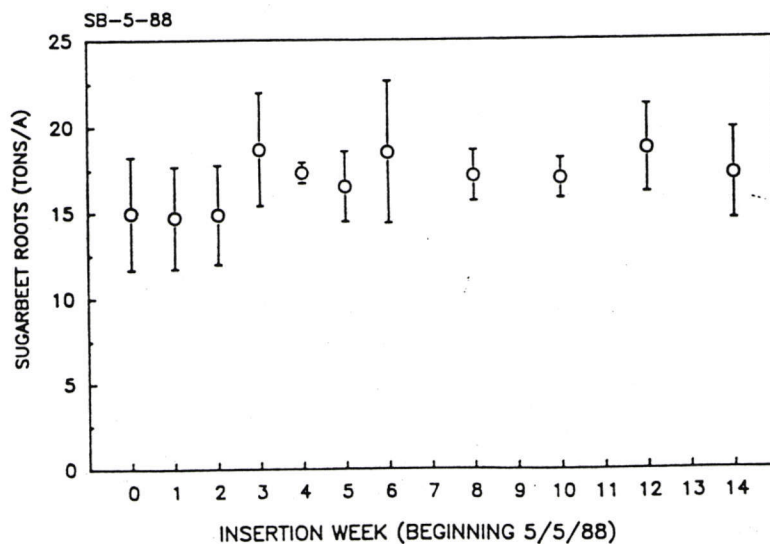
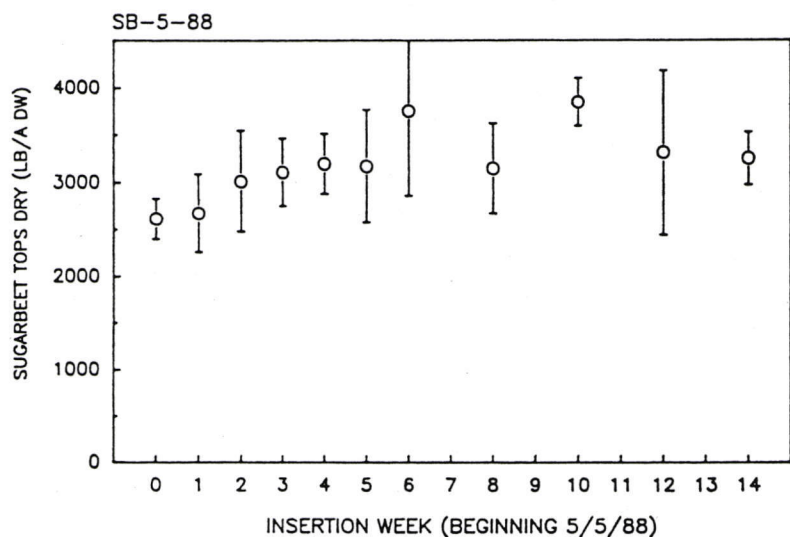
HARVEST: Sugarbeets and barnyardgrass were harvested by hand during the week of 10/10-14/88 from 3 meters of the center 2 rows (total of 6 meter row). Fresh and dry weights were taken for sugarbeet tops and roots and barnyardgrass plants. Tiller and seed head number were also determined for the grass. The primary seed head for each of the grass plants collected was bagged and removed to determine overall seed production.

ADDITIONAL COMMENTS: Bayleton was applied July 29, 1988 at a rate of 0.25 lb/A for mildew control. A second application of Bayleton and Carbaryl was necessary to control mildew and Western Yellow Striped Armyworm on September 5, 1988.

RESULTS:

The sugarbeet stand was uniform. All plots were hand thinned to about 6 beets per meter of row (about 1 per 6.5"). A drip irrigation system with one emitter per barnyardgrass location was used to insure adequate moisture for each newly initiated barnyardgrass cohort during the week following insertion. The system was moved from plot to plot as required. Barnyardgrass densities were maintained at 1 plant per m of row of sugarbeets throughout the season. There were some flooding problems in the first rep and in the far end of rep four which tended to favor the grass and hinder the beets in those locations.

Sugarbeet root yields were reduced nearly 20 % when barnyardgrass and the crop germinated together. Suppression of sugarbeets ceased when the grass was inserted between 3 and 4 weeks or later after planting, but variability in beet yield precluded determining the exact time of late barnyardgrass germination at which competition did not occur. Barnyardgrass yield data (not presented here) will be used to estimate amount of seed returned to the soil.



COMPETITION BY VARIOUS DENSITIES OF BARNYARDGRASS AND TWO LEVELS OF IRRIGATION AND NITROGEN FERTILIZATION ON SUGARBEETS (SB-4-88). This trial investigated the competitive effect of barnyardgrass at various densities in relation to added nitrogen fertilizer and 2 irrigation regimes.

Detail of experimental procedures:

LOCATION: UCD Farm, Yolo County

SOIL TYPE: Reiff very fine sandy loam SOIL CONDITION: small clods

VARIETY: SSE 1

PLANTING DATE: 6/1/88

EXPERIMENTAL DESIGN: Split plot

PLOT SIZE: Main, 70 m x 4 beds (irrigation)
Sub A, 35 m x 4 beds (nitrogen)
Sub B, 5 m x 4 beds (barnyardgrass densities)

REPLICATIONS: 3

IRRIGATION TYPE: Rainfall DATES: 6/5 & 6/6/88 AMOUNT: 0.25"
Furrow 6/2 & 6/17/88 Dry & wet
Then main dry -- every 14 days
main wet -- every 7 days

CULTIVATION: 6/29 & 6/13/88 (Furrow, except 6-8" of bed top)

WEED SPECIES: Barnyardgrass (ECHCG), sowed at specific densities and raked in;
all other weeds removed by hand.

TREATMENTS:

Main: Irrigation	1 = dry irrigated every 14 days
	2 = wet irrigated every 7 days
Sub 1: Nitrogen	1 = no fertilizer
	2 = 75 lb/A nitrogen applied as Urea on 5/5/88
Sub 2: Barnyardgrass	A = no grass, weed-free control
	B = 0.5 plant/m of crop row
	C = 2.0 plant/m of crop row
	D = 50+ plant/m of crop row

HARVEST: Sugarbeets and barnyardgrass were hand harvested between September 29 and October 10, 1988 from 2 meters of the center 2 rows only (total of 4 meter row). Fresh and dry weights were taken from the tops, roots and barnyardgrass plants.

ADDITIONAL COMMENTS: Bayleton was applied to the beets at a rate of 0.25 lb/A as a direct spray on August 2, 1988 for mildew control.

RESULTS:

Sugarbeet stand was good. All plots were hand thinned to approximately 30 beets per 5 meter of row. Germination of barnyardgrass was also good. After the grass emerged, specific densities were established by hand thinning and were maintained until July when the crop and weeds closed over the rows.

The sugarbeet yields showed a significant reduction as the barnyardgrass density increased. A density of 0.5 plant/m of row caused a 11% beet yield reduction, whereas density of 2.0 plants/m of row caused 33% beet yield reduction. Overall, there was a difference between the wet and dry regimes, though it was not significant. Added nitrogen, regardless of barnyardgrass density did not alter the response of sugarbeet to the weed.

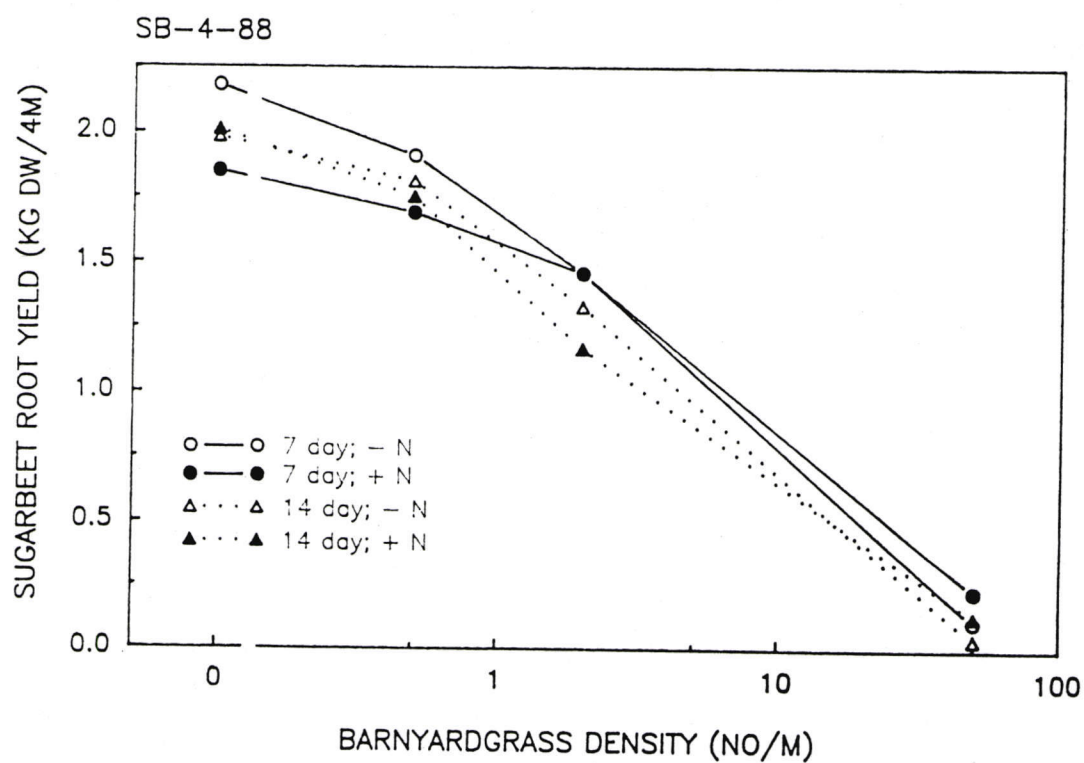
Table 1.

<u>Barnyardgrass density planted</u> (no./m)	<u>Irrigation regime</u>	<u>Nitrogen level</u>	<u>Sugarbeet harvest 9/29/88</u>			
			<u>Roots</u>		% of weed free	<u>Tops</u>
			(No./ 4m)	(kg dw/ 4 m)		(kg dw/ 4 m)
0	dry	no N	25	2.18		1.28
	dry	+ N	29	1.85		1.06
	wet	no N	25	1.98		1.27
	wet	+ N	27	2.01		1.47
0.5	dry	no N	31	1.91		1.08
	dry	+ N	33	1.69		1.14
	wet	no N	29	1.81		1.15
	wet	+ N	34	1.75		1.13
2.0	dry	no N	31	1.46		0.98
	dry	+ N	26	1.46		0.94
	wet	no N	32	1.33		0.83
	wet	+ N	23	1.17		0.88
50+	dry	no N	19	0.11		0.14
	dry	+ N	18	0.23		0.31
	wet	no N	13	0.04		0.19
	wet	+ N	16	0.13		0.20

All data are means of 3 replications.

Table 2. Overall Summary

<u>Irrigation</u>	<u>ROOTS</u>		<u>TOPS</u>
	(No./4 m)		(Kg/4 m)
Dry	26	1.36	0.87
	25	1.27	0.89
<u>Nitrogen</u>			
No	26	1.35	0.87
Yes (+)	26	1.28	0.89



Comparison of preplant incorporated and postemergence herbicides in sugarbeets. Norris, R.F., R.A. Lardelli. A field study designed to evaluate the efficacy of preplant incorporated herbicide treatments for weed control in sugarbeets was established at Davis, California.

A randomized complete block design with 4 replications and plots 2 beds on 30-inch centers by 20 feet long. Sugarbeets were planted on May 26; the natural weed infestation consisted of barnyardgrass, redroot pigweed and common purslane. All herbicide treatments (see table) were applied with a CO₂ backpack handsprayer delivering 40 gpa for the preplant treatments and 20 gpa for the postemergence treatments; pressure used was 30 and 20 psi through 80015 E and 8003 E flat fan nozzles, respectively. The PPI treatments were incorporated with a 2-row bedshaper/incorporator to a depth of 2 to 3 inches. The postemergence treatment was applied when the weeds were 1 to 3 inches tall and the crop was at the 2 to 4 true leaf growth stage. Phermedipham plus desmedipham was applied as two split treatments 7 days apart, with the first treatment applied one day after sethoxydim was applied. Plots were cultivated 2 times during the growing season, but the bed-tops received no weed management other than the herbicide treatments. The center 3 m of each row of each plot was hand dug and sugarbeet root fresh weights obtained on October 17.

Crop tolerance and weed control were evaluated visually on 6/28/88. No herbicides affected the sugarbeet stand or vigor. Excellent barnyardgrass control was achieved with all treatments. Combination treatments of diethatyl plus ethofumesate possibly offered broader spectrum weed control than any single herbicide.

Split treatment of sethoxydim and phermedipham plus desmedipham provided good grass control but showed weakness in control of the broadleaf weeds. Sugarbeet root yield at harvest was the highest from the plots treated with diethatyl at 6.0 lb/A. (Department of Botany, University of California, Davis, 95616.)

(SB-6-88)

Pre-plant/postemergence weed control in spring planted sugarbeets^{1/}

Herbicide	Rate	Visual evaluations 6/28 ^{2,3/}				Sugarbeet harvest	
		Sugar-beets	ECHO	AMARE	POROL	roots/6m	
		6/28	6/28	6/28	6/28	10/17	
	(lb ai/A)	% (vigor)	— (% control) —			(kg)	(no.)
<u>Preplant incorporated 5/26</u>							
ethofumesate	3.00	98 a	89 b	96 ab	100 a	14.3 ab	77 a
diethatyl	6.00	100 a	100 a	96 ab	98 ab	16.4 a	65 ab
cycloate	6.00	96 a	99 a	88 b	95 ab	12.6 bc	64 ab
ethofumesate + diethatyl	2.0 + 4.0	98 a	100 a	100 a	100 a	15.4 ab	77 a
cycloate + diethatyl	3.0 + 3.0	95 a	100 a	99 a	96 ab	15.4 ab	56 ab
cycloate + diethatyl	3.75 + 4.0	95 a	100 a	100 a	100 a	14.7 ab	61 ab
<u>Post-emergence 6/22^{4/}</u>							
sethoxydim	0.375						
+ pherm./desm.	0.5						
+ pherm./desm.	0.5	76 c	100 a	58 c	88 b	9.5 c	57 ab
Untreated check		85 b	0 c	0 d	0 c	2.4 d	55 b

^{1/}Means within a column followed by the same letter are not significantly different at the 5% level according to Duncan's multiple range test.

^{2/}Vigor: 100 = full vigor, 0 = dead.

^{3/}Abbreviations are WSSA code numbers from composite list of weeds, Weed Science 32, Suppl. 2.

^{4/}Oil = No Foam herbicide activator; used at volume of 1 qt./A.

EVALUATION OF POST-EMERGENCE HERBICIDES FOR LATE SPRING PLANTED SUGARBEETS (SB-7-88). The purpose of this experiment was to evaluate a new DOW herbicide and sethoxydim/phenmedipham plus desmedipham/cycloate as tank-mix or split application for safety and efficacy in sugarbeets.

Detail of experimental procedures:

LOCATION: UCD Farm, Yolo County

SOIL TYPE: Reiff very fine sandy loam SOIL CONDITION: small clods

VARIETY: SSE 1

PLANTING DATE: 5/26/88

DATES OF APPLICATION: 6/15/88 (6 p.m.), 6/16/88 split treatment (21 hrs. later)

MOISTURE AT APPLICATION: dry surface DEPTH TO MOISTURE: 0.5"

METHOD OF APPLICATION: CO₂ backpack hand sprayer

SPRAY VOLUME: 20 gal/A

PLOT SIZE: 2 beds (5 ft.) x 10 ft.

REPLICATIONS: 3

IRRIGATION TYPE: Furrow

DATES: 6/9 & 6/17/99

WEED SPECIES: Barnyardgrass (ECHCG), 0.5-3" tall; redroot pigweed (AMARE), 0.5-1.0" (6 lf.); purslane (POROL), 0.5-1.0"

WEATHER:	<u>Date</u>	<u>Low</u>	<u>High</u>
	6/15	56 F (13 C)	95 F (35 C)
	6/16	57 F (13 C)	91 F (33 C)

RESULTS:

An even stand of sugarbeets was present with a good population of barnyardgrass and redroot pigweed. No herbicide affected the sugarbeet stand, and reduction in sugarbeet vigor was minimal. However, the plots treated with DOW XRM 3972 showed a definite discoloration of the sugarbeet tops for several days after application.

Sethoxydim applied in combination with phenmedipham plus desmedipham provided excellent barnyardgrass and purslane control. No antagonism of grass control by sethoxydim was observed when tank mixed with phenmedipham + desmedipham. Split treatments, or adding cycloate to the mixture treatment showed no advantage in weed control. DOW XRM 3972 showed poor performance in this trial.

Treatments ^{1,2,3/}	Herbicide rate	Sugarbeet Injury 6/23	POROL 6/28	ECHCG 7/21	AMARE 7/21
	(lb ai/A)	-- (%) --	----- (% control)	-----	-----
sethoxydim	0.19	2 d	47 bcd	100 a	22 cde
sethoxydim	0.375	5 cd	47 bcd	100 a	0 e
sethoxydim + phenm./desm. ^{4/} TM ^{5/}	0.19 + 1.0	23 a	100 a	100 a	43 abcd
sethoxydim + phenm./desm. TM	0.375 + 1.0	20 ab	98 a	98 a	82 a
sethoxydim + phenm./desm. SPLIT ^{5/}	0.19 + 1.0	20 ab	100 a	98 a	57 abc
sethoxydim + henm./desm. SPLIT	0.375 + 1.0	13 bc	100 a	100 a	60 abc
sethoxydim + phenm./ desm. + cycloate TM	0.19 + 1.0 + 0.75	23 a	80 abc	80 a	55 abc
sethoxydim + phenm./ desm. + cycloate TM	0.375 + 1.0 + 0.75	23 a	83 abc	100 a	45 abcd
sethoxydim + phenm./ desm. + cycloate TM	0.19 + 1.0 + 1.5	17 ab	93 a	100 a	73 ab
sethoxydim + phenm./ desm. + cycloate TM	0.375 + 1.0 + 1.5	22 ab	88 ab	100 a	35 bcde
DOW XRM 3972	0.125	2 d	10 d	20 b	6 de
DOW XRM 3972	0.25	3 d	43 cd	20 b	13 de
DOW XRM 3972	0.5	3 d	33 d	0 c	10 de
Untreated check		2 d	10 d	0 c	0 e

All data are means off 3 replications.

- ^{1/} Oil = No Foam herbicide activator applied at 1 qt./A, except untreated check with DOW XRM 3972.
- ^{2/} Means within a column followed by the same letter are not significantly different at the 5% level according to Duncan's multiple range test.
- ^{3/} Abbreviations are WSSA code numbers from Composite List of Weeds, Weed Sci., 32, Suppl. 2.
- ^{4/} Phenm./desm. = phenmedipham plus desmedipham.
- ^{5/} TM = Tank mix; SPLIT = sethoxydim 6/15/88 (6 p.m.), phenm./desm. 21 hrs. later.

INFLUENCE OF SPECIES, FOUR GROWTH STAGES AND SPRAY VOLUME ON POSTEMERGENCE ACTIVITY OF SETHOXYDIM AND FLUAZIFOP (SB-9-88). This trial represents a continued evaluation of sethoxydim efficacy in relation to the volume of water used at application, weed growth stage, and herbicide rate.

Detail of experimental procedures:

LOCATION: UCD Farm, Yolo County

SOIL TYPE: Reiff very fine sandy loam SOIL CONDITION: small clods

VARIETY: see note for weeds PLANTING DATE: see note

DATES OF APPLICATION: 7/26/88

MOISTURE AT APPLICATION: see note

METHOD OF APPLICATION: CO₂ backpack hand sprayer

SPRAY VOLUME: see table

PLOT SIZE: 2 beds (5 ft.) x 12 ft. REPLICATIONS: 3

IRRIGATION TYPE: furrow, see note

WEED SPECIES: Barnyardgrass (ECHCG), yellow foxtail (SETLU) and wheat (Yolo) were drill-seeded, barnyardgrass on one bed, and the other two species on top of the other 30-inch center bed.

NOTE: Planting dates:		Size at application (inches)			Age at treatment (days)
		<u>ECHCG</u>	<u>SETLU</u>	<u>WHEAT</u>	
Stage 1	irrigated 6/22/88	19-28	8-14	12-16	34
Stage 2	irrigated 6/29/88	10-15	8-12	5-8	27
Stage 3	irrigated 7/8/88	4-8	4-5	5-7	18
Stage 4	irrigated 7/13/88	0.5-2.5	0.5-3.5	2-5	13

WEATHER: Low, 64 F; High, 98 F. Calm, partly overcast at treatment.

RESULTS:

The design of this experiment is a repeat of last year's trial. As with last year's trial, activity of sethoxydim on barnyardgrass or yellow foxtail increased with increasing rates, decreasing spray volume and decreasing plant age. Yellow foxtail control followed a very similar pattern to that for barnyardgrass. Wheat control was also similar to barnyardgrass, with the same trends, but overall control was lower. Application rate of 0.1 lb/A applied to 13- or 18-day old plants provided equal control to higher rates when applied at the lower spray volume. Control with fluazifop was more effectively on wheat than sethoxydim at the equal rates.

Table 1.

BARNYARDGRASS (ECHCG)		Age at Treatment (days) ^{1/}							
Herbicide ^{3/} rate	Spray volume	Rating 1. DAT: 15 ^{2/}				Rating 2. DAT: 37			
		13	18	27	34	13	18	27	34
(lb ai/A)	(gpa)	----- (% control) -----							
Sethoxydim									
0.1	6	87	85	82	72	88	93	98	60
	12	97	68	63	45	97	82	72	42
	24	85	73	67	65	73	57	50	40
	48	60	42	40	40	57	37	33	20
0.2	6	98	97	88	72	92	95	98	76
	12	98	90	85	57	90	98	88	72
	24	92	92	50	63	97	93	67	62
	48	90	70	67	50	90	83	68	50
0.4	6	100	100	97	80	90	97	100	93
	12	98	95	92	78	92	100	100	95
	24	98	97	96	48	92	98	100	55
	48	98	87	83	62	100	98	94	83
Fluazifop									
0.2	24	99	73	68	67	97	87	63	52
0.4	24	99	86	80	53	93	98	97	73
Untreated check		0	0	0	0	0	0	0	0

Overall Summary of Sethoxydim

		Rating 1. DAT: 15	Rating 2. DAT: 37
		----- (% control) -----	-----
Herbicide rate (lb ai/A)	0.1	67	62
	0.2	78	83
	0.4	88	93
Spray volume (gpa)	6	88	90
	12	80	86
	24	77	74
	40	66	68
Age at treatment (days)	34	61	62
	27	76	81
	18	83	86
	13	92	88

Footnotes - see Table 3.

Table 2.

YELLOW FOXTAIL (SETLU)		Age at Treatment ^{1/} (days)							
Herbicide ^{3/} rate	Spray volume	Rating 1. DAT: 15 ^{2/}				Rating 2. DAT: 37			
		13	18	27	34	13	18	27	34
(lb ai/A)	(gpa)	----- (% control) -----							
Sethoxydim									
0.1	6	95	72	63	53	93	73	57	27
	12	98	67	50	37	97	57	27	10
	24	95	73	50	57	85	70	0	23
	48	87	63	40	37	67	57	7	7
0.2	6	99	87	70	53	97	88	73	67
	12	98	80	72	52	93	87	53	47
	24	95	88	33	47	97	80	40	30
	48	97	63	50	40	97	78	27	23
0.4	6	100	98	82	60	90	95	85	72
	12	100	92	73	70	95	98	77	73
	24	100	92	73	40	90	88	80	45
	48	100	87	70	53	100	98	77	67
Fluazifop									
0.2	24	92	70	57	50	88	68	47	20
0.4	24	97	78	60	47	95	70	55	50
Untreated check		0	0	0	0	0	0	0	0

Overall Summary of Sethoxydim

		Rating 1. DAT: 15	Rating 2. DAT: 37
		----- (% control) -----	-----
Herbicide rate (lb ai/A)	0.1	65	47
	0.2	70	67
	0.4	81	83
Spray volume (gpa)	6	78	76
	12	74	68
	24	70	61
	48	60	59
Age at treatment (days)	34	50	40
	27	61	50
	18	80	81
	13	97	92

Footnotes - see Table 3.

Table 3.

WHEAT (YOLO)	Herbicide ^{3/} rate	Spray volume	Age at Treatment ^{1/} (days)							
			Rating 1. DAT: 15 ^{2/}				Rating 2. DAT: 22			
			13	18	27	34	13	18	27	34
(lb ai/A)		(gpa)	----- (% control) -----							
Sethoxydim										
0.1	6	68	53	53	47	73	37	40	37	
	12	63	33	40	27	77	27	23	27	
	24	33	33	37	48	43	28	20	43	
	48	40	27	30	23	67	27	27	23	
0.2	6	87	82	65	53	93	83	50	47	
	12	80	63	50	40	97	52	33	43	
	24	53	47	30	37	70	38	33	30	
	48	78	47	47	33	83	40	33	27	
0.4	6	99	87	60	38	99	97	70	50	
	12	93	73	67	40	100	82	60	50	
	24	63	77	50	30	80	75	50	27	
	48	65	68	47	37	73	47	53	43	
Fluazifop										
0.2	24	78	67	63	40	80	73	68	44	
0.4	24	88	75	68	50	100	96	83	60	
Untreated check			0	0	0	0	0	0	0	

Overall Summary of Sethoxydim

		Rating 1. DAT: 15	Rating 2. DAT: 37 ²²
		----- (% control) -----	-----
Herbicide rate (lb ai/A)	0.1	41	39
	0.2	56	53
	0.4	62	66
Spray volume (gpa)	6	66	65
	12	58	56
	24	45	45
	48	45	45
Age at treatment (days)	34	38	37
	27	48	41
	18	58	53
	13	69	80

All data are means of 3 replications

^{1/} Application date 7/26/88. Rating 1: 8/10/88. Rating 2: 9/01/88 (Wheat 8/17/88).

^{2/} DAT = days after treatment

^{3/} 1 qt./A of No Foam herbicide activator added to all treatments.

SUGARBEET INJURY/WEED CONTROL VS. SINGLE/SPLIT APPLICATION OF PHENMEDIPHAM/DESMEDIPHAM ON FOUR GROWTH STAGES (SB-8-88). The purpose of this experiment is to focus on the continued evaluation of split application of phenmedipham/desmedipham with incorporation of four growth stages of sugarbeets and broadleaf weeds to determine if split applications could control older weeds.

Detail of experimental procedures:

LOCATION: UCD Farm, Yolo County

SOIL TYPE: Yolo silt loam

SOIL CONDITION: Small clods

VARIETY: SSE 1

PLANTING DATE: See note

DATES OF APPLICATION: 7/26/88

MOISTURE AT APPLICATION: Intermediate (see note)

METHOD OF APPLICATION: Co₂ backpack hand sprayer

SPRAY VOLUME: 30 gpa

PLOT SIZE: 2 beds (5 ft.) x 12 ft.

REPLICATIONS: 3

IRRIGATION TYPE: Furrow (see notes)

WEED SPECIES: Redroot pigweed (PW) (AMARE) and purslane (PO) (POROL) were drill-seeded on top of the right 30-inch center bed; sugarbeets on top of the left 30-inch center bed

NOTE: Planting dates:		Size at application (inches)			Age at treatment (days)
Stage 1	irrigated 6/22/88	SB: 9-11	PW: 8-15	PU: 10-12	34
Stage 2	irrigated 6/29/88	SB: 6-8	PW: 5-7	PU: 9	27
Stage 3	irrigated 7/8/88	SB: 3-6	PW: 2-4	PU: 4-7	18
Stage 4	irrigated 7/13/88	SB: Cotyl.-2	PW: 0.25-1	PU: 0.5-2	13

WEATHER:	Date	Temp. (F)		Wind	Type of Day
		Low	High		
	7/26	64	98	Calm	Clear & sunny
	7/18	59	100	Calm	Clear & sunny
	8/2	56	88	Calm	Clear & sunny

RESULTS:

Germination of sugarbeets and weeds for all growth stages was uniform throughout the experiment. All 0 day and split treatments were applied between 7:30 a.m. and 8:30 a.m. High rates, split applications, and decreasing plant age resulted in increased injury to sugarbeets.

Split applications, two days apart, totaling 0.65 lb/A, caused very low injury to sugarbeets only 13 days old. This condition also offered excellent Redroot pigweed (AMARE) and Purslane (POROL) control. Split applications

provided better control of older weeds (18-day vs. 13-day old) than obtained with single applications but did not equal that obtained at 13 days. Split applications thus did not permit delaying application without a weed control penalty.

Table 1. Sugarbeet injury

Treatment: Phenmedipham/desmedipham										
Application days ^{1/}			Age at Treatment (days) ^{2/}							
			Rating 1. DAT: 15				Rating 2. DAT: 22			
0	2	7	13	18	27	34	13	18	27	34
---- Rate (lb ai/A) ----			----- (% injury) ^{3/} -----							
0.65			47	0	0	0	30	0	0	0
0.325	0.325		27	3	0	0	10	0	0	0
0.325		0.325	33	13	0	0	13	10	0	0
	0.65		27	0	3	0	13	7	0	0
		0.65	23	20	0	0	10	10	0	0
1.00			53	7	0	0	33	0	0	0
0.50	0.50		37	13	3	0	23	10	0	0
0.50		0.50	53	20	0	0	30	0	0	0
	1.00		57	13	0	0	43	17	0	0
		1.00	30	27	0	0	17	23	0	0
1.30			70	7	3	0	60	0	0	0
0.65	0.65		53	37	7	0	33	20	3	0
0.65		0.65	60	30	7	3	37	23	7	0
	1.30		37	10	0	0	17	0	0	0
		1.30	57	10	0	3	37	7	0	0
Untreated check			0	0	0	0	0	0	0	0

^{1/} All data are means of 3 replications.

^{2/} Application: 0 day = 7/26/88.

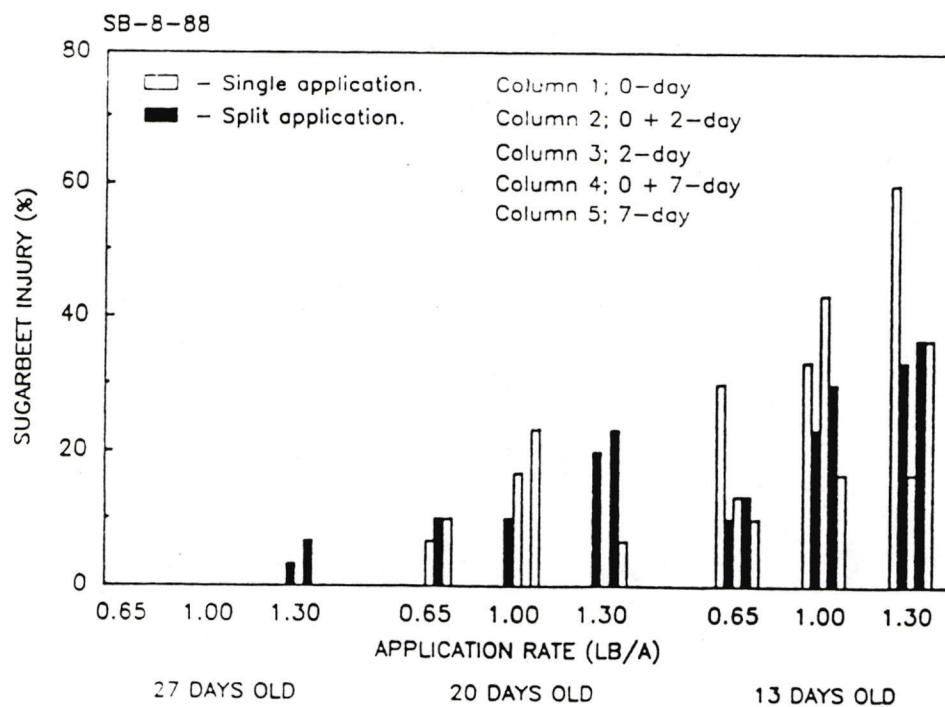
^{3/} DAT = days after treatment.

^{3/} Sugarbeet injury: 0 = no injury; 100 = killed.

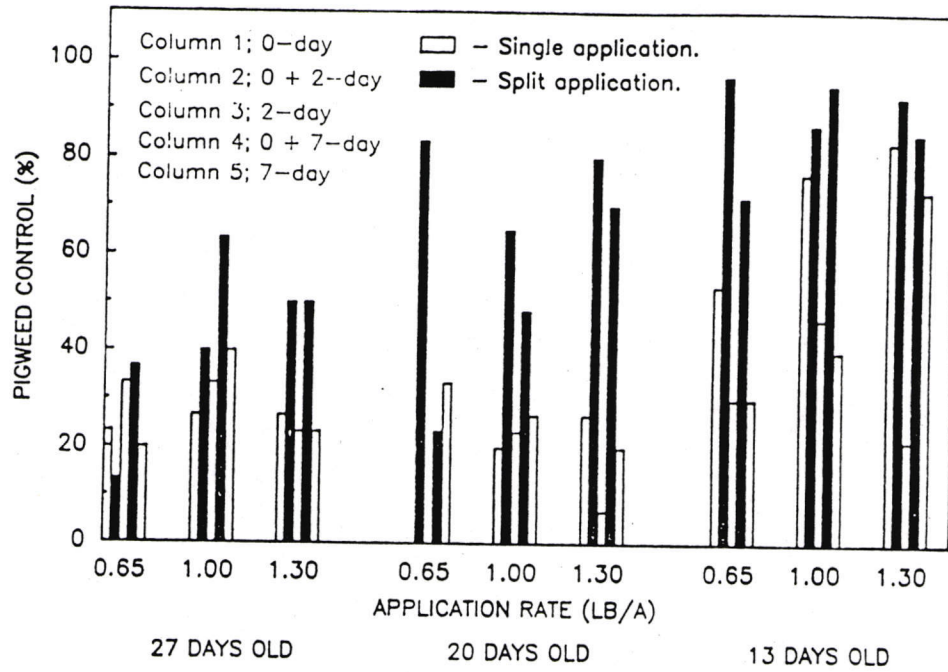
Table 2.

Treatment: Phenmedipham/desmedipham														
			Age at Treatment (days) ^{1,2/}											
			AMARE ^{3/}								POROL			
Application days			Rating 1. DAT: 15				Rating 2. DAT: 22				Rating 1. DAT: 15			
0	2	7	13	18	27	34	13	18	27	34	13	18	27	34
-- Rate (lb ai/A) ---			----- (% control) ^{3/} -----											
0.65			80	10	27	40	53	0	23	17	63	23	33	0
0.325	0.325		98	75	33	23	97	83	13	20	97	43	33	0
0.325		0.325	83	37	47	33	72	23	37	30	100	53	47	17
	0.65		43	40	47	40	30	0	33	48	60	47	40	10
		0.65	53	50	43	37	30	33	20	20	57	50	50	20
1.00			83	30	43	30	77	20	27	10	73	50	43	36
0.50	0.50		93	77	57	40	87	65	40	30	98	67	33	10
0.50		0.50	93	70	60	37	95	48	63	27	100	77	57	13
	1.00		60	40	60	33	47	23	33	20	87	33	57	0
		1.00	60	50	47	37	40	27	40	23	70	57	43	10
1.30			90	30	50	20	83	27	27	20	90	27	43	0
0.65	0.65		93	83	67	30	93	80	50	23	97	73	77	7
0.65		0.65	86	75	67	43	85	70	50	30	100	83	80	10
	1.30		53	33	40	47	22	7	23	43	87	43	33	17
		1.30	77	40	40	37	73	20	23	23	70	50	27	10
Untreated check			0	0	0	0	0	0	0	0	0	0	0	0

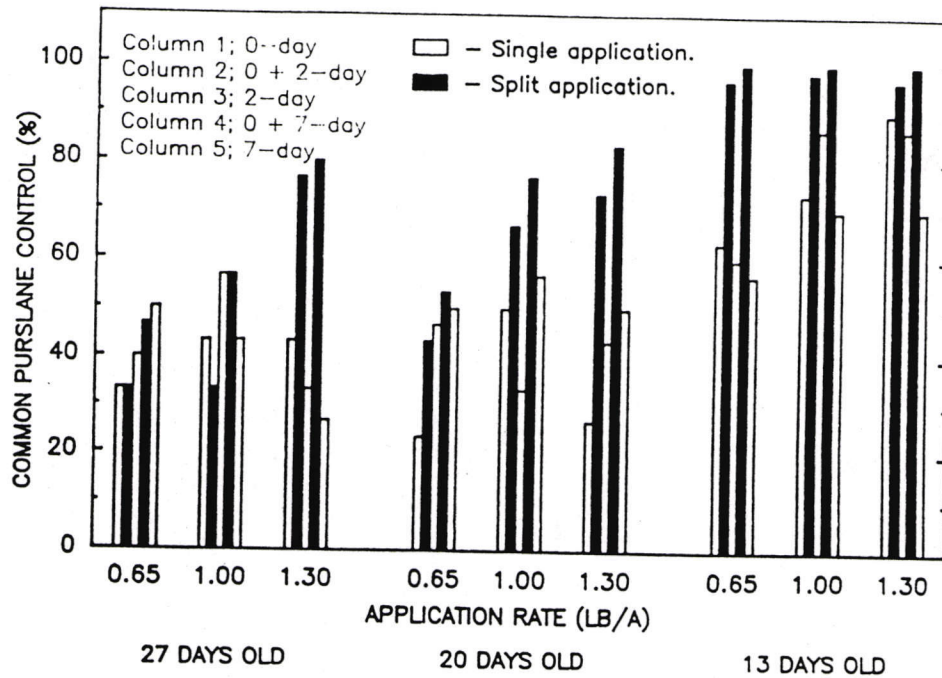
- All data are means of 3 replications.
^{1/} Application: 0 day = 7/26/88.
^{2/} DAT = days after treatment.
^{3/} % control: 0 = none; 100 = killed.



SB-8-88



SB-8-88



EVALUATION OF PHENMEDIPHAM/DESMEDIPHAM SINGLE/SPLIT APPLICATION OR IN COMBINATION WITH ENDOTHALL FOR BROADLEAF WEED CONTROL IN SUGARBEETS (SB-3-88). This experiment focused on the continued evaluation of split application of phenmedipham/desmedipham and mixture with endothall, with emphasis on control of common knotweed and pale smartweed.

Detail of experimental procedures:

LOCATION: Upper Jones Tract, Holt, San Joaquin County

SOIL TYPE: sandy loam

SOIL CONDITION: small clods

VARIETY: HH 37

PLANTING DATE: 1/27/88

DATES OF APPLICATION: First date: 3/2/88; others, see table.

MOISTURE AT APPLICATION: 3/2/88, moist surface (2/29/88 rainfall, 4/5")

METHOD OF APPLICATION: CO₂ backpack hand sprayer

SPRAY VOLUME: 30 gal/A

PLOT SIZE: 2 beds (5 ft.) x 15 ft.

REPLICATIONS: 4

IRRIGATION TYPE: Rainfall

DATE: 2/29/88

WEED SPECIES: Common knotweed (POLAV), pale smartweed (POLLA)

SIZE OF WEEDS: Day 0 = 2-5 lf (POLAV), 2 lf, uneven distribution (POLLA)

WEATHER:

Treatment		Temp.		Wind		Type of Day
Days	Dates	Low	High	MPH	Direction	
0	3/2	37F (3C)	65	0-5	W	Clear & sunny
2	3/4	41F (5C)	69	calm	-	Clear & sunny
5	3/7	44F (7C)	71	5-10	NW	Clear & sunny
9	3/11	36F (2C)	64	5-12	NW	Clear & sunny
10	3/17	37F (3C)	74	0-3	W	Clear & sunny

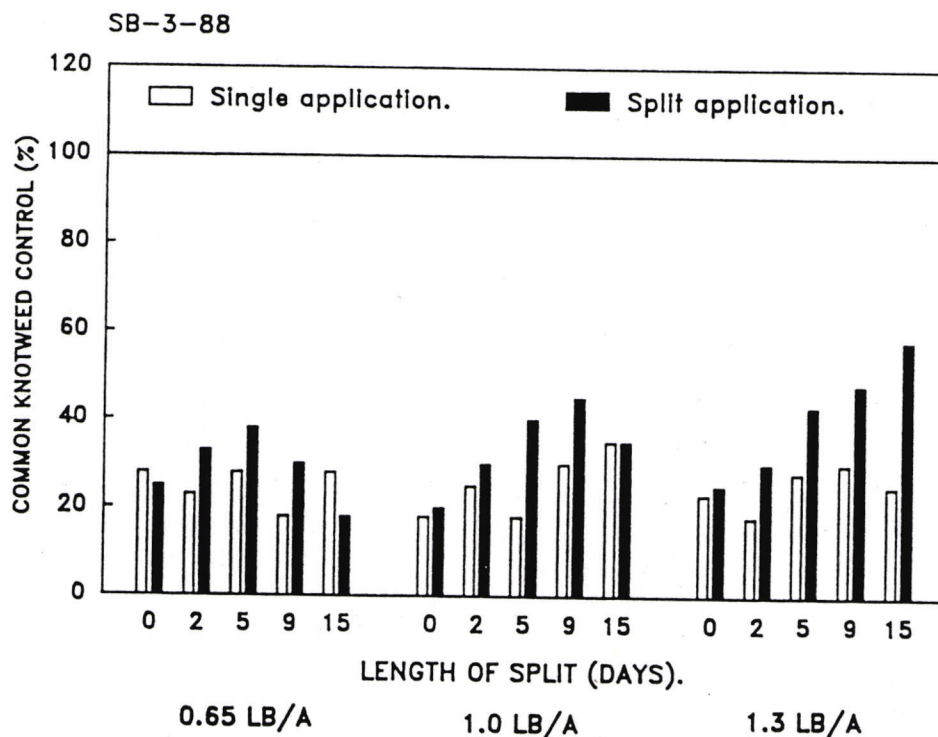
COOPERATORS: Franz Kegel, Farm Advisor, San Joaquin County, and Mantelli Bros., grower.

RESULTS:

Sugarbeet stand was good with an even population of common knotweed; smartweed population was good only in replication 3 and 4.

Results from 3/17/88 showed slight temporary foliage damage on the sugarbeets for the mixture treatments of endothall plus phenmedipham/desmedipham applied at the full rates. No weed control evaluation was meaningful at that observation. Ratings on 3/25/88 showed increasing regrowth of weeds in the early treated plots receiving only one application of phenmedipham/desmedipham. Any single treatment applied later than day 0 showed less control than a split treatment such as an application with 5 or 9 days between treatments. Overall, no treatment provided complete weed control; however, in most cases the split treatments were better than a single application, especially at the higher rates.

A mixture of endothall plus phenmedipham/desmedipham gave less weed control than split phenmedipham/desmedipham treatments.



Treatment: Phenmedipham/desmedipham						Mixture Treatments	Weed Control ^{1,2/}	
Application days							POLAV + POLLA	POLAV
0	0	2	5	9	15	0	3/25	4/5
----- Rate (lb ai/A) -----							----- (%) -----	
0.325	0.65						25 cdef	28 bcdef
	0.325						23 def	25 bcdef
		0.65					23 def	23 cdef
	0.325	0.325					35 abcde	33 bcde
			0.65				28 bcdef	28 bcdef
	0.325		0.325				35 abcde	38 abcde
				0.65			25 cdef	18 ef
	0.325			0.325			26 cdef	30 bcde
0.50					0.65		23 def	28 bcdef
	0.325				0.325		23 def	18 ef
	1.00						18 efg	18 ef
	0.50						13 fg	20 def
		1.00					33 bcdef	25 bcdef
	0.50	0.50					33 bcdef	30 bcde
			1.00				30 bcdef	18 ef
	0.50		0.50				45 abc	40 abcde
0.65				1.00			35 abcde	30 bcde
	0.50			0.50			48 ab	45 abc
					1.00		40 abcd	35 abcde
	0.50				0.50		40 abcd	35 abcde
	1.30						26 cdef	23 cdef
	0.65						15 efg	25 bcdef
		1.30					30 bcdef	18 ef
	0.65	0.65					30 bcdef	30 bcde
0.65			1.30				43 abcd	28 bcdef
	0.65		0.65				55 a	43 abcd
				1.30			40 abcd	30 bcde
	0.65			0.65			43 abcd	48 ab
					1.30		35 abcde	25 bcdef
	0.65				0.65		35 abcde	58 a
Endothall + Phenmedipham/desmedipham						0.75 + 0.65	43 abcd	28 bcdef
Endothall + Phenmedipham/desmedipham						0.75 + 1.00	40 abcd	25 bcdef
Endothall + Phenmedipham/desmedipham						0.75 + 1.30	35 abcde	18 ef
Untreated check							0 g	5 f

All data are means of 4 replications.

^{1/} Abbreviations are WSSA code numbers from Composite List of Weed Sci., 32, Suppl. 2.

^{2/} Means within a column followed by the same letter do not differ significantly (5% level) according to Duncan's multiple range test.

Evaluation of several herbicides for postemergence split applications on control of velvetleaf. Norris, R.F., R.A. Iardelli. Velvetleaf (ABUTH), also known by the common names of Indian mallow and butter print, is becoming an increasingly serious weed in several crops in California. This research was conducted at Davis, California in late summer to evaluate efficacy of several sugarbeet herbicides for control of velvetleaf.

The experiment used a randomized complete block design with 3 replications. Plots were 2 beds on 30 inch center by 12 feet long. Velvetleaf was drill seeded as a single row in each bed. The herbicides were applied broadcast with a CO₂ backpack handsprayer on day 0 (September 6) followed by day 4 and 8 for the split treatments. Carrier volume was 30 gal/A delivered at 30 psi pressure through 8002 flat fan nozzles.

The plots were visually evaluated on September 20 and a destructive harvest made on September 26. Endothal as a single treatment, and the combination of ethofumesate plus the full rate phermedipham/desmedipham as an eight-day split treatment provided greatest control and the lowest yields at harvest. Phermedipham/desmedipham as a single or split treatment failed to show any control. (Botany Department, University of California, Davis. 95616)

SB-10-88

Herbicide ¹	Treatment date			ABUTH	
	9/6	9/10	9/14	9/20	9/26
	Rate			Control ²	Yield ^{3,4}
	(lb ai/A)			(%)	(DW g/4 m)
Phermedipham/desmedipham	1.30			0 f	100 b
Phermedipham/desmedipham	0.65		0.65	0 f	124 a
Phermedipham/desmedipham	0.50	0.40	0.40	3 f	105 ab
ethofumesate	1.50			65 b	47 cd
ethof. + pherm./desm.	1.50 + 1.30			58 bc	50 cd
ethof. + pherm./desm.	1.50 + 0.65		0.65	75 a	23 e
pyrazon	3.00			37 e	52 c
pyrazon + pherm./desm.	3.00 + 0.65		0.65	37 e	51 cd
endothall	2.00			49 cd	28 de
endothall + ethofumesate	2.00 + 1.50			53 cd	34 cde
endothall + pherm./desm.	2.00 + 1.30			45 de	37 cde
endothall + pherm./desm.	2.00 + 0.65		0.65	48 cd	48 cd
Untreated check				0 f	120 ab

¹Surfactant X77 added at 0.50% to pyrazon and endothall.

²Control, 0 = no control, 10 = dead.

³Harvest: 2 rows x 2 meters.

⁴Means within a column followed by the same letter do not differ significantly (5% level) according to Duncan's multiple range test.