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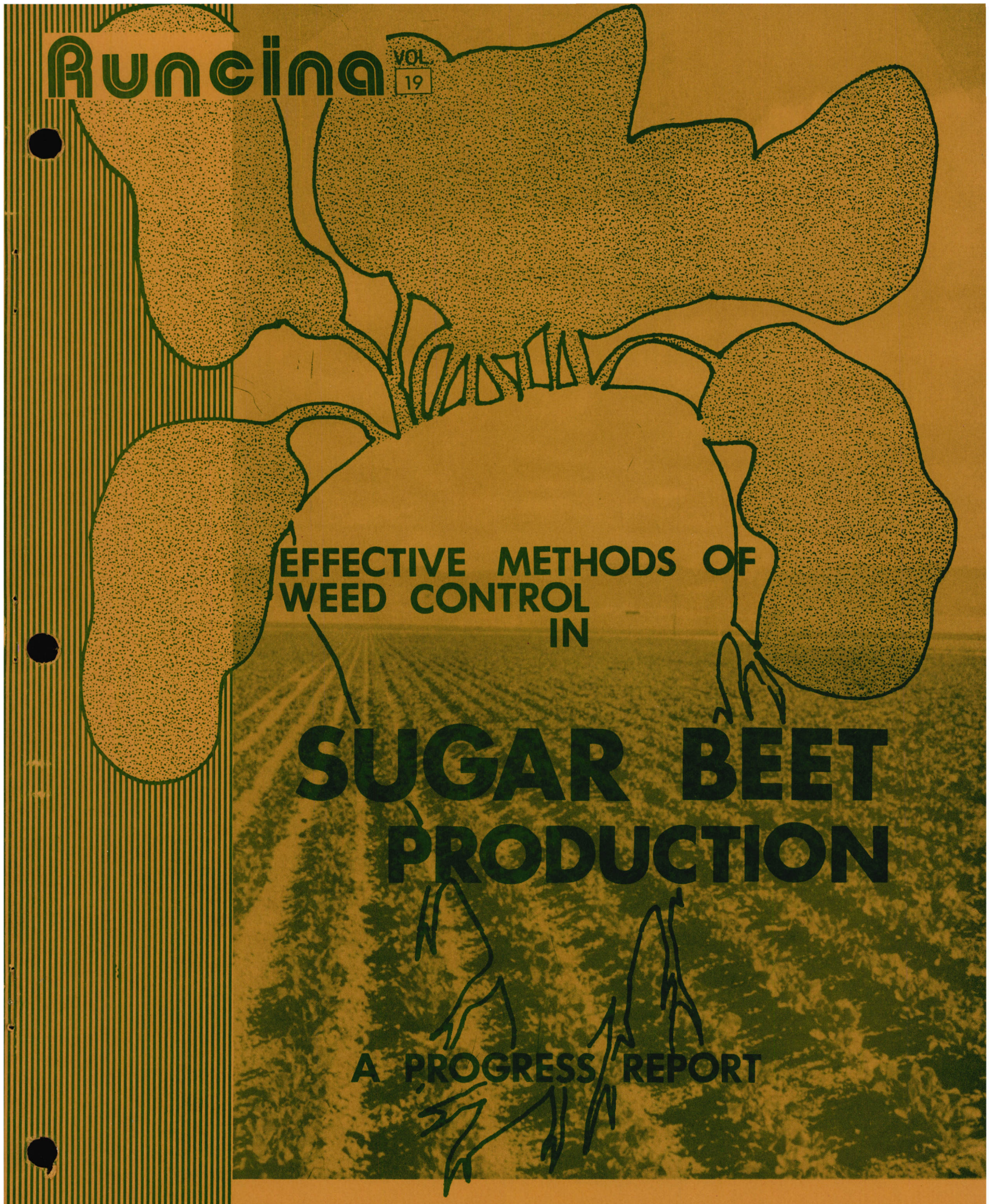

EFFECTIVE METHODS OF WEED CONTROL IN

SUGAR BEET PRODUCTION

A PROGRESS REPORT

Univ. of Calif. Coop. Extension • Fresno Cty.

This is a report of work in progress only. The chemicals and uses contained in this publication are experimental data and should not be considered as recommendations for use.

Until the products and their uses given in this report appear on a registered pesticide label or other legal, supplementary direction for use, it is illegal to use the chemicals as described.

WARNING ON THE USE OF CHEMICALS

Pesticides are poisonous. Always read and carefully follow all precautions and safety recommendations given on the container label. Store all chemicals in their original labeled containers in a locked cabinet or shed, away from food or feeds, and out of the reach of children, unauthorized persons, pets, and livestock.

Recommendations are based on the best information currently available, and treatments based on them should not leave residues exceeding the tolerance established for any particular chemical. Confine chemicals to the area being treated. THE GROWER IS LEGALLY RESPONSIBLE for residues on his crops as well as for problems caused by drift from his property to other properties or crops.

Consult your County Agricultural Commissioner for correct methods of disposing of leftover spray material and empty containers. **Never burn pesticide containers.**

PHYTOTOXICITY: Certain chemicals may cause plant injury if used at the wrong stage of plant development or when temperatures are too high. Injury may also result from excessive amounts or the wrong formulation or from mixing incompatible materials. Inert ingredients, such as wetters, spreaders, emulsifiers, diluents, and solvents, can cause plant injury. Since formulations are often changed by manufacturers, it is possible that plant injury may occur, even though no injury was noted in previous seasons.

To simplify information, trade names of products have been used. No endorsement of named products is intended, nor is criticism implied of similar products which are not mentioned.

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Trade Names, Common Names and Suppliers of the Herbicides Mentioned in this Progress Report

Trade Name	Common Name	Supplier
Antor	diethecine	Hercules
Betanal	phenmadipham	NorAm
Betanex	desmadipham	NorAm
Dowpon M	dalapon	Dow
Eptam	EPTC	Stauffer
Herbicide 273	endothal 273	Pennwalt
Hoelon	diclofopmethyl	Hoechst
Nortron	ethofumesate	Fisons
Pyramin	pyrazon	BASF
Ro-Neet	cycloate	Stauffer
TCA	TCA	Dow
Tillam	pebulate	Stauffer
Treflan	trifluralin	Elanco

Experimental Compounds

BAS 90210	----------	BASF
BAY 1139	----------	Chemagro
Hoe 29152	----------	Hoechst
SAN-252	----------	Sandoz

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ACKNOWLEDGEMENT

This progress report was prepared to inform members of District 6 California Beet Growers Association of the applied research studies that were conducted with their generous support.

This progress report does not contain recommendations for the use of herbicides in sugar beet production. Its purpose is to keep our cooperators informed of the progress of our studies.

Without the generous cooperation and managerial assistance of many beet growers in District 6 these studies could not have been conducted. We wish to express our appreciation of Richard Hoover and Fred Fischer, University of California West Side Field Station; Dan Dieter and Stan Bayer, Spreckels Ranch 41 for their helpful assistance.

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The secretarial tasks of Rita Cassidy, the art work of Gwen Okamoto and the printing by Walt Morgan made the preparation of this progress report possible.

The herbicides used in the experiments were furnished free of charge by their respective manufacturers. We wish to express our thanks for their generosity and cooperation. Trade names of chemicals are used in this report; they are capitalized and are protected by the US Patent Office.



BILL B. FISCHER
Farm Advisor

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CO-OPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS, U. S. Department of Agriculture and University of California Co-opera

Effective Methods of Weed Control in Sugar Beet Production

A Progress Report

B. B. Fischer, L. M. Burtch, R. Smith*

It doesn't require much skill to determine the effectiveness of a weed control program. A glance at the sugar beet field tells the story.

To obtain effective, economical weed control, however, requires considerable skill and advanced planning. It has been demonstrated in the Central San Joaquin Valley that numerous methods can be used to obtain good weed control in beet fields. But difficulties and frustrations are often encountered when a specific method is planned for a particular field.

The problem is complicated because no single method can provide reliable, economical weed control in any one district, in any one season, or for that matter on any one farm. Perhaps the keys to successful weed control programs are flexibility, adaptability and timeliness.

The need for flexibility and adaptability is better appreciated when one realizes that sugar beets in the Central San Joaquin Valley are planted from September to June. They are grown in rotation with 12 to 15 different agronomic or vegetable crops under furrow and sprinkler irrigations, and in soils that vary in texture from clay to loamy sand.

The late harvest of certain crops or early rainfall during the fall and winter months may prevent proper land preparation or incorporation of preplant herbicides. The timely application of postemergence herbicides with ground equipment may not be possible because of wet field conditions

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resulting from rain or fog. Aerial application of herbicides may be also thwarted and delayed by fog.

Advanced planning for weed control is essential, but flexibility must be built into the program. Unless a grower can adapt his weed control program to changing conditions imposed on him by uncontrollable forces, his costs may be significantly increased.

The Need for Flexibility

A few examples that we have encountered during the past couple of years may help illustrate the need for flexibility in planning.

Grower A decided not to use a preplant or preemergence herbicide. Rains prevented entry into the field with a groundrig for timely application of postemergence herbicides.

Betanal was applied with an airplane, but it failed to control mustard, London rocket, fiddleneck and shepherds purse that were beyond the two true leaf stage of growth. Four weeks later Betanal plus Betanex were applied in a 10 inch band with a groundrig, but the weeds were too large and poor control was obtained. The field was cleaned by hand hoers and the crop was saved.



This grower could have obtained the same result at a small fraction of the cost if he would have applied a selective herbicide in an 8 to 10 inch band preplant or pre-emergence, as pictured on the left.

Grower B applied Pyramin plus TCA preplant in a recently leveled saline soil. Upon the suggestion of the pest control adviser he applied five tons of gypsum on the west half of the field where, according to the soil analysis, the pH was above 8.2.

The beets were furrow irrigated to establish a stand. Where the gypsum was applied the stand was very poor; where no gypsum was applied an acceptable stand was obtained.

In saline or alkaline soil a postemergence herbicide would provide greater selectivity than a preplant incorporated herbicide. The addition of 5 tons of typsum per acre magnified the salinity problem.

The use of sprinkler irrigation would have minimized the problem by leaching the salts from the immediate area of the germinating seed. Furrow irrigation concentrated the salts in the vicinity of the seed and the addition of gypsum in the presence of herbicides prevented the survival of the beet seedlings.

Grower C applied Pyramin plus TCA in a 6 inch band following planting of the beets on 30 inch rows. Rainfall occurred within a week following planting and good weed control was obtained. But periodic rainfall prevented timely cultivation and by the time the grower was able to enter the field the weeds, especially wild oats, completely covered the treated band.

The field was eventually cleaned with the use of Bezzerides' cultivators and hand hoeing. Treating a wider band of soil (8-10 inches) with the preemergence herbicides would have been more effective. It would have delayed weed encroachment.

The application of Endothal plus dalapon by air would have controlled the wild oats in the furrow and resulted in effective weed control at a significant lower cost.



Timely cultivation following the use of preplant or preemergence herbicides can prevent the encroachment of the weeds into the treated area.

Grower D applied Pyramin plus TCA on the surface of the soil after planting. The field was furrow irrigated but rainfall did not occur until three weeks following the beet and weed emergence and it continued off and on for several weeks, preventing entry into the field with a groundrig.

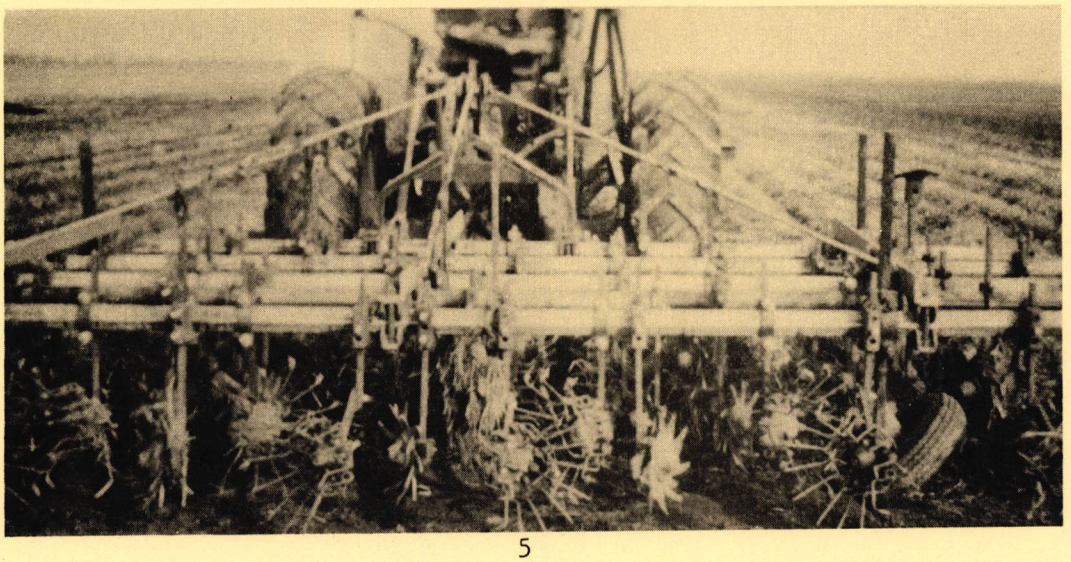
Betanal was applied by air, but it only stunted the weeds. Dowpon was applied a week later to control the grasses. This treatment was not effective either. Two weeks later Betanal plus Betanex was applied with a groundrig, but the weeds were too old resulting in very poor control.

Shredding the weeds followed by close cultivation and costly hand weeding saved the field.

Just as effective, but a less costly approach, would have been to wait and use Bezzerides cultivators and hand hoeing, saving the money spent for the postemergence herbicides.



The sugar beet field pictured on the left was shredded and cultivated three times with the (Bezzerides) rolling cultivator shown in the lower picture. Following cultivation the field was cleaned by hand hoeing and the crop was saved.



Grower E applied Tillam and used a disk to incorporate it into the soil. The field was listed, rolled, planted and furrow irrigated to germinate the beet seed and establish a stand.

No pigweed and lambsquarter control was obtained and the barnyardgrass control was very poor. Betanal-Betanex applied in a 10 inch band effectively controlled the broadleaf weeds but the grasses had to be removed by hand hoeing. Treflan was applied, and the field was maintained relatively free of weeds through the season.

However, all weeds present in the field were susceptible to Tillam. With proper incorporation they could have been controlled at 1/5 of the amount spent by the grower.

Grower F applied Roneet preplant and incorporated it with Lilliston rolling cultivators arranged in gangs of three on top of 30 inch beds. The weed control obtained was excellent. The few weeds that survived were removed by the thinners.

The grower was advised to irrigate and after irrigation cultivate and incorporate Treflan prior to the next irrigation.

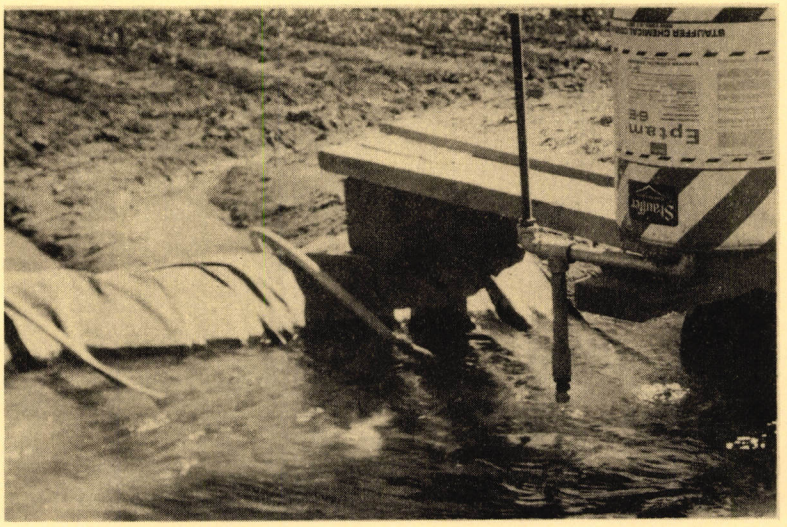
The barnyardgrass and pigweed seeds did not wait for the Treflan application before germinating. They were destroyed in the furrows and shoulders of the beds during the incorporation of Treflan, but not in the planted row. The grower finished the season with a severely weed infested crop.

Application of Treflan following thinning and prior to the first crop irrigation would have resulted in a much cleaner field without any additional cost. Eptam applied into the water during the first crop irrigation would have resulted in a cleaner field and possibly in increased yield.



Properly timed application of a postemergence herbicide could have prevented the weeds from growing in the field pictured on the left

Treflan applied post thinning and incorporated with rolling cultivators or Eptam applied into the irrigation water as shown on the right provided effective weed control. But neither one controlled the established weeds.



Grower G did not use a preplant or preemergence herbicide in his January planted field.

Betanal plus dalapon was applied by air to control the volunteer barley, fiddleneck and smartweed. With the exception of the seedling fiddleneck the weeds were not controlled. The field was cultivated and hand weeded at a cost of $39 per acre.

The use of Endothal plus dalapon would have provided better control of the weeds at a significantly lower cost.

These are only a few examples where flexibility in planning and adapting to changing conditions could have resulted in better and more economical weed control.

Need for Advanced Planning

Although, effective weed control methods need to be flexible and adaptable to changing conditions, this in no way diminishes the need for advanced planning. Essential components of a well planned weed control program in beet production includes:

Field Selection and Cropping Sequence

Through proper field selection a grower can avoid planting beets in fields that are high in salts which can reduce the selectivity of preplant incorporated or preemergence herbicides. Only in a carefully planned cropping sequence can a grower avoid injury to beets from small quantities of residual herbicides that may have been used on the previous crop.







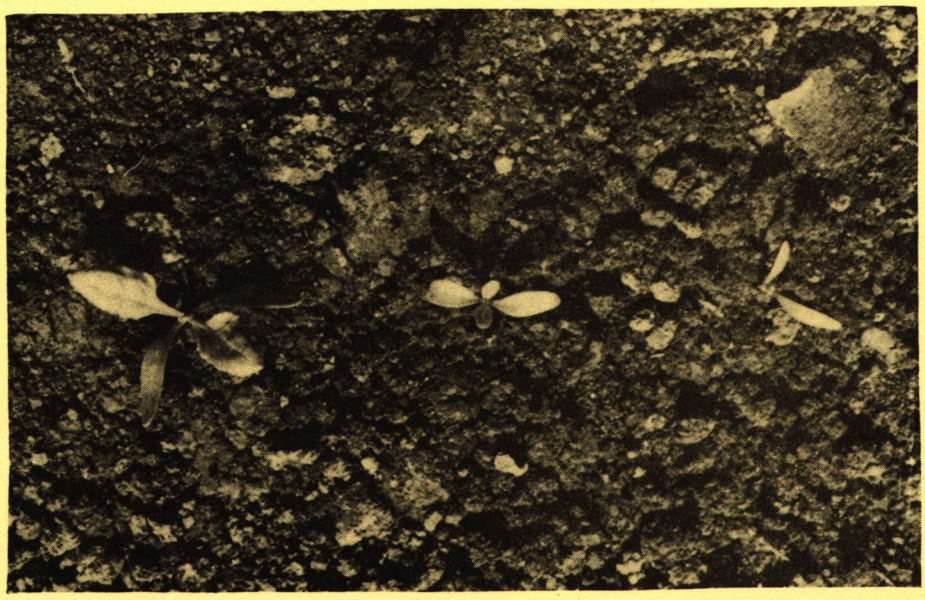
Substituted dinitroaniline herbicides such as Basalin, Cobex, Prowl, Tolban and Treflan used in the crop planted prior to sugar beets can cause injury such as shown on the left. Effected seedling beet on the extreme left and mature beets center and right.

Adequate Land Preparation

Advanced planning can facilitate the proper preparation of the field and the seed bed. In a properly prepared seed bed, free of large clods and trash from the previous crop residue, more rapid and uniform beet seed germination can be obtained. Herbicides applied preplant can be more effectively incorporated and preemergence herbicides will provide more effective weed control in a well prepared seed bed. Haste in land preparation to advance the planting dates 2 or 3 days has cost many beet growers dearly.

Preirrigation Enhances Weed Control

Irrigating the field prior to final seed bed preparation is very desirable whenever it can be scheduled. It will not eliminate the need for selective herbicides, but it can significantly enhance their performance. Pre-irrigation favors the preparation of a good seed bed and it can germinate the seeds of crops planted in the field ahead of the beets hence reducing early competition from volunteer crops.



Uniform emergence and vigorous seedling growth enhances the effective use of herbicides. It is difficult to schedule postemergence herbicide application in a field where beet seedlings vary in size, as shown above.

Knowledge of the Weed Infestation and Their Biology

The adage "to know is half the battle" applies to a well planned weed control program. Economical weed control with the use of selective herbicides cannot be prepared without knowledge of the weed infestation and some information about their habit of growth. Keeping records of the distribution of weed species is essential in order to adequately plan a weed control program, especially where preplant or preemergence herbicides are to be used. This can be accomplished on cards such as the one stapled inside the back cover of this progress report.

Not keeping records of weed distribution on the farm and not monitoring their growth in the crop costs growers in central California millions of dollars a year.

Prevention Through Sanitation

If the adage "prevention is the best cure" has any validity it is most applicable to beet growers. There are many weeds that not only compete with the beet crop for moisture, nutrients and space, but they serve as hosts to virus diseases that can ravage the crop. A beet grower can significantly increase yield and reduce weed control costs through good sanitation. A beet grower needs to pay special attention to prevent the survival of volunteer beets in fields previously planted and along the roadside. They can serve as a reservoir for curly top virus and yellows.

Vigorously Growing Beets Control Weeds

Timely irrigation, adequate fertilization, insect and disease control that promote the rapid, uniform growth of beets are important integral components of a well planned weed control program. Vigorously growing beets are excellent competitors with weeds. They show greater tolerance to selective herbicides whether applied preplant, preemergence or postemergence and they recover more

rapidly from the shock or injury that are often caused by herbicides.

The Significance of Flexibility

Rigid adherence to any method of weed control, no matter how well planned, can result in poor and/or expensive weed control. Flexibility is an essential feature of a well planned weed control program. No matter how thoroughly a program is planned it needs to be reexamined and often altered to meet the biologically dynamic conditions that occur in beet fields.

To aid growers, fieldmen and pest control advisers adapt to changes in the weed control program. The three charts included in this report can be very helpful. They contain the most comprehensive information available relating to the susceptibility of weeds to herbicides registered for use in sugar beet production. They also contain brief descriptions of conditions that resulted in the most effective use of specific herbicides, and recount conditions that resulted in poor weed control and beet injury.

To use the weed susceptibility and herbicide performance charts to the best advantage and to make appropriate changes in a planned weed control program it must be kept in mind that:

a. Vigorously growing weeds are most susceptible to herbicides.
b. Vigorously growing beets are most tolerant to selective herbicides.
c. The younger the weeds the more effectively they are controlled with postemergence herbicides.
d. Beets are most susceptible to postemergence herbicides when in their seed leaf (cotyledon) and first pair of true leaf stage of growth.

e. Beet fields are generally infested with a large spectrum of weeds and often combinations of herbicides provide the most effective weed control.

f. Sequential application of herbicides may be needed to obtain good weed control. The timing of their application requires careful scheduling in order to achieve weed control with a minimum injury risk to the crop.



The weeds in the beet field pictured on the left are too far advanced in growth for effective control with selective herbicides. The field can be saved with repeated tillage and hand hoeing.

g. Temperature and soil moisture and seed bed conditions can influence the selectivity and performance of certain herbicides.

h. Proper calibration and accurate application are often the key to a successful weed control program.

i. Instructions printed on the labels should be judiciously followed to obtain good weed control and avoid beet injury.

j. Regardless of the availability of many selective herbicides, mechanical devices or hand hoeing may provide the most effective and least costly weed control under certain conditions.

In Conclusion

In the final analysis everyone engaged in sugar beet production is interested in producing the maximum yield at the lowest possible cost. The amount of money a grower spends controlling unwanted competing vegetation can significantly influence the figures in the profit and loss column in his cost analysis ledger.

A large array of mechanical and chemical tools are available to beet growers. With their effective, timely use weed control costs can be kept to a minimum. But this can be accomplished only in a well planned program that is reexamined and adapted to the changing conditions imposed by the environment.



With the proper selection and timely application of herbicides effective weed control, such as shown on the left, can be obtained.

CHART # 1

SUSCEPTIBILITY OF WEEDS TO HERBICIDES FOR THE SELECTIVE CONTROL OF WEEDS IN SUGAR BEETS*

= Effectively Controlled
= Partially or Erratically Controlled
= Not Controlled
W = Winter Annual
S = Summer Annual
▽ = Perennial

		PREPLANT INCORPORATED				PREEMERGENCE SPRINKLER OR RAINFALL ACTIVATED				POSTEMERGENCE **										POST-THINNING *	
		Pyramin®	Pyramin® + TCA	Ro-neet® or Tillam®	Pyramin® + Nortron®	Pyramin®	Pyramin® + TCA	Pyramin® + Nortron®	Nortron®	Pyramin®	Pyramin® + dalapon	Betanal®	Betanex®	Betanal® + Betanex®	Betanex® + dalapon	Endothal®	Endothal® + dalapon	dalapon	IPC	Eptam®	Treflan®
BROADLEAF WEEDS																					
Cheeseweed	W + S																				
Chickweed	W																				
Clover	W + S																				
Cocklebur	S																				
Cudweed	W + S																				
Dock Seedling	W + S																				
Fat Hen	S																				
Fiddleneck	W																				
Filaree	W																				
Flaxleaved Fleabane	S																				
Goosefoot	S																				
Groundcherry	S																				
Groundsel	W																				
Henbit	W																				
Knotweed	W + S																				
Lambsquarter	S																				
London Rocket	W																				
Marsetail	S																				
Miners Lettuce	W																				
Monolepis	W + S																				
Mustard	W																				
Nettle	W																				
Nightshade	S																				
Pigweed	S																				
Pineapple Weed	W																				
Popcorn Flower	W																				
Prickly Lettuce	W + S																				
Puncture Vine	S																				
Purslane	S																				
Red Maids	W																				
Russian Thistle	S																				
Shepherd's Purse	W																				
Sow Thistle	W + S																				
Speedwell	W																				
Spotted Spurge	S																				
Tolguacha	▽ S																				
Wild Radish	S																				
GRASSY WEEDS																					
Annual Bluegrass	W																				
Barnyardgrass	S																				
Bromegrass	W																				
Canarygrass	W																				
Crabgrass	S																				
Feather Fingergrass	S																				
Fescues	W																				
Foxtail (Bristlegrass)	S																				
Johnsongrass (Seed)	S																				
Lovegrass	S																				
Nutsedge	▽ S																				
Rabbitfootgrass	W																				
Ryegrass	W																				
Sandbur	S																				
Volunteer Cereals	W																				
Wild Barley	W																				
Wild Oats	W																				

** Effective when weeds are treated in their seedling stage of growing.

*** Effective when applied before weed emergence.

* This chart is tentative, based on experiments conducted in the Central San Joaquin Valley. Proper timing and accurate application is imperative.

CHART #2 Summary of Herbicide Performance in Sugar Beet Trials
Planted October-January in the Central San Joaquin Valley

METHOD OF APPLICATION	HERBICIDE	Conditions That Resulted in Most Effective Control	Conditions That Resulted in Poor Control or Injury
PREPLANT INCORP-ORATED	Pyramin®	Broadleaf weeds. Mild temperatures, with good growing conditions.	Cold temperatures and poor growing conditions can cause beet stand reduction. When grasses predominate.
	Pyramin® + TCA	Broadleaf weeds and fine grasses. Mild temperatures, with good growing conditions.	Cold temperatures and poor growing conditions. Volunteer cereals or wild oats present.
	Pyramin®+ Nortron	In winter planted fields when volunteer cereals and broadleaf weeds are present. Mild temperatures and good growing conditions.	Cold temperature and poor beet growing conditions. Ryegrass is present.
	Nortron®	When volunteer barley, wheat and/or wild oats were the only weeds present.	When other than volunteer wheat or barley were present.
PRE-EMERGENCE	Pyramin®	In pre-irrigated fields. Broadleaf weeds and good growing conditions. Under sprinkler irrigation or rainfall.	Poor beet growing conditions and where more than 2 inches of water applied per sprinkler set. When grasses predominate.
	Pyramin®+ Nortron	In pre-irrigated fields. Broadleaf weeds, volunteer cereals and good growing conditions. Under sprinkler irrigation or when at least ½" rainfall occurs prior to the crop and weed emergence.	Poor beet growing conditions and where more than 2" of sprinkler irrigation applied per set prior to stand establishment. Where ryegrass or barnyardgrass are present. Where no rainfall occurs and furrow irrigation is used.
	Pyramin® + TCA	In pre-irrigated fields. Broadleaf weeds and fine grasses. Under sprinklers or rainfall and good growing conditions.	Poor growing conditions and where more than 2 inches of water applied — crop injury may result. Volunteer cereals or wild oats present.
POST-EMERGENCE	Pyramin® + surfactant	Seedling mustards growing vigorously.	Broadleaf weeds other than mustards and grasses.
	Pyramin® + dalapon + surfactant	Seedling broadleaf weeds and grasses growing vigorously, when residual activity desired.	Moisture-stressed weeds. Weeds beyond their seedling stage.
	Betanal®	Vigorously growing seedling broadleaf weeds, except pigweed.	When grasses and pigweeds are present and residual control is desired. Application above 80°F may result in injury if applied before 3 p.m.
	Betanex®	Vigorously growing seedling, broadleaf weeds, except swamp smartweed.	When grasses, swamp smartweed or knotweed are present. Application above 80°F may result in injury if applied before 3 p.m.
	Betanex®+ dalapon	Vigorously growing winter and summer annual broadleaf weeds and seedling grasses except swamp smartweed.	When volunteer cereals are present. Weeds stressed for moisture and when beyond their seedling stage. Inury may result is applied earlier than 3 p.m. when temperature is above 80°F.
	Betanal®+ Betanex®	Vigorously growing winter and summer broadleaf annual weeds including pigweed	When grasses are present. Application when temperature exceeds 80°F injury may result when applied before 3 p.m. When weeds are stressed for moisture.
	Endothal®	When fiddleneck and/or swamp smartweed were the only weeds present.	When weeds other than fiddleneck and/or swamp smartweed were present.
	Endothal® dalapon + surfactant	Volunteer wheat, volunteer barley, or wild oats. When temperature was below 70°F.	Broadleaf weeds, ryegrass, or canarygrass.
	IPC	Canarygrass or volunteer cereals and wild oats under sprinkler irrigation or if ½" rain occurred soon after treatment.	Broadleaf weeds. Fields not irrigated within 24 hours of application. Erratic on volunteer Mexican wheat.
	dalapon + surfactant	Temporary control of grasses desired.	Broadleaf weeds present.
POST-THINNING SOIL INCORP-ORATED	Treflan®	Summer annual grasses, pigweeds, and lambsquarters. After thorough soil incorporation into cleaned fields.	When resistant weed species predominated. When soil incorporation was poor.
POST-THINNING INJECTED INTO IRRIGATION WATER	Eptam®	Injected into irrigation water. Summer annual grasses and broadleaf weeds before germination. When weeds resistant to Treflan® predominated, including nutsedge. Repeated application was essential.	Where wild sunflower or cocklebur predominated. Poor water distribution and poor subbing of the beds. Weeds established at the time of treatment. Timely follow-up treatment not made.

CHART #3 Summary of Herbicide Performance in Sugar Beet Trials
Planted February-June in the Central San Joaquin Valley

Method of Application	Herbicide	Conditions That Resulted in Most Effective Control	Conditions That Resulted in Poor Control or Injury
PREPLANT INCORP-ORATED	Roneet® or Tillam®	Summer annual broadleaf weeds and grasses in well prepared seed bed, free of clods. In nutsedge infested fields.	In fields where mustards and London rocket predominate. Poorly prepared cloddy seed bed.
POST-EMERGENCE	Betanal®	Vigorously growing winter and summer annual broadleaf weeds except pigweed.	When pigweeds and Russian thistle predominated and grasses were present. When temperature exceeded 80°F, injury resulted if applied before 3 p.m.
	Betanex®	Vigorously growing winter and summer annual broadleaf weeds except swamp smartweed.	When grasses, swamp smartweed or knotweed are present. Injury may result if applied earlier than 3 p.m. when temperature is above 80°F.
	Betanex® + dalapon	Vigorously growing seedling, broadleaf weeds and seedling grasses, except swamp smartweed.	When volunteer cereals are present. Weeds stressed for moisture and when beyond their seedling stage. Injury may result if applied earlier than 3 p.m. when temperature is above 80°F.
	Betanal® + Betanex	Vigorously growing winter and summer annual broadleaf weeds, including pigweed and swamp smartweed.	When grasses are present. Application when temperature exceeds 80°F inury may result when applied before 3 p.m. When weeds are stressed for moisture.
	Pyramin® + dalapon + surfactant	Seedling mustard species and other winter annuals are present. Volunteer cereals and grasses except barnyardgrass.	Summer annual broadleaf weeds and barnyardgrass are present. Rising temperatures and low soil moisture.
	endothal + dalapon + surfactant	When volunteer barley or wheat predominate and temperature is below 70°F.	When broadleaf weeds and grasses other than volunteer cereals are present.
POST-THINNING, SOIL INCORP-ORATED	Treflan®	Summer annual grasses and broadleaf weeds — except resistant species. Thoroughly incorporated into clean fields.	When resistant species of weeds predominate. When soil incorporation is poor.
POST-THINNING INJECTED INTO IRRIGATION WATER	Eptam®	Injected into irrigation water prior to weed emergence. Broadleaf weeds resistant to Treflan including nutsedge. Repeat application essential.	When cocklebur and wild sunflower predominate. Poor distribution of irrigation water and poor subbing. Weeds established at time of treatment. Timely follow-up treatment not made.

Applied Research Studies - 1978

A Progress Report

Beet plantings were significantly below the desired acreage in 1978 as a consequence of the continuing drought last fall and winter. The record-breaking precipitation came too late to permit normal planting of the 1978 crop. Once the rains started, they occurred with sufficient frequency over a prolonged period of time to prevent many growers from planting in early spring. In addition, growers who were able to plant early were often unable to enter fields to cultivate or apply herbicides correctly. Consequently, we were confronted with many challenging problems in commercial fields as well as in our applied research trials. In spite of the periodic rainfall and other adverse conditions, eleven trials were conducted during the 1978 cropping season. Major emphasis was placed on studying the effects of sequential applications of herbicides on seedling sugar beets and weed control.

Two methods of soil incorporation were again studied and the effectiveness of combinations of herbicides preplant, preemergence and postemergence were further evaluated.

The "drought" continued in the availability of new herbicides. Only three experimental compounds were evaluated. One failed to provide effective weed control in two preplant incorporated trials. BAS-90210 and Hoe-29152 continued to look very promising for the postemergence control of grasses including volunteer cereals. However, their development in the United States of America is not being pursued, therefore, they were included only in one trial.

Hoelon in combination with Nortron looks very promising where ryegrass and barnyardgrass are prevalent. The one thing we can cheer about is that after many years' of evaluations the Environmental Protection Agency granted registration for the use of Nortron in sugar beets.

Procedures Used in Conducting the Trials

The 1978 applied research trials were conducted at the West Side Field Station, Spreckels Research Farm No. 41, and in commercially grown beet fields with cooperating growers. All of the trials were replicated in randomized block design. The herbicides were applied with CO_2 constant pressure sprayers.

Commercial type power driven rotary tillers were used to incorporate the herbicides into the top 2 to 2½ inches of soil. To evaluate incorporation techniques, sectioned rolling cultivators arranged in gangs of two on top of 30 inch beds were used to incorporate herbicides to 1 to 1½ inch depths. Information regarding herbicides used, rates applied per acre, soil type, and irrigation methods used are presented in the tables that summarize the results.

Weed control, stand count and beet injury rating were made several times. The ratings are based on a scale of 0 to 10. A rating of "0" can denote no weed control, no injury or as a vigor rating it indicates very poor beet growth. A rating of "10" means perfect weed control, as a vigor rating it indicates vigorously growing beets, and as injury rating "10" means very severe beet injury.

Adverse climatic conditions prevented timely application of certain treatments, therefore, some experiments had to be abandoned. Because of early preparation of this report, yield data from some of the trials will be made available later.

What Have We Learned?

The results obtained in the trials are summarized in Tables 1 through 9 following the narrative part of this progress report. Observations made in conducting the trials and in commercially treated fields can be briefly summarized as follows:

Sequential Application of Herbicides

Sugar beet fields in central California are infested with a large spectrum of weeds. To obtain their effective control, combinations of herbicides and/or sequential application of herbicides are desirable.

Several herbicides and combinations of herbicides were preplant incorporated, and later postemergence herbicides were applied. Two trials were conducted - in one, summarized in Tables 1 and 2, the postemergence herbicides were applied when the beets had one pair of true leaves. In the second trial the postemergence herbicides were applied when the beets had 3 to 4 pairs of true leaves, too late to obtain effective weed control. The observation and data indicate that:

- Betanex at 1.25 lb ai/A applied when the beets had one pair of true leaves caused severe growth retardation and marginal burn on the leaves (necrosis).
- The beet injury was most severe in areas where Roneet or Pyramin were preplant incorporated. In these plots some stand loss was observed. See Table 1 and 2.
- Least injury was observed from postemergence applications of Betanex in plots treated with Nortron preplant.

- Betanex plus Betanal at 0.625 lb ai/A each caused less severe injury than Betanex at 1.25 lb ai/A.

- Combining Endothal 273 at 1.0 lb ai/A with Betanex at 1.25 lb ai/A caused less severe retardation in the growth of the young beets and less marginal leaf burn than with Betanex used alone. See Table 1.

- Beets having 2 to 4 pairs of true leaves when treated with Betanex exhibited more tolerance. However, waiting to treat at this stage of beet growth resulted in less effective weed control.

- Betanex plus Endothal caused more severe leaf burn (necrosis) on beets sprayed in their 2 to 4 pair of true leaf than in their first pair of true leaf stage of growth.



Nortron caused leaf deformity (gnarling and twisting) as pictured above. The symptoms were observable 8 to 12 weeks following emergence.

Preplant Incorporated and Preemergence Studies

The results obtained and observations made were very similar to those reported in earlier progress reports:*

- Roneet properly incorporated provided very good control of summer annual broadleaf weeds and grasses.

- Nortron provided excellent volunteer cereal, wild oat, canarygrass and certain other winter annual grass control. Nortron did not control annual ryegrass and weeds in the mustard family.

- Twisted and gnarled beet leaves (pictured on page 20) were observed in the Nortron treated plots. At 2.0 lb ai/A approximately 5 to 10 percent of the plants showed the symptoms. This deformity was observed 8 to 12 weeks following emergence but does not seem to reduce stands or harvest yields.

- Nortron plus Pyramin provided very effective control of winter annual broadleaf weeds and winter annual grasses except ryegrass.

- The combination of 1.5 to 2.0 lb ai/A of Nortron plus 3.0 lb ai/A of Pyramin has been repeatedly demonstrated to provide excellent weed control in late fall and winter planted beets.

- Nortron alone or in combination with Pyramin did not provide effective barnyardgrass control.

*Runcina Volumes and U.C. Cooperative Extension, Fresno County 1976 and 1977

- Pyramin alone or in combination with other herbicides caused severe reduction in vigor and stand in saline-alkali soils whether preplant incorporated or surface applied under sprinkler irrigation.

- Antor, as in earlier studies, provided good summer annual grass control and control of certain broadleaf weeds. It failed to control lambsquarter and weeds in the mustard and thistle families.

- Antor in combination with Nortron provided good summer annual weed control; however, it caused some growth retardation.

- Hoelon alone and in combination with Nortron exhibited good selectivity.

- Hoelon at 2.0 lb ai/A preplant incorporated did not provide as effective barnyardgrass control as at 4.0 lb ai/A in combination with Nortron. See Table 3.

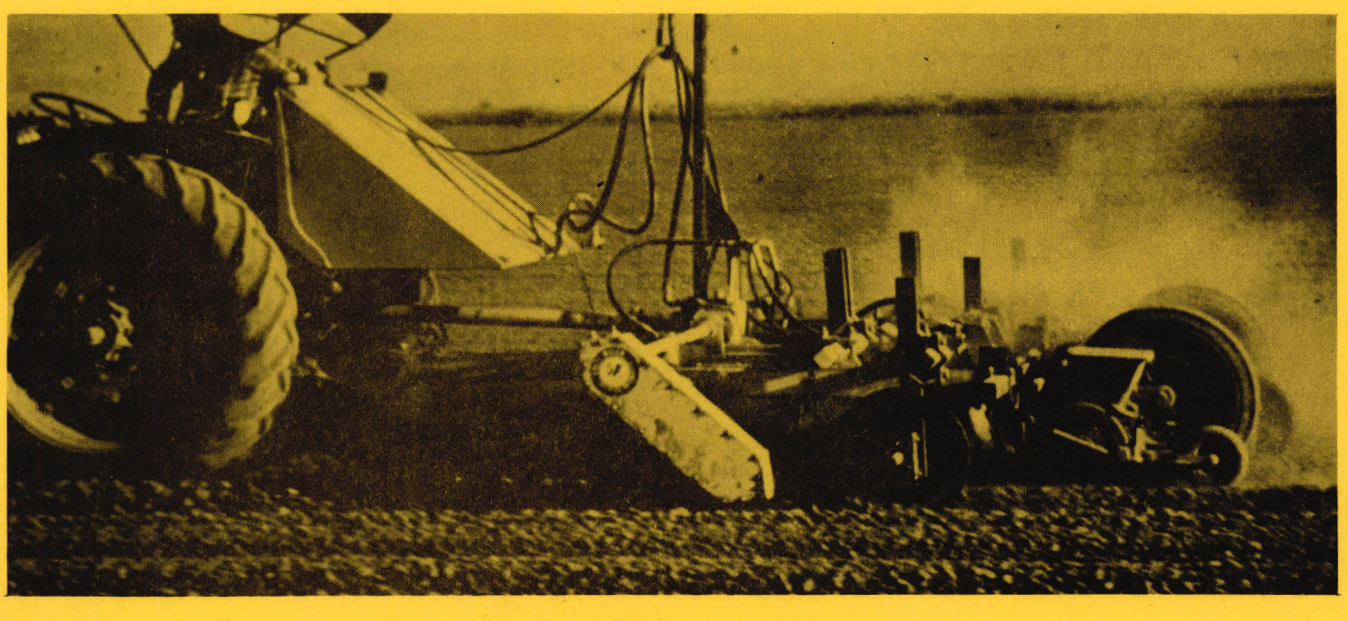
- SAN-255 failed to provide annual grass control when evaluated at 2.0 and 4.0 lb ai/A alone or in combination with Pyramin.

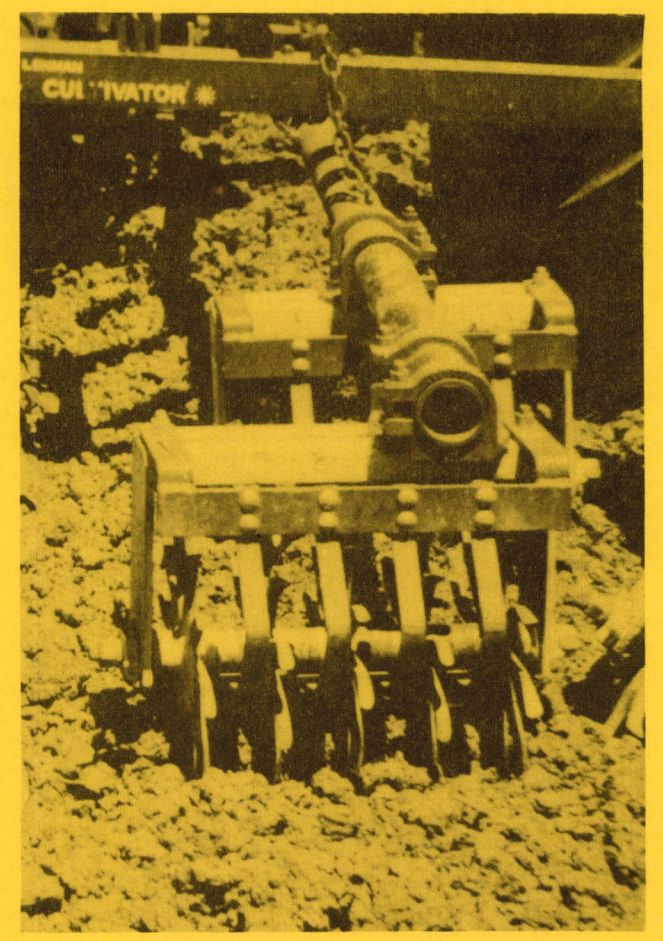
Methods of Herbicide Incorporation

Ground driven rotary tillers require less power and less labor to operate than power driven rotary tillers. Therefore, it would be more economical to use if they would effectively mix the herbicide into the soil.

In earlier trials it was found that sectioned rolling cultivators (Lillistons) arranged in gangs of two or three on top of the beds provided good incorporation, hence effective weed control, in a well prepared seed bed.

Growers experienced mixed results; some obtained very good weed control, others poor or no control. This year and in earlier trials it was clearly demonstrated that in cloddy or trashy fields ground driven rotary tillers will not provide good control. Under the same soil conditions power driven rotary tillers provided much more effective control.





Herbicides incorporated with power driven rotary tillers such as the one pictured above resulted in the most effective weed control.

Rolling cultivators arranged in gangs of two, shown on the left, or three on top of the bed provided good weed control but only in a well prepared seed bed.

It was also observed in commercially treated fields that Roneet incorporated with power driven rotary tillers resulted in very good weed control. In a well prepared seed bed rolling cultivators arranged in gangs of three on top of the beds provided acceptable control but not as effective as the degree of control obtained with power driven rotary tiller incorporation.

Disk incorporation of Roneet often resulted in erratic weed control. Frequently the time and money saved in incorporation is spent for post-emergence application of herbicides and/or hand weeding.

Postemergence Studies

There are several herbicides available for the postemergence control of broadleaf weeds in sugar beets. The need for an effective postemergence selective herbicide for the control of grasses including volunteer cereals is urgent. Dowpon is widely used but the timing of its application in relation to the growth of seedling grasses is critical. Often, even under favorable conditions erratic control was observed.

Two experimental herbicides looked very promising last year and their evaluation was continued in one trial. The results and observations can be outlined as follows:

Hoe-29152 effectively controlled annual grasses including volunteer cereals but not annual bluegrass.

Sugar beets exhibited very good tolerance to this herbicide. Hoe-29152 provided rapid control of the grasses and its activity was not enhanced with the addition of Endothal.

BAS-90210 provided excellent annual grass and volunteer cereal control but its activity was slow. It required 4 to 5 weeks for the grasses to die.

The addition of Endothal at 0.5 and 1.0 lb ai/A to 2.0 lb ai/A of BAS-90210 resulted in more rapid and somewhat more effective grass and volunteer barley control.

Nortron failed to control well established (4 to 5" tall) volunteer barley. In earlier trials effective control was obtained when Nortron was applied on volunteer cereals in their 1 to 2 leaf stage of growth and rain fell or sprinkler irrigation was applied shortly after treatment.

The combination of Nortron plus Betanal provided only slightly better volunteer cereal control than Nortron alone.

Hoelon was evaluated alone and in combination with Nortron and Betanex but the trial area was not sufficiently infested with grasses to obtain reliable evaluation. However, it was evident, in the trial summarized in Table 9 and in a second trial that was abandoned because of bird damage, that Hoelon controlled only those barnyardgrass plants that were growing vigorously and while in their seedling stage.

The combination of Hoelon and Nortron caused somewhat more beet injury than either herbicide used singly.

In Conclusion

Numerous selective herbicides are available for use in sugar beet production. They can be used preplant, preemergence, postemergence and post thinning. To obtain effective weed control growers can combine two or more of them or they can use them sequentially. However, their safe and effective use depends on and is greatly influenced by their proper selection and timely application.

Selective herbicides can provide the most effective and economical weed control only in an integrated program of sound cultural practices including timely cultivations. Relying entirely on selective herbicides for weed control in beet fields may be unwise and uneconomical. However, the use of costly hand labor can be greatly minimized or eliminated with the judicious use of selective herbicides.

The need for further evaluation of combination of herbicides and sequential application of herbicides are essential. The search for more effective, more selective and more economical use of herbicides will continue in the years ahead.



In central California beet fields relatively free of unwanted vegetation produce the most profitable yields.



Table 1

Effect of Sequential Application of Herbicides on the Early Growth of Sugar Beets
C-50, 425, 91, 10, 78-7

Trial Location: Westside Field Station
Soil Type: Panoche Clay Loam
Preplant Herbicides Applied: 8 May 1978
Beets Replanted: 1 June 1978
Postemergence Herbicides Applied: 12 June 1978

Plot Size: Preplant: 4 beds (12" on 30" beds) x 90'
Postemergence: 2 beds or 5'x40'
Beet Variety: USH-9
Irrigation Method: Furrow
Evaluation dates: Stand Count: 9 June Vigor Eval: 19 Jun

BEET VIGOR-MARGINAL LEAF BURN AND WEED CONTROL EVALUATIONS - AVERAGE OF FOUR REPLICATIONS[1/]

Preplant Incor Herbicides	lb ai/A	Stand[2/] Count Prior to Post Treatment 6/9/78 Plant Per Ft/Row	Postemergence Herbicides and lb/A Applied 12 Jun 78-Beet with One Pair of True Leaves											
			Betanex 1.25			Betanal 0.625 + Betanex 0.625			Betanex 1.25 + Endothal 273 1.0			No Postemergence Treatment		
			Beet Vigor	Marginal Leaf Burn	Weed Control	Beet Vigor	Marginal Leaf Burn	Weed Control	Beet Vigor	Marginal Leaf Burn	Weed Control	Beet Vigor	Marginal Leaf Burn	Weed Contr.
A Roneet	4.0	5.1	4.5	4.7	9.7	7.2	2.7	10	6.0	2.7	9.7	9.5	0.5	8.0
B Nortron	2.0	5.6	7.0	3.5	9.7	8.0	2.5	10	7.0	2.5	9.7	10.0	0.5	8.7
C Nortron	4.0	4.9	7.2	3.7	10.0	7.2	2.0	9.7	7.2	3.5	10.0	10.0	0.5	7.5
D Nortron + Hoelon	2.0 + 2.0	5.3	5.7	3.5	10.0	7.7	2.2	10	8.0	2.5	10.0	10.0	0	7.0
E Nortron + Antor	2.0 + 2.0	4.9	6.2	4.0	9.5	7.2	2.7	10	6.0	3.0	9.7	10.0	0	9.0
F Antor + Pyramin	2.0 + 3.0	5.4	5.7	3.7	10.0	7.2	2.2	9.5	7.2	2.2	10.0	10.0	0.5	7.7
G Untreated	---	5.4	6.5	4.0	7.5	7.7	3.0	8.0	8.0	2.5	9.0	9.7	0.7	3.2
H Pyramin	4.0[3/]	5.2	4.5	5.2	10.0	8.0	2.5	10.0	8.5	1.5	10.0	10.0	0.5	5.0

1/ Beet vigor, leaf burn and weed control ratings are based on a 0 to 10 scale; 0=very poor beet vigor-no marginal leaf burn no weed control; 10=vigorously growing beet seedlings, very severe leaf burn or perfect weed control.
2/ Stand counts made in four feet of row, values represent the average of 16 counts.
3/ Included only in two replications.

Table 2

Effect of Sequential Application of Herbicides on the Early Growth of Sugar Beets
C-50, 425, 91, 10, 78-7

Trial Location: West Side Field Station
Soil Type: Panoche Clay Loam
Herbicides Applied: Preplant - 8 May 1978
Postemergence - 12 Jun 1978
Evaluated: 28 June 1978

Beet Variety: USH-9
Plot Size: Preplant - 4 beds x 90'
Postemergence - 2 beds x 40'
Irrigation Method: Furrow

Preplant Incorp. Herbicides	lb ai/A	Sugar Beet Vigor and Percent Stand Evaluations - Average of Four Replications[1/]: Postemergence Herbicides and lb ai/A Applied 6/12/78 — Betanex 1.25		Betanal 0.62 + Betanex 0.62		Betanex 1.25 + Endothal 1.0		No Postem. Herbicide	
		Beet Vigor	Percent Stand	Beet Vigor	Percent Stand	Beet Vigor	Percent Stand	Beet Vigor	% Stand
A Roneet	4.0	7.2	70.0	9.2	90.0	7.8	77.5	9.5	93.7
B Nortron	2.0	8.5	83.7	9.0	91.2	8.3	92.5	10.0	97.8
C Nortron	4.0	8.5	87.5	9.0	90.0	8.5	88.7	10.0	98.7
D Nortron Hoelon	2.0 2.0	8.2	77.5	8.5	93.7	9.2	98.7	10.0	100.0
E Nortron Antor	2.0 2.0	8.0	90.0	8.5	83.7	8.0	85.0	10.0	100.0
F Antor Pyramin	2.0 3.0	7.2	73.7	8.1	88.7	9.0	88.7	10.0	97.5
G Untreated	---	8.7	86.2	9.0	96.2	8.7	91.2	9.5	93.7
H Pyramin	4.0[2/]	6.5	47.5	7.5	87.5	9.0	95.0	10.0	82.5

1/ Vigor evaluation based on a 0 to 10 scale; 0=very poor vigor, 10=vigorously growing beets.
2/ Only in two replications.

Table 3

Effect of Preplant Incorporated Herbicides on
Sugar Beet Vigor and Weed Control
C-50, 425, 10, 91, 78-7

Trial Location: West Side Field Station
Soil Type: Panoche Clay Loam
Herbicides Applied: 8 May 1978
Evaluated: 6/9, 6/12 and 6/28/78

Beets replanted: 1 June 1978
Plot Size: 2 beds (12"on 30" beds)x45'-4 reps
Irrigation Method: Furrow

			Sugar Beet Stand, Vigor and Weed Control Rating[1]						
			Beets Per[2]	Stand Percent	Beet	6/12 Weed Control		6/28 Weed Control	
	Herbicides	lb ai/A	ft of row	of Untreated	Vigor	Bdlf	Grass	Bdlf	Grass
A	Antor	3.0	4.1	80	8.2	9.5	9.7	8.0	9.5
B	Roneet	4.0	5.6	109	8.5	9.2	9.5	9.0	9.5
C	Roneet	6.0	5.2	101	8.2	9.2	10	9.0	10
D	Hoelon	4.0	6.5	127	9.2	1.2	9.5	0	9.0
E	Antor	2.0	5.2	101	9.7	9.7	10	9.5	10
	Nortron	2.0							
F	Nortron	2.0	5.1	100	8.7	9.0	8.5	9.0	8.0
	Hoelon	2.0							
G	Nortron	2.0	5.7	111	9.7	8.7	10	8.0	10
	Hoelon	4.0							
H	San-252	2.0	4.2	82	8.0	8.5	3.7	8.0	3.0
	Pyramin	3.0							
J	San-252	4.0	4.5	88	9.2	9.0	4.7	9.0	3.0
	Pyramin	3.0							
K	San-252	2.0	5.5	107	8.2	9.7	8.5	9.0	7.0
	Nortron	2.0							
L	Nortron	2.0	5.7	111	8.5	9.0	4.0	9.0	5.0
M	Untreated	---	5.1	100	8.7	0	0	0	0

1/ Ratings based on a 0 to 10 scale. 0=no weed control or very poor vigor; 10=perfect weed control or vigorously growing beet seedlings.

2/ Stand counts made in two 4'x6" areas in the center of each plot. Values represent the average number of beets per foot of row.

Table 4

Effect of Preplant Incorporated Herbicides
on Sugar Beets and Weed Control
C-50, 425, 91, 10, 78-5

Trial Location: Spreckels Ranch 41, Mendota
Soil Type: Chino Loam
Herbicides Applied: 4 May 1978
Evaluated: 6/12 & 6/28/78

Beets Planted: 4 May 1978-Variety USH-9
Plot Size: 1 bed (12" on 30")x30'- 4 reps
Irrigation Method: Furrow

	Herbicide	lb ai/A	Weed Control and Beet Injury Evaluation 1/ 12 June 1978 Grasses	12 June 1978 Broadleaf	12 June 1978 Beet Injury	28 June 1978 Grasses	28 June 1978 Broadleaf	28 June 1978 Beet Injury
A	SAN-252	2.0	1.0	0	0	0	0	0
B	SAN-252	4.0	2.5	0	0	2.0	0	0
C	SAN-252 Pyramin	1.0 3.0	1.5	8.5	2.0	1.0	8.0	1.0
D	SAN-252 Pyramin	2.0 3.0	2.0	8.0	2.0	2.0	7.0	1.0
E	SAN-252 Nortron	2.0 2.0	6.5	8.5	1.0	6.0	8.0	1.0
F	Untreated	---	0	0	0	0	0	0

Remarks: Herbicides applied with a CO_2 sprayer in 250cc of water per plot (wind velocity 15 to 18 mph. 8008 LP orifice and shield was used) and incorporated with power driven rotary tillers.

1/ Weed control and beet injury evaluations are based on a 0 to 10 scale; 0=no weed control or no beet injury; 10=perfect weed control or severe beet injury.

Table 5

Sugar Beet Weed Control Trial Preemergence
C-51, 425, 91, 10, 78-2

Trial Location: James Road 9 mi.S of Tranquillity
½ mi. W of Holding Inc. Hdq, ¼ mi
S of Turnquist equipment yard

Soil Type: Panoche Clay
Herbicides Applied: 1 Dec 1977
Evaluated: 15 March 1978

Plot Size: 5'x40' - 4 reps
Irrigation Method: Furrow

	Herbicides	lb ai/A	Beet Stand and Vigor Evaluations[1/]	
			Stand Percent of Untreated	Beet Vigor
A	Pyramin	4.0	113	6.8
B	Pyramin Nortron EC	3.0 1.5	96	5.5
C	Pyramin Antor	3.0 2.0	103	6.2
D	Pyramin Hoelon	3.0 4.0	88	8.2
E	Pyramin TCA	4.0 8.0	113	7.2
F	Bay 1139	4.0	104	7.8
G	Bay 1139 Nortron EC	4.0 1.5	98	6.5
H	Hoelon	4.0	99	8.0
K	Untreated	---	100	7.5

1/ Vigor rating based on a 0 to 10 scale; 0=very poor vigor, 10=vigorously growing beets.

Remarks: Cobex was used as a layby application on the cotton that was grown in this field before the sugar beets. Severe twisting and deformity of the beet roots were observed in all plots.

The weed population was too sparse for meaningful evaluation.

Table 6

Effect of Preemergence Herbicides on
Sugar Beet Emergence and Vigor

Trial Location: Spreckels Farm 41, Mendota
Soil Type: Traver Sandy Loam, saline-alkali
Herbicide Applied: 17 May 1978

Plot Size: 5'(2 rows)x 30' - 4 reps
Irrigation Method: Sprinkler
Evaluated: 15 June 1978

Herbicide	lb ai/A	Beet Stand and Vigor Evaluation 1/		
		Beets per Ft/Row	Beet Stand % of Untreated	Beet Vigor
A Pyramin TCA	2.0 6.0	2.5	69	2.0
B Pyramin TCA	3.0 6.0	1.6	46	1.0
C Pyramin Antor	2.0 2.0	2.0	55	3.0
D Pyramin Antor	3.0 2.0	1.6	46	2.2
E Pyramin Nortron	2.0 2.0	2.3	65	1.0
F Pyramin Nortron	3.0 2.0	1.5	42	1.2
G Antor	3.0	4.5	125	7.2
H Antor Nortron	2.0 2.0	3.2	88	5.5
J Nortron Hoelon	1.5 1.0	3.3	93	5.5
K Nortron Hoelon	2.0 2.0	3.6	100	6.5
L Hoelon	2.0	3.5	97	7.7
M Untreated	---	3.6	100	7.5

1/ Beet vigor based on a 0 to 10 scale; 0=very poor vigor (dead plants), 10=vigorously growing beets.

Remarks: During the first irrigation 3.5" of water was applied during a 24 hour set. The weed population was too sparse in the trial area to obtain meaningful weed control evaluation.

Table 7

Effect of Two Methods of Herbicide
Incorporation on Weed Control and Beet Injury

Trial Location: Spreckels Farm 41, Mendota
Soil Type: Chino Loam
Trial Established: 3 May 1978
Evaluated: 30 May 1978

Beet Variety: US-H9
Plot Size: 2 rows(5')x50' - 4 reps
Irrigation Method: Furrow

Sugar Beet Stand Count, Beet Injury and Weed Control Evaluations 1/

			Power Driven Incorporator						Ground Driven Lilliston Incorporator					
	Herbicide	lb ai/A	Beets Per Ft/Row	Beet Injury	Grasses	Pig Weed	Lambs Qtr	Sow Thistle	Beets Per Ft/Row	Beet Injury	Grasses	Pig Weed	Lambs Qtr	Sow Thistle
A	Antor	3.0	3.5	2.5	8	0	10	0	1.8	.4	42	3	26	4
B	Roneet	4.0	3.9	1.8	10	3	10	3	2.5	.4	49	7	32	2
C	Roneet	6.0	3.8	3.2	2.0	0	5	1	2.4	3.5	37	2	14	2
D	Nortron	2.0	3.3	3.0	2.2	1	12	3	2.7	3.8	44	3	23	8
E	Antor + Nortron	2.0 + 2.0	3.2	2.2	0	0	5	0	2.4	2.8	44	1	20	1
F	Nortron + Hoelon	2.0 + 2.0	3.1	3.0	0	0	3	0	2.4	3.8	28	0	20	3
G	Nortron + Hoelon	2.0 + 4.0	3.6	3.0	0	4	4	1	2.3	3.2	2	1	20	7
H	Untreated	---	3.5	2.0	134	2	25	6	1.9	3.8	156	11	60	5

1/ Counts were made in two 6'x6" areas in each plot. Beet stands are reported as number of plants per foot of row. Weed counts reported as the total number in 24ft area. Beet injury rating is based on a 0 to 10 scale. 0=no injury, 10=very severe injury.

Table 8

Effect of Postemergence Herbicides on the Control
of Volunteer Barley in Sugar Beets
C-51, 425, 91, 10, 78-1

Trial Location: Clarkson Ave. 1¼ mi. East of Cantua Creek Post Office-Gary George Farm
Soil Type: Panoche Clay Loam
Herbicides Applied: 1 Dec 77
Beet Growth Stage: 2 to 4 true lvs
Plot Size: 5'x40' - 4 reps
Irrigation Method: Sprinkler

	Herbicides	lb ai/A	Volunteer Cereal Control and Beet Vigor Evaluations[1/] 22 Dec 1977 Barley Control	8 Jan 1978 Barley Control	Beet Vigor
A	BAS 90210	2.0	1.5	9.5	10
B	BAS 90210 Endothal 273	2.0 0.5	6.2	10.0	10
C	BAS 90210 Endothal 273	2.0 1.0	6.2	10.0	9.5
D	Hoe 29152 Bio-88	1.0 0.5%	7.2	9.0	10
E	Hoe 29152 Bio-88	2.0 0.5%	9.2	9.8	10
F	Hoe 29152 Endothal 273 Bio-88	1.0 0.5 0.5%	8.0	9.5	10
G	Hoe 29152 Endothal 273 Bio-88	1.0 1.0 0.5%	8.7	9.5	9.0
H	Hoe 29152 Endothal 273 Bio-88	2.0 2.0 0.5%	9.0	10.0	8.5
J	Endothal Dowpon M Bio-88	1.0 2.0 0.5%	3.2	8.0	8.7
K	Nortron EC	1.5	0	4.0	10
L	Nortron EC Betanal	1.5 1.0	2.2	6.0	9.0
M	Untreated	---	0	0	8.0

1/ Weed control and beet vigor evaluations are based on a 0 to 10 scale. 0=no weed control or very poor vigor; 10=perfect weed control or vigorously growing beets.

Remarks: Herbicides applied with a CO_2 sprayer in 640cc of water per plot. Volunteer barley the only weed present, well tillered 4 to 6" tall.
Pyramin 4.0 lb ai/A plus TCA 8.0 lb/A were applied preemergence. Field was sprinkler irrigated 9/12/77.

Table 9

Effect of Postemergence Herbicides for the Selective Control of Purslane in Sugar Beets

Trial Location: Spreckels Farm 41, Mendota
Soil Type: Traver Sandy Loam, saline-alkali
Beets Planted: 16 May 1978
Herbicides Applied: 2 June 1978
Evaluated: 9 June 1978

Sugar Beet Stage of Growth: 4 to 6 true leaves
Plot Size: 5 (2 beds) x 30' - 4 reps
Irrigation Method: Furrow

	Herbicide	lb ai/A	Purslane Control and Beet Injury Evaluation[1/]	
			Purslane Control	Beet Injury
A	Betanex Dowpon	0.75 2.0	5.0	2.8
B	Betanex Dowpon	1.25 2.0	8.0	4.5
C	Betanex Betanal	0.62 0.62	8.5	3.8
D	Betanex Hoelon	1.0 1.0	8.0	3.5
E	Hoelon X-77	1.0 0.5%	3.5	1.8
F	Nortron X-77	2.0 0.5%	9.0	2.3
G	Hoelon Nortron X-77	1.0 1.0 0.5%	9.0	4.0
H	Dowpon X-77	3.0 0.5%	2.8	1.0
J	Dowpon X-77	5.0 0.5%	3.0	0.8
K	Untreated	---	1.8	0.3

1/ Purslane control and beet injury evaluations are based on a 0 to 10 scale. 0=no purslane control or no beet injury; 10=perfect purslane control or very severe injury--death.

Remarks: Herbicides applied 2:30 pm; the temperature was 88°F.

Purslane varied in size from seedling to stems several inches in length.

WEED INFESTATION RECORD

FIELD LOCATION _____ CROP _____ HERBICIDE USED _____

DATE PLANTED _____ DATE NOTES TAKEN _____ PREVIOUS CROP _____

BROADLEAF ANNUALS	Anise	Atriplex	Bassia Five Hook	Black Bindweed	Bristly Oxtongue	Burweed	Carpetweed	Cat's Ear	Cheeseweed
Chickweed	Clover	Cocklebur	Corn Spurry	Cudweed	Dandelion	Dock	Dodder	Fat Hen	Fiddleneck
Filaree	Flaxleaved Fleabane	Ground-cherry	Groundsel	Hemlock	Henbit	Jimson Weed	Knotweeds	Lambsquarters	Lettuce Wild
London Rocket	Mare's Tail	Mayweed	Milk Thistle	Minerslettuce	Morning Glory	Mustard	Nettle	Nettleleaf Goosefoot	Nightshade
Nuttalls Monolepis	Phacelia	Pigweed	Pineapple Weed	Plantain	Puncture Vine	Purslane	Red Maids	Russian Thistle	Scarlet Pimpernel
Shepherd's Purse	Sow Thistle	Spiny Clotbur	Spurge	Sunflower, Common	Tarweed	Telegraph-plant	Toadflax	Turkey Mullein	Velvet Leaf
Venice Mallow	Veronica	Willow Herb	Yellow Starthistle						
GRASSES ANNUAL	Annual Bluegrass	Barley, Volunteer	Barnyard-grass	Bromegrass	Canarygrass	Cupgrass	Dallisgrass	Diffuse Lovegrass	Feather Finger-grass
Foxtails (Bristle-grass)	Jungle Rice	Orcutts Lovegrass	Rabbitfootgrass	Ripgut Brome	Ryegrass	Sandbur	Sprangletop	Wild Barley (Foxtails)	Wild Oats
Witchgrass									
PERENNIALS	Alkali Sida	Bermudagrass	BINDWEED (Morning Glory)	Cattail	Chickory	Heliotrope	Hoary Cress	Johnsongrass	Nutsedge, Purple
Nutsedge, Yellow	Russian Knapweed	Saltgrass	SILVERLEAF NIGHTSHADE (Horsenettle)	Swamp Smart-weed (Kelp)	Tolgoucha	Tule			

COMPLIMENTS OF

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TOWARD MORE EFFECTIVE WEED CONTROL

This weed control record card properly used will enable you to use selective herbicides more economically. Fill out a card for each field three times during the growing season:

a. soon after crop emergence;

b. mid-season;

c. before harvest.

To indicate the presence of a weed, use a check mark ✓ in the spaces provided. To indicate the degree of infestation you can use a scale of 1 - 5.

1 = very few weeds present
2 = light infestation
3 = moderate infestation
4 = heavy infestation
5 = very heavy infestation

A good record of weed infestation will enable you to select a crop rotation system that can minimize your weed control costs and enable you to select the most effective tools whether chemical or mechanical.

Bill B. Fischer, Farm Advisor Fresno County
UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION

Toward More Effective WEED CONTROL

Without knowledge of the weed infestation it is impossible to plan an effective, economical control program.

To help identify weeds the University of California's "Growers Weed Identification Handbook" may be helpful. It contains colored photographs and descriptions of 183 commonly occurring weeds in different stages of their growth. The pictures in a sturdy 3-ring binder can be purchased from Publications, Division of Agricultural Sciences, University of California, 1422 Harbour Way South, Richmond, California 94804.

Being able to identify weeds is but the first step. Keeping records of their presence is essential to use selective herbicides intelligently. Cards, such as the one stapled to this page, can be used to keep records of weed infestations. They are available from Cooperative Extension offices, from pest control advisors and distributors of herbicides.

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