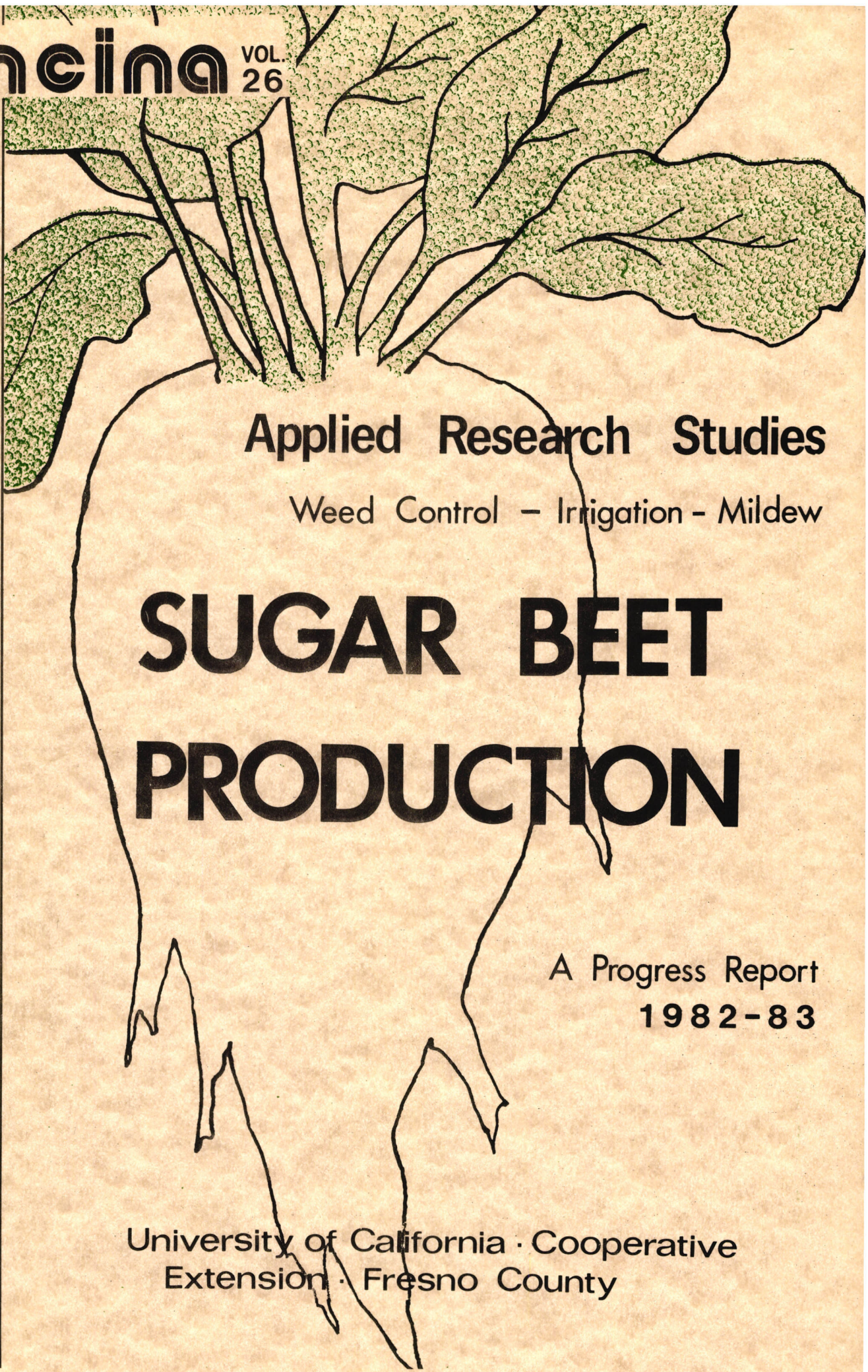


**Runcina** VOL. 26



**Applied Research Studies**

Weed Control - Irrigation - Mildew

# **SUGAR BEET PRODUCTION**

A Progress Report  
**1982-83**

University of California · Cooperative  
Extension · Fresno County



COOPERATIVE EXTENSION  
UNIVERSITY OF CALIFORNIA

County of Fresno  
Farm and Home Advisors Office

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ACKNOWLEDGEMENTS

The applied research studies summarized in this progress report were made possible by the continued encouragement and generous support of members of District 6 California Beet Growers Association. Their sustained cooperation and assistance is greatly appreciated.

We wish to express our thanks to the many cooperating growers for supplying land, labor and managerial assistance in conducting the trials. We are grateful to Richard Hoover and Fred Fischer, of the Westside Field Station, for their assistance.

The cooperation of Jack Hills, Terry Howell, Lou Ziska and Larry Brown is appreciated.

The herbicides and fungicides were furnished free of charge by their respective manufacturers; we thank them for their generosity.

Trade names of chemicals that are more familiar to growers, are used in this report; they are capitalized and protected by the U.S. Patent Office. This report does not contain recommendations for the use of herbicides or fungicides in sugarbeet production. The purpose of this progress report is to inform beet growers, PCA's, our cooperators and others interested in our research studies.

We are indebted to Nancy Shaw for her untiring secretarial assistance and Kathy Garrison for her art work and printing of this report.



B.B.F., L.M.B., T.A.B.

\* \* \* \* \*

\* Runcina was the goddess of weeding worshipped \*  
\* during the Augustinian period. Variations \*  
\* such as runco, erunco and runciato acquired \*  
\* the meaning of weeding. \*

\* Runcina today is the title of progress reports \*  
\* of applied research studies of weeding \*  
\* conducted in Fresno County. It contains no \*  
\* recommendations for the use of herbicides. \*

\* \* \* \* \*

-a-

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University of California, and County of Fresno Co-operating.



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* * * * *
*
*   WE ALL MAKE ERRORS!
*
*   Please correct ours as indicated:
*
*   Table 4 (gold colored paper) in the percent
*   clean beet column the Untreated should be
*   93.5 and not 13.5.
*
*   Table 8 (green colored paper), Broadleaf
*   control in Treatment "J" should be 9.0 and
*   not 0.
*
* * * * *
  
```



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

| <u>Trade Name</u> | <u>Common Name or Code Number</u> | <u>Manufacturer</u> |
|-------------------|-----------------------------------|---------------------|
| ANTOR             | diethecine                        | Nor-Am              |
| ASSURE            | DPX-Y6202                         | DuPont              |
| BETAMIX           | phenmedipham + desmedipham        | Nor-Am              |
| DOWPON M          | dalapon                           | Dow                 |
| ENDOTHAL 273      | endothall                         | Pennwalt            |
| FUSILADE          | fluazifop                         | ICI Americas        |
| KERB              | pronamide                         | Rohm & Haas         |
| NORTRON           | ethofumasate                      | Nor-Am              |
| POAST             | sethoxydin                        | BASF                |
| PYRAMIN           | chloridazon                       | BASF                |
| RONEET            | cycloate                          | Stauffer            |
| SELECTONE         | RE-36290                          | Ortho               |
| TILLAM            | pebulate                          | Stauffer            |
| TCA               | TCA                               | Hopkins             |
| VERDICT           | DOWCO 453 ME                      | Dow                 |
| ---               | CGA 82725                         | Ciba Geigy          |
| ---               | HOE-00581                         | American Hoechst    |
| ---               | SC-1084                           | Stauffer            |
| ---               | UBI-5734                          | Mobay               |

Fungicides

|          |                  |            |
|----------|------------------|------------|
| BAYLETON | triadimefon      | Mobay      |
| SULFUR   | ---              | ---        |
| TILT     | CGA-64250        | Ciba Geigy |
| TRIMIDAL | naurimol(EL-228) | Elanco     |
| ---      | DPX H6573        | DuPont     |
| ---      | XE-779           | Ortho      |



## APPLIED RESEARCH STUDIES IN SUGARBEETS

### Progress Report 1982-1983

B. B. Fischer, L. M. Burtch, T. A. Babb

### Introduction and Synopsis

Seven recently introduced grass herbicides were evaluated during 1982 and 1983 to study their effectiveness to control unwanted vegetation in sugarbeet fields. They provided effective control in numerous trials of many summer and winter annual grasses, volunteer cereals, volunteer corn, and perennials such as johnsongrass and Bermudagrass.

The effectiveness of the grass herbicides used in combination with Betamix in controlling a broad spectrum of grasses and broadleaf weeds in sugarbeets was clearly demonstrated. Trials were also conducted at the Westside Field Station and in the Mendota area in which the effectiveness of different combinations of herbicides applied preplant incorporated and preemergence were further assessed.

Powdery mildew control studies were conducted in five trials comparing the effectiveness of five systemic fungicides and sulfur. Climatic conditions during 1983 were very favorable for powdery mildew at the Westside Field Station, but it was disappointing to observe the relatively short period of control obtained with Bayleton which is in conflict with results obtained in prior years. However, it appears that protecting the beets during their early growth -- 100 to 120 days after planting -- may be sufficient to obtain maximum economical response.

---

\*Farm Advisor, U. C. Cooperative Extension, Fresno County; Agricultural Research Director, Spreckels Division of Amstar Corporation; and Research Assistant, U. C. Cooperative Extension respectively.



An irrigation cut-off trial was conducted in a commercially grown beet field. The highest sucrose yield was obtained where the last irrigation was applied seven (7) weeks prior to harvest. A comprehensive irrigation frequency and irrigation cutoff experiment was conducted at the Westside Field Station under the leadership of Dr. Terry Howell, U.S.D.A.-A.R.S. The study indicates that growers have great flexibility in irrigation frequency as long as the depleted moisture can be replenished.

### Rizomania

A disturbing occurrence during 1983 was the discovery of the wide distribution of rizomania (rhizomania), a potentially devastating virus disease infesting sugarbeets.

It is caused by the Beet Necrotic Yellow Vein Virus (BNYVV) which is transmitted by the parasitic soil borne fungus called Polymyxa betae Keskin. Rizomania is reported to occur in several European countries and Japan.

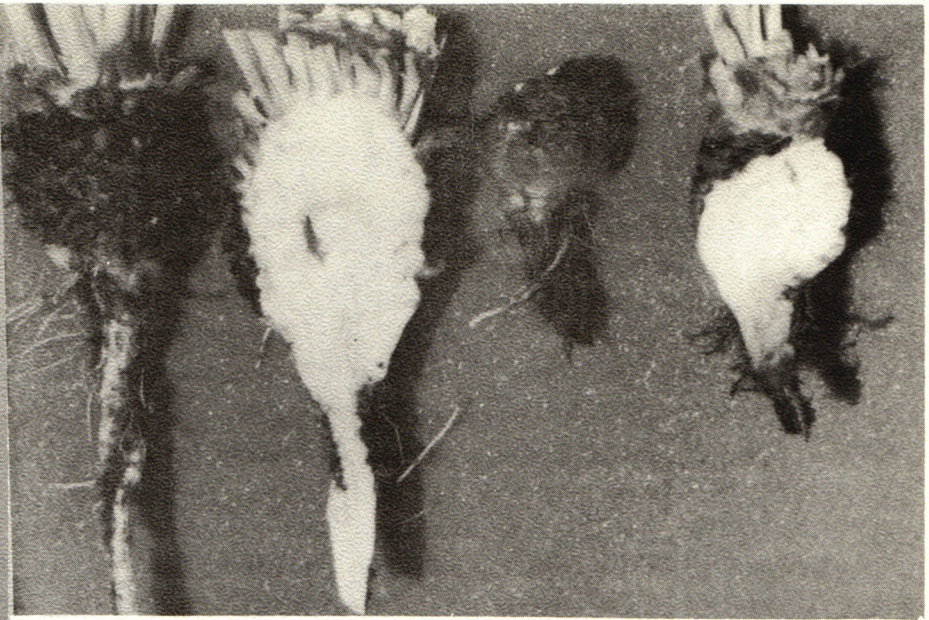
The ecological requirements favoring the disease are: Soil temperature of 70<sup>0</sup> to 80<sup>0</sup>F for prolonged periods; high humidity caused by excessive rainfall, intensive irrigation, poorly drained soil, and compacted soil. Alkaline soil also favors its development. Infection can be spread by soil water, soil movement, harvesters, and to a limited extent, cultivators.

The vector Polymyxa betae is widespread in many arid soils. In California, B. H. Faulk and J. D. Duffus first reported its presence in 1977, but they did not observe BNYVV. To determine the presence of the vector requires microscopic examination of the roots of host plants.

The literature is not precise about its host range. Swiss chard and weeds in the lambsquarter family are reported to be hosts. Pigweed has also been reported as a host. A commonly used test plant in the laboratory is New Zealand spinach (*Tetragonia expansa*), not in the lambsquarter family.

Symptoms of the disease on beets may show as light green leaves with yellowish spots or blotches and the blades tend to grow upright. Infested roots remain small and have extensive lateral roots. Often the taproot is discolored or decayed starting at the tip. Cutting the root will reveal yellowing discoloration of the vascular rings that turn brown as the disease progresses.





Note the poor root development and excessive lateral roots on rizomania infested roots on the left and the discolored vascular bundles in the picture above.



Extensive lateral roots and deformed beets can be caused by compacted soil and the presence of dinitroaniline herbicides (Prowl, Treflan) used in the previous crop. However, the root tips are not decayed and the vascular rings (bundles) are not discolored.

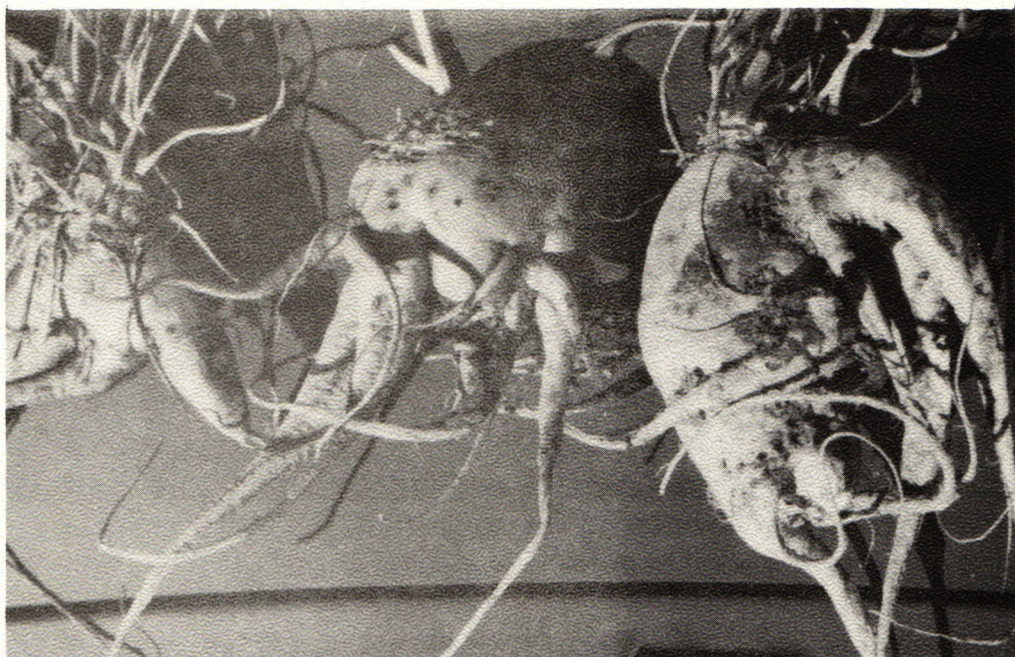
Chemical control of rizomania is economically prohibitive. However, cultural practices that can minimize the problem are:

Deep plowing to reduce soil compaction.

Avoiding the application of excessive irrigation water.

Not applying excessive amount of nitrogen.





Excessive lateral roots caused by a dinitoaniline herbicide pictured above and by rizomania on the left.

Good maintenance of drainage.

Crop rotation may be helpful, but the long survival of P. betae in the soil makes this questionable.

Climatic conditions including excessive rainfall during 1983 may have especially favored the development of rizomania. Hopefully, the problem will not recur but we must be alert and pursue cultural practices that will not favor its growth.



## Weed Control - Present Status

Unwanted competing vegetation infests all fields planted with sugarbeets. During the past decade numerous selective herbicides have been registered for use in sugarbeet production. Today the availability of herbicides and many varied mechanical tools can enable every beet grower to grow a crop relatively free of weeds.

For economic reasons, growers depend more and more on the use of selective herbicides. However, they must be carefully evaluated along with all other available alternative methods of weed control. Their application can be justified only if effective control is provided at a lower cost than that obtained with mechanical methods and hand weeding.

A large number of applied research studies were conducted since 1965 in the Central San Joaquin Valley developing practical weed control techniques and evaluating the safe and effective use of a great number of herbicides applied preplant, preemergence, and postemergence. Many herbicides were evaluated singly, in combinations, and in sequential applications. The studies were summarized, published, and distributed yearly as progress reports to beet growers, fieldmen, and upon request to P.C.A.'s and anyone interested.

In many studies it was repeatedly demonstrated, as well as observed in many growers fields, that selective herbicides when intelligently chosen, properly timed and accurately applied, can provide excellent long-lasting control of unwanted competing vegetation at the lowest cost. When selected without knowledge of the weed infestation or when their application was improperly timed or inaccurately applied, the cost of weed control was significantly increased.

In progress reports published in past years, it was emphasized that effective, economical weed control can be obtained only if it is integrated into the total farming operation. The importance of this cannot be over-emphasized. Briefly stated, weed control can be greatly enhanced by:

- a. Proper field selection.
- b. Intelligent cropping sequence.
- c. Good land and seedbed preparation.



- d. Preirrigation and timely crop irrigations.
- e. Adequate sanitation in and around the field.
- f. Proper weed identification and keeping records of their distribution on the farm.
- g. Ensuring the vigorous growth of the crop through adequate fertilization, insect and disease control.

As a guide to growers, abbreviated summaries of earlier studies have been prepared and updated yearly in two simplified charts. In one, the relative susceptibility of commonly occurring weeds to specific herbicides are listed.

The second chart presents a summary of the performance of herbicides that are marketed or those that were evaluated in trials and may be labeled for use in the near future.

These charts are not intended to be recommendations for the use of herbicides in sugarbeet production. They can serve as a guide in planning an effective weed control program and in the selection of herbicides. Publications containing information regarding sugarbeet production and weed control recommendations are available from the University of California Cooperative Extension offices throughout the state.

Detailed summaries of applied research studies conducted during 1982 and 1983 are presented on the pages following the two charts. They are prepared to inform members of District 6 California Beet Growers Association of our applied research studies made possible because of their generous support and cooperation.



# 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 AND PREEMERGENCE

## POSTEMERGENCE\*\*

## POST THINNING\*\*\*

### BROADLEAF WEEDS

|                     |       | Ro-net or Tillam<br>(must be incorporated) |
|---------------------|-------|--------------------------------------------|
| 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     |                                            |

|                     | Pyramin | Pyramin + TCA | Pyramin + Nortron | Nortron | Antor |
|---------------------|---------|---------------|-------------------|---------|-------|
| Cheeseweed          |         |               |                   |         |       |
| Chickweed           |         |               |                   |         |       |
| Clover              |         |               |                   |         |       |
| Cocklebur           |         |               |                   |         |       |
| Cudweed             |         |               |                   |         |       |
| Dock Seedling       |         |               |                   |         |       |
| Fat Hen             |         |               |                   |         |       |
| Fiddleneck          |         |               |                   |         |       |
| Filaree             |         |               |                   |         |       |
| Flaxleaved Fleabane |         |               |                   |         |       |
| Goosefoot           |         |               |                   |         |       |
| Groundcherry        |         |               |                   |         |       |
| Groundsel           |         |               |                   |         |       |
| Henbit              |         |               |                   |         |       |
| Knotweed            |         |               |                   |         |       |
| Lambsquarter        |         |               |                   |         |       |
| London Rocket       |         |               |                   |         |       |
| Marsetail           |         |               |                   |         |       |
| Miners Lettuce      |         |               |                   |         |       |
| Monolepis           |         |               |                   |         |       |
| Mustard             |         |               |                   |         |       |
| Nettle              |         |               |                   |         |       |
| Nightshade          |         |               |                   |         |       |
| Pigweed             |         |               |                   |         |       |
| Pineapple Weed      |         |               |                   |         |       |
| Popcorn Flower      |         |               |                   |         |       |
| Prickly Lettuce     |         |               |                   |         |       |
| Puncture Vine       |         |               |                   |         |       |
| Purslane            |         |               |                   |         |       |
| Red Maids           |         |               |                   |         |       |
| Russian Thistle     |         |               |                   |         |       |
| Shepherd's Purse    |         |               |                   |         |       |
| Sow Thistle         |         |               |                   |         |       |
| Speedwell           |         |               |                   |         |       |
| Spotted Spurge      |         |               |                   |         |       |
| Tolguacha           |         |               |                   |         |       |
| Wild Radish         |         |               |                   |         |       |

|                     | Pyramin | Pyramin + dalapon | Betamix | Endothal | Endothal + dalapon | Dalapon | IPC | Poast | Fusilade |
|---------------------|---------|-------------------|---------|----------|--------------------|---------|-----|-------|----------|
| Cheeseweed          |         |                   |         |          |                    |         |     |       |          |
| Chickweed           |         |                   |         |          |                    |         |     |       |          |
| Clover              |         |                   |         |          |                    |         |     |       |          |
| Cocklebur           |         |                   |         |          |                    |         |     |       |          |
| Cudweed             |         |                   |         |          |                    |         |     |       |          |
| Dock Seedling       |         |                   |         |          |                    |         |     |       |          |
| Fat Hen             |         |                   |         |          |                    |         |     |       |          |
| Fiddleneck          |         |                   |         |          |                    |         |     |       |          |
| Filaree             |         |                   |         |          |                    |         |     |       |          |
| Flaxleaved Fleabane |         |                   |         |          |                    |         |     |       |          |
| Goosefoot           |         |                   |         |          |                    |         |     |       |          |
| Groundcherry        |         |                   |         |          |                    |         |     |       |          |
| Groundsel           |         |                   |         |          |                    |         |     |       |          |
| Henbit              |         |                   |         |          |                    |         |     |       |          |
| Knotweed            |         |                   |         |          |                    |         |     |       |          |
| Lambsquarter        |         |                   |         |          |                    |         |     |       |          |
| London Rocket       |         |                   |         |          |                    |         |     |       |          |
| Marsetail           |         |                   |         |          |                    |         |     |       |          |
| Miners Lettuce      |         |                   |         |          |                    |         |     |       |          |
| Monolepis           |         |                   |         |          |                    |         |     |       |          |
| Mustard             |         |                   |         |          |                    |         |     |       |          |
| Nettle              |         |                   |         |          |                    |         |     |       |          |
| Nightshade          |         |                   |         |          |                    |         |     |       |          |
| Pigweed             |         |                   |         |          |                    |         |     |       |          |
| Pineapple Weed      |         |                   |         |          |                    |         |     |       |          |
| Popcorn Flower      |         |                   |         |          |                    |         |     |       |          |
| Prickly Lettuce     |         |                   |         |          |                    |         |     |       |          |
| Puncture Vine       |         |                   |         |          |                    |         |     |       |          |
| Purslane            |         |                   |         |          |                    |         |     |       |          |
| Red Maids           |         |                   |         |          |                    |         |     |       |          |
| Russian Thistle     |         |                   |         |          |                    |         |     |       |          |
| Shepherd's Purse    |         |                   |         |          |                    |         |     |       |          |
| Sow Thistle         |         |                   |         |          |                    |         |     |       |          |
| Speedwell           |         |                   |         |          |                    |         |     |       |          |
| Spotted Spurge      |         |                   |         |          |                    |         |     |       |          |
| Tolguacha           |         |                   |         |          |                    |         |     |       |          |
| Wild Radish         |         |                   |         |          |                    |         |     |       |          |

|                     | Eptam | Treflan |
|---------------------|-------|---------|
| Cheeseweed          |       |         |
| Chickweed           |       |         |
| Clover              |       |         |
| Cocklebur           |       |         |
| Cudweed             |       |         |
| Dock Seedling       |       |         |
| Fat Hen             |       |         |
| Fiddleneck          |       |         |
| Filaree             |       |         |
| Flaxleaved Fleabane |       |         |
| Goosefoot           |       |         |
| Groundcherry        |       |         |
| Groundsel           |       |         |
| Henbit              |       |         |
| Knotweed            |       |         |
| Lambsquarter        |       |         |
| London Rocket       |       |         |
| Marsetail           |       |         |
| Miners Lettuce      |       |         |
| Monolepis           |       |         |
| Mustard             |       |         |
| Nettle              |       |         |
| Nightshade          |       |         |
| Pigweed             |       |         |
| Pineapple Weed      |       |         |
| Popcorn Flower      |       |         |
| Prickly Lettuce     |       |         |
| Puncture Vine       |       |         |
| Purslane            |       |         |
| Red Maids           |       |         |
| Russian Thistle     |       |         |
| Shepherd's Purse    |       |         |
| Sow Thistle         |       |         |
| Speedwell           |       |         |
| Spotted Spurge      |       |         |
| Tolguacha           |       |         |
| Wild Radish         |       |         |

### 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   |
| Regrass                | W   |
| Sandbur                | S   |
| Volunteer Cereals      | W   |
| Wild Barley            | W   |
| Wild Oats              | W   |

|                        |  |
|------------------------|--|
| Annual Bluegrass       |  |
| Barnyardgrass          |  |
| Bromegrass             |  |
| Canarygrass            |  |
| Crabgrass              |  |
| Feather Fingergrass    |  |
| Fescues                |  |
| Foxtail (Bristlegrass) |  |
| Johnsongrass (Seed)    |  |
| Lovegrass              |  |
| Nutsedge               |  |
| Rabbitfootgrass        |  |
| Regrass                |  |
| Sandbur                |  |
| Volunteer Cereals      |  |
| Wild Barley            |  |
| Wild Oats              |  |

|                        |  |
|------------------------|--|
| Annual Bluegrass       |  |
| Barnyardgrass          |  |
| Bromegrass             |  |
| Canarygrass            |  |
| Crabgrass              |  |
| Feather Fingergrass    |  |
| Fescues                |  |
| Foxtail (Bristlegrass) |  |
| Johnsongrass (Seed)    |  |
| Lovegrass              |  |
| Nutsedge               |  |
| Rabbitfootgrass        |  |
| Regrass                |  |
| Sandbur                |  |
| Volunteer Cereals      |  |
| Wild Barley            |  |
| Wild Oats              |  |

|                        |  |
|------------------------|--|
| Annual Bluegrass       |  |
| Barnyardgrass          |  |
| Bromegrass             |  |
| Canarygrass            |  |
| Crabgrass              |  |
| Feather Fingergrass    |  |
| Fescues                |  |
| Foxtail (Bristlegrass) |  |
| Johnsongrass (Seed)    |  |
| Lovegrass              |  |
| Nutsedge               |  |
| Rabbitfootgrass        |  |
| Regrass                |  |
| Sandbur                |  |
| Volunteer Cereals      |  |
| Wild Barley            |  |
| Wild Oats              |  |

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

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

\*\*\* Effective when applied before weed emergence.



# SUMMARY OF HERBICIDE PERFORMANCE IN SUGAR BEET TRIALS CONDUCTED IN THE CENTRAL SAN JOAQUIN VALLEY

| METHOD OF APPLICATION                        | HERBICIDE                        | CONDITIONS FAVORING MOST EFFECTIVE WEED CONTROL                                                                                                                                                                                       | CONDITIONS RESULTING IN POOR CONTROL OR INJURY                                                                                                                                                                                                              | APPLICATION PERIOD       |
|----------------------------------------------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| Pre-Plant Incorporated Only                  | Roneet® or Tillam®               | Summer annual broadleaf weeds and grasses in well prepared seed beds in nutsedge infested fields. Requires thorough incorporation.                                                                                                    | Where winter broadleaf weeds are expected, or where cloddy seed bed conditions are expected.                                                                                                                                                                | March through September  |
| Pre-Emergence or Pre-Plant Incorporated      | Pyramin®                         | Winter broadleaf weeds, mild temperatures with good growing conditions.                                                                                                                                                               | Cold temperatures with poor growing conditions. When grasses or vol. cereals are expected. Under sprinkler irrigation where more than 2" are applied per set.                                                                                               | October through February |
|                                              | Pyramin® + TCA                   | Winter broadleaf weeds and grasses; mild temperatures with good growing conditions.                                                                                                                                                   | Cold temperatures and poor growing conditions. Under sprinkler irrigation where more than 2" are applied per set prior to emergence.                                                                                                                        | October through February |
|                                              | Pyramin® + Nortron®              | When volunteer cereals and winter broadleaf weeds are expected, with good growing conditions.                                                                                                                                         | Cold temperatures and poor growing conditions when ryegrass is expected. Under sprinkler irrigation where more than 2" are applied per set before emergence.                                                                                                | October through February |
|                                              | Nortron®                         | When volunteer barley, wheat and wild oats are expected. Annual grasses except ryegrass.                                                                                                                                              | When winter weeds other than volunteer cereals are expected.                                                                                                                                                                                                | October through February |
|                                              | Antor®                           | For winter and summer annual grasses other than volunteer cereals and wild oats. When pigweeds are present.                                                                                                                           | When winter broadleaf or volunteer cereal are present. When broadleaf weeds other than pigweed are expected.                                                                                                                                                | All planting Periods     |
|                                              | Antor® + Nortron®                | Summer annual broadleaf and grasses. Especially good for pigweeds, purslane and barnyardgrass.                                                                                                                                        | When winter annual broadleaf weeds are expected.                                                                                                                                                                                                            | All planting Periods     |
| Post-Emergence                               | Pyramin® + Dalapon + Surfactant  | Seedling broadleaf weeds and grasses growing vigorously. Residual activity occurs following rainfall.                                                                                                                                 | Larger weeds and weeds under moisture stress.                                                                                                                                                                                                               | October through February |
|                                              | Betamix®                         | When vigorously growing winter and summer annual broadleaf weeds in their seedling stage are present.                                                                                                                                 | When grasses, knotweed or swamp smartweed are present. And when other weeds are beyond their seedling stage of growth. Delay application after 3 p.m. when temperature exceeds 80°F to reduce injury. Do not apply to weeds that are under moisture stress. | All planting Periods     |
|                                              | Endothal®                        | When fiddleneck, knotweed or swamp smartweed predominate.                                                                                                                                                                             | When weeds other than fiddleneck and/or swamp smartweed are present.                                                                                                                                                                                        | October through February |
|                                              | Endothal® + Dalapon + Surfactant | Under winter temperatures (below 70°F) when volunteer barley, wheat or wild oats are main weeds present.                                                                                                                              | When temperatures exceed 70°F. When broadleaf weeds other than fiddleneck and swamp smartweed are present. Seedling beets (2-4 leaf stage) can be damaged.                                                                                                  | October through February |
|                                              | Chemhoe®                         | Canary grass or volunteer cereals and wild oats under sprinkler irrigation or if more than 0.5 inches of rain falls soon after treatment.                                                                                             | Where broadleaf weeds predominate. Where only light rainfall or irrigation occur within 24-48 hours following treatment.                                                                                                                                    | October through February |
|                                              | Poast®<br>Fusilade®              | Vigorously growing summer and winter annual grasses before tillering, except annual bluegrass. Irrigation followed treatment.                                                                                                         | When grasses are moisture stressed and in late tillering stage. Not irrigated following treatment.                                                                                                                                                          | All planting Periods     |
| Post-Thinning Soil Incorporated (Layby)      | Treflan®                         | Summer annual grasses, pigweed and lambsquarter with thorough soil incorporation into cleaned fields.                                                                                                                                 | When resistant weed species predominate. When poor soil incorporation is obtained. Where established weeds are present.                                                                                                                                     | February through August  |
| Post-Thinning Injected into Irrigation Water | Eptam®                           | Injected into irrigation water for control of summer annual grasses and broadleaf weeds before or immediately after germination. Where Treflan resistant species including nutsedge are expected. Repeat application may be required. | Where poor subbing or water distribution occur. Where large or resistant weeds including sunflower and cocklebur predominate. Where follow-up treatment is not provided for.                                                                                | February through August  |



## WEED CONTROL STUDIES IN SUGARBEET PRODUCTION - 1982-1983

### Preplant Incorporated and Preemergence Trials

The primary purpose of conducting the preplant incorporated and preemergence trials was to evaluate the effectiveness and selectivity of combinations and sequential applications of herbicides to obtain control of the broadest spectrum of weeds infesting sugarbeet fields in the Central San Joaquin Valley.

### Procedures Used

Herbicides were applied with an experimental sprayer, tractor-pulled and equipped with an air compressor to provide constant pressure of 30 psi, and with a continually agitated shaking device. In some trials the herbicides were applied with a CO<sub>2</sub> sprayer.

All trials were replicated in randomized block designs. In the preplant incorporated trials the herbicides were mixed into the top 2-1/2-inch layer of soil with a power-driven rotary tiller on preshaped beds.

The soil type, method of irrigation, variety of beets planted, date of trial establishment, and other pertinent information is given in the table that contains the summary for that specific trial. The tables follow the narrative sections of the reports.

Herbicides used are listed in the tables summarizing the results. Their rates of application are given as active ingredients per treated acre and abbreviated as "lbai/A." The methods of evaluations used in the trials varied. In some, stand counts were taken; in others only visual assessments of weed control, beet injury, or beet vigor were made. The rating system used was as follows:

|                     |                                                                                                                                                                                                |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>Weed Control</u> | A 0 to 100 percent scale is used. A rating above 80 to 85 percent can be considered as acceptable control in a commercially grown beet field. The surviving species of weeds are often listed. |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



Beet Injury was assessed on a 0 to 10 rating scale; 0 = no injury, 10 = very severe injury. Persistent injury ratings above "3" are not acceptable in commercially grown beets. However, herbicides may cause temporary injury expressed as stunting, deformity, curling or scorching of the leaf margins. These symptoms may be short-lived and do not adversely affect the growth, quality, and yield. Hence, it is essential to make more than one evaluation.

Vigor Rating was also based on 0 to 10 scale. A "0" rating means very poor vigor, and "10" denotes vigorously growing beet seedlings. A vigor rating of 8 or lower may not be acceptable especially if it persists. However, temporary reduction in vigor does not adversely affect the yield.

### Results and Discussion

In the Central San Joaquin Valley, combinations and sequential applications of herbicides are needed to maintain seasonal control of weeds in sugarbeet production. This was again demonstrated as in earlier studies.

In the preplant incorporated trials none of the herbicides adversely affected the emergence of the sugarbeet seedlings. However, certain combinations such as Antor plus Nortron, and the three-way combination of Antor plus Nortron plus Pyramin caused temporary reduction in the vigor of beet seedlings, but this was not reflected in reduced yield, as shown in Table 3.

Sugarbeets are planted, at times, in soils that are high in total salts and/or in alkaline soils. The use of many herbicides in these soils whether applied preplant incorporated or preemergence under sprinkler irrigation has adversely affected the stand and reduced the vigor of the seedlings. This was observed in numerous trials in the past as well as in the trial summarized in Tables 9 and 10. Two preemergence trials were established on the same day, one on Merced clay soil high in total salts and the other on Chino loam soil that is moderately saline. Both the stand and seedling vigor was poorer in the highly



saline soil. It is interesting to note that Antor used alone had the least adverse effect on the stand as well as on the seedling vigor.

This suggests that if beets are planted in soils high in total salts or in alkaline soils, growers should carefully weigh the merit of using preplant incorporated or preemergence herbicides. They may find that the use of postemergence herbicides, coupled with timely cultivation, may provide effective weed control with a greater margin of selectivity.

#### Options are Numerous

With the availability of Betamix and Betanex, two broadleaf herbicides, and the introduction of several grass herbicides, such as Poast and Fusilade, growers of sugarbeets have numerous options. They can use combinations of preplant incorporated herbicides in furrow irrigated fields. They can apply combinations of herbicides after planting, but preemergence to the crop, in sprinkler irrigated fields or in areas where rainfall can be relied on to leach the herbicide into the top 1-1/2 to 2 inches of soil.

Growers have the option to apply a preplant or preemergence herbicide to control the most numerous weed species and follow-up with postemergence application of herbicides. A further option could be to omit using preplant or preemergence herbicides and to depend entirely on the use of postemergence herbicides.

The feasibility of using these options have been demonstrated in applied research studies. However, climatic conditions and other cultural operations may impose severe limitations on some of the above listed options, especially reliance entirely on postemergence herbicides.

For the most effective and economical use of postemergence herbicides, entry into the field with ground equipment is essential. Fall or winter planted beet fields are often not accessible for their timely application. Entry into the field often requires closing of irrigation ditches or removal of pipes. Proper timing of the application of postemergence herbicides relative to the growth of the weeds and beets is very critical. Many weeds are susceptible to postemergence herbicides in their seedling stage and become less and less susceptible as they mature.



It is necessary to consider that sugarbeets are most adversely affected by weed competition during their seedling stage of growth. Weeds are also most difficult and expensive to remove from the planted row. Electronic or mechanical thinners cannot be used effectively in weed-infested fields. These are compelling reasons for the careful consideration of the continued use of herbicides preplant or preemergence especially in fall and winter planted fields.

The following combinations may warrant consideration:

Antor plus Pyramin in fields where weeds in the mustard family and winter annual grasses, other than volunteer cereals, have provided effective broad spectrum weed control. This combination can be preplant incorporated or applied preemergence.

Antor plus Nortron has been used effectively in fields infested primarily with grasses including volunteer cereals and certain broadleaf weeds. This combination has not provided adequate control of winter annual weeds in the mustard and sunflower families (i.e., sowthistle, prickly lettuce, common groundsel).

Pyramin plus Nortron has provided excellent control of volunteer cereals and other winter annual grasses, except annual ryegrass, and a large spectrum of broadleaf weeds.

Antor plus Nortron plus Pyramin was an effective combination for the control of a large spectrum of winter annual broadleaf and grass weeds including volunteer cereals and annual ryegrass. See Tables 1 through 10.

Pyramin plus TCA is being used extensively in late fall and winter planted fields. Preplant incorporated or preemergence applications have provided very effective control of a broad spectrum of broadleaf weeds and small seeded winter annual grasses. The combination has been somewhat less effective in fields infested with volunteer cereals and wild oats. TCA is a water soluble compound readily leachable in soils. In preplant incorporated and furrow irrigated



fields, the treated band can be displaced if water is applied in every other furrow to obtain a stand.

Antor plus Roneet warrants consideration in spring and early summer planted fields. This combination has provided good control in fields that were somewhat cloddy; under such conditions the performance of Roneet was erratic. In combination, these two herbicides provided good control of a broad spectrum of broadleaf and grass weeds, including those in the potato family (groundcherry, nightshades) and yellow nutsedge.

Endothal plus Nortron applied preemergence may warrant consideration in fields infested with knotweed, smartweed, fiddleneck, volunteer cereals and other grasses.

#### Sequential Application of Herbicides

In many areas, fields planted with sugarbeets are often infested with a large number of different species of broadleaf and grass weeds. Perfect control is difficult to obtain even with combinations of preplant or postemergence herbicides. Lack of adequate information about the weed infestation can result in poor selection of herbicides. Therefore, trials were conducted to gather more information about the effect of postemergence applied herbicides, especially Betamix, Poast and Fusilade on seedling beets in fields treated with preplant incorporated or preemergence applied herbicides. Summaries of these studies are presented in Tables 1, 2, 5, and 8. The results and observations indicate that:

Betamix, applied on young beets growing in areas treated with Roneet preplant incorporated, caused temporary injury to the beets. The symptoms were barely evident three weeks following the Betamix application.

Betamix caused some injury to beet seedlings whether they were growing in areas treated or untreated with herbicides prior to emergence. On vigorously growing beets, the symptoms were short-lived.



Betamix applied on beet seedlings in areas treated with Antor or Antor plus Nortron applied preemergence, caused temporary retardation in the vigor of growth and the typical symptoms of marginal necrosis (death) of leaf tissue, necrotic spotting and thickening of the leaf tissue. These symptoms were evident only on the leaves sprayed. The newly developing leaves appeared healthy without any evidence of phytotoxicity.

It is essential to emphasize that Betamix causes less injury to the beets when it is applied after 3:00 p.m. if the temperature is above 75<sup>0</sup> to 80<sup>0</sup>F.

Poast or Fusilade, applied postemergence on beets growing in areas treated with preemergence applied herbicides, had no adverse effect on the growth of the beets and they provided effective control of young vigorously growing grasses.

In the following section, a more detailed discussion is presented on the performance of Poast, Fusilade, and other newly introduced grass herbicides.



TABLE 1 -EFFECT OF PREPLANT INCORPORATED HERBICIDES ON SUGARBEET  
EMERGENCE, SUGARBEET VIGOR AND WEED CONTROL

302, 425, 81, 10, 83-2

Location: Westside Field Station

Soil Type: Panoche clay loam

Variety: SSE-1

Herbicides Applied: 4-1-83, 5-3-83

Irrigation Method: Furrow

Plot Size: 2 beds (12") x 45', Reps 4

Planted: 4-1-83

Evaluated: See below

BEET EMERGENCE, VIGOR AND WEED CONTROL EVALUATIONS

| Herbicide   | Lb ai/<br>Acre | Date<br>Applied | 4-22-83   |                    |                   |                  |                     |
|-------------|----------------|-----------------|-----------|--------------------|-------------------|------------------|---------------------|
|             |                |                 | Beet*     | Beet <sup>1/</sup> | %                 | %                | Weeds <sup>2/</sup> |
|             |                |                 | Emergence | Vigor              | Brdlf.<br>Control | Grass<br>Control | Present             |
| A Roneet    | 4.0            | 4-1-83          | 5.0       | 9.9                | 93                | 99               | I, La Ni            |
| Betamix     | 1.0            | 5-3-83          |           |                    |                   |                  |                     |
| B Roneet    | 4.0            | 4-1-83          | 4.1       | 9.8                | 94                | 100              | I, La               |
| C Roneet    | 6.0            | 4-1-83          | 5.1       | 9.8                | 96                | 99               | I, Sf               |
| Betamix     | 1.0            | 5-3-83          |           |                    |                   |                  |                     |
| D Antor     | 2.0            | 4-1-83          | 4.8       | 9.5                | 66                | 99               | La, Ni, Sf          |
| Betamix     | 1.0            | 5-3-83          |           |                    |                   |                  |                     |
| E Antor     | 4.0            | 4-1-83          | 4.7       | 10.0               | 62                | 97               | I, La, Sf           |
| Betamix     | 1.0            | 5-3-83          |           |                    |                   |                  |                     |
| F Antor     | 2.0            | 4-1-83          | 4.6       | 8.8                | 99                | 100              | I                   |
| Nortron     | 2.0            | 4-1-83          |           |                    |                   |                  |                     |
| G Antor     | 2.0            | 4-1-83          | 3.7       | 9.0                | 97                | 99               | I, Sf               |
| Pyramin     | 3.0            | 4-1-83          |           |                    |                   |                  |                     |
| H Antor     | 4.0            | 4-1-83          | 3.4       | 9.1                | 98                | 99               | I, La               |
| Roneet      | 4.0            | 4-1-83          |           |                    |                   |                  |                     |
| J Nortron   | 2.0            | 4-1-83          | 4.7       | 9.3                | 97                | 56               | I, Sf               |
| Pyramin     | 3.0            | 4-1-83          |           |                    |                   |                  |                     |
| K Antor     | 2.0            | 4-1-83          | 4.4       | 8.2                | 99                | 91               | Sf                  |
| Nortron     | 2.0            | 4-1-83          |           |                    |                   |                  |                     |
| Pyramin     | 2.0            | 4-1-83          |           |                    |                   |                  |                     |
| L Antor     | 2.0            | 4-1-83          | 4.3       | 9.6                | 96                | 99               | I, La, Sf           |
| Roneet      | 4.0            | 4-1-83          |           |                    |                   |                  |                     |
| Betamix     | 1.0            | 5-3-83          |           |                    |                   |                  |                     |
| M Untreated | ---            | ---             | 3.8       | 9.9                | 0                 | 0                | B, I, La, Ni        |

<sup>1/</sup>Beet Vigor ratings are based on a scale of 0 - 10. 0 = very poor vigor, 10 = vigorously growing plants.

<sup>2/</sup>Weeds Present: B=barnyardgrass, I=pigweed, La=lambquarter, Ni=nightshade, Sf=sunflower

\*Emergence based on beets in 1 ft. of row, average of 4 replications.

Remarks: Herbicides incorporated with a power driven rotary tiller to a depth of 2½ inches.



TABLE 2 - EFFECT OF PREPLANT INCORPORATED HERBICIDES ON SUGARBEET  
INJURY, VIGOR AND WEED CONTROL  
302, 425, 81, 10, 83-2

Location: Westside Field Station  
Soil Type: Panoche clay loam  
Variety: SSE-1  
Herbicides Applied: 4-1-83, 5-3-83

Irrigation Method: Furrow  
Plot Size: 2 beds (12") x 45', Reps 4  
Planted: 4-1-83  
Evaluated: See below

|             |                |                 | BEET INJURY, VIGOR AND WEED CONTROL EVALUATIONS |                   |                  |                             |
|-------------|----------------|-----------------|-------------------------------------------------|-------------------|------------------|-----------------------------|
|             |                |                 | 5-16-83                                         |                   |                  | 5-27-83                     |
| Herbicide   | Lb ai/<br>Acre | Date<br>Applied | Beet <sup>1/</sup><br>Injury                    | Brdlf.<br>Control | Grass<br>Control | Beet <sup>2/</sup><br>Vigor |
| A Roneet    | 4.0            | 4-1-83          | 2.0                                             | 100               | 98               | 9.8                         |
| Betamix     | 1.0            | 5-3-83          |                                                 |                   |                  |                             |
| B Roneet    | 4.0            | 4-1-83          | 0                                               | 96                | 98               | 10.0                        |
| C Roneet    | 6.0            | 4-1-83          | 2.5                                             | 100               | 99               | 9.6                         |
| Betamix     | 1.0            | 5-3-83          |                                                 |                   |                  |                             |
| D Antor     | 2.0            | 4-1-83          | 2.0                                             | 100               | 98               | 9.8                         |
| Betamix     | 1.0            | 5-3-83          |                                                 |                   |                  |                             |
| E Antor     | 4.0            | 4-1-83          | 2.2                                             | 100               | 95               | 9.8                         |
| Betamix     | 1.0            | 5-3-83          |                                                 |                   |                  |                             |
| F Antor     | 2.0            | 4-1-83          | 0.5                                             | 80                | 99               | 10.0                        |
| Nortron     | 2.0            | 4-1-83          |                                                 |                   |                  |                             |
| G Antor     | 2.0            | 4-1-83          | 0.5                                             | 90                | 98               | 10.0                        |
| Pyramin     | 3.0            | 4-1-83          |                                                 |                   |                  |                             |
| H Antor     | 4.0            | 4-1-83          | 1.0                                             | 90                | 98               | 10.0                        |
| Roneet      | 4.0            | 4-1-83          |                                                 |                   |                  |                             |
| J Nortron   | 2.0            | 4-1-83          | 0                                               | 95                | 60               | 10.0                        |
| Pyramin     | 3.0            | 4-1-83          |                                                 |                   |                  |                             |
| K Antor     | 2.0            | 4-1-83          | 1.5                                             | 80                | 90               | 10.0                        |
| Nortron     | 2.0            | 4-1-83          |                                                 |                   |                  |                             |
| Pyramin     | 2.0            | 4-1-83          |                                                 |                   |                  |                             |
| L Antor     | 2.0            | 4-1-83          | 3.0                                             | 100               | 98               | 9.5                         |
| Roneet      | 4.0            | 4-1-83          |                                                 |                   |                  |                             |
| Betamix     | 1.0            | 5-3-83          |                                                 |                   |                  |                             |
| M Untreated | ---            | ---             | 0                                               | 0                 | 0                | 10.0                        |

<sup>1/</sup>Beet injury rating based on a scale of 0 to 10. 0 = no injury, 10 = severe injury.

<sup>2/</sup>Beet vigor rating based on a scale of 0 to 10. 0 = very poor vigor, 10 = vigorously growing plants.

Remarks: Herbicides incorporated with a power driven rotary tiller to a depth of 2½ inches.  
 All weeds from all plots removed by hand weeding.



TABLE 3 -EFFECT OF PREPLANT INCORPORATED HERBICIDES ON WEED CONTROL  
BEET VIGOR AND BEET YIELD

302, 425, 81, 10, 82-9

Location: West Side Field Station  
Soil Type: Panoche Clay Loam  
Herbicides Applied: 4-20-82  
Variety: SP-H9E  
Beets Planted: 4-20-82

Irrigation: Furrow  
Plot Size: 2 beds (12" base) x 45' 4 reps  
Evaluated: 5-11 & 5-19/82  
Harvested: 11-4-82

| Stand Count, Weed Control and Yield Data |                |                         |               |                      |               |                      |            |              |                |
|------------------------------------------|----------------|-------------------------|---------------|----------------------|---------------|----------------------|------------|--------------|----------------|
| Herbicide                                | Lb.ai/<br>Acre | 5/11/82                 |               | 5/19/82              |               | Harvest Data 11/4/82 |            |              |                |
|                                          |                | Beets per<br>ft. of row | Beet<br>Vigor | % Bdlf.<br>Weed Cntl | Beet<br>Vigor | Beets<br>T/A         | %<br>Sugar | Sugar<br>T/A | Nitrate<br>PPM |
| A Roneet                                 | 5.0            | 5.6                     | 9.0           | 94                   | 9.2           | 37.0                 | 13.8       | 5.1          | 35.3           |
| B UBI-S734                               | 1.0            | 5.8                     | 9.5           | 57                   | 9.2           | 32.9                 | 13.7       | 4.5          | 45.8           |
| C UBI-S734                               | 2.0            | 4.9                     | 8.5           | 72                   | 8.5           | 35.8                 | 14.0       | 5.0          | 44.0           |
| D Antor                                  | 4.0            | 5.4                     | 9.2           | 85                   | 8.5           | 34.0                 | 14.0       | 4.8          | 37.0           |
| E Nortron F1                             | 2.0            | 5.2                     | 9.2           | 81                   | 9.0           | 33.8                 | 14.1       | 4.7          | 40.0           |
| F Nortron Ec                             | 2.0            | 4.9                     | 9.2           | 90                   | 9.0           | 35.2                 | 13.7       | 4.8          | 53.8           |
| G Pyramin                                | 3.0            | 5.5                     | 8.5           | 99                   | 8.5           | 34.6                 | 14.3       | 4.9          | 40.8           |
| UBI-S734                                 | 2.0            |                         |               |                      |               |                      |            |              |                |
| H Antor                                  | 1.0            | 5.7                     | 8.5           | 89                   | 9.0           | 34.6                 | 14.1       | 4.8          | 34.3           |
| Nortron F1                               | 2.0            |                         |               |                      |               |                      |            |              |                |
| I Antor                                  | 2.0            | 5.9                     | 8.0           | 96                   | 8.0           | 36.4                 | 13.9       | 5.1          | 40.8           |
| Nortron F1                               | 2.0            |                         |               |                      |               |                      |            |              |                |
| J Antor                                  | 2.0            | 4.9                     | 9.5           | 91                   | 9.0           | 36.0                 | 14.0       | 5.1          | 38.3           |
| Nortron F1                               | 1.0            |                         |               |                      |               |                      |            |              |                |
| K Antor                                  | 3.0            | 5.7                     | 9.0           | 96                   | 9.8           | 33.6                 | 14.4       | 4.8          | 32.0           |
| Nortron F1                               | 1.0            |                         |               |                      |               |                      |            |              |                |
| L Pyramin                                | 3.0            | 5.0                     | 8.0           | 91                   | 8.2           | 36.3                 | 13.7       | 5.0          | 50.5           |
| Nortron F1                               | 2.0            |                         |               |                      |               |                      |            |              |                |
| Antor                                    | 2.0            |                         |               |                      |               |                      |            |              |                |
| M Pyramin                                | 3.0            | 5.6                     | 10.0          | 87                   | 9.5           | 35.6                 | 14.2       | 5.1          | 38.8           |
| Antor                                    | 2.0            |                         |               |                      |               |                      |            |              |                |
| N Pyramin                                | 3.0            | 5.2                     | 9.5           | 94                   | 9.2           | 35.7                 | 13.5       | 4.8          | 43.3           |
| Nortron F1                               | 2.0            |                         |               |                      |               |                      |            |              |                |
| P Untreated                              | ---            | 4.9                     | 10            | 50                   | 9.0           | 37.0                 | 13.6       | 5.0          | 4.30           |

Statistical Notation

% C.V. = 6.07                      NS              NS              -              -              NS              NS              NS              NS

Remarks: Following stand count and weed control evaluations the field was thinned, hand-weeded and Treflan was applied at 0.75 lbai/A. Bayleton at 0.5 lbai/A was used for powdery mildew control.



TABLE 4 - SUGAR BEET WEED CONTROL - PREEMERGENCE

302, 425, 81, 10, 82-2

Location: Hwy. 33, 4 m. N. of Adams Ave.  
Murrieta FarmsIrrigation Method: SprinklerSoil Type: Oxali's silty clayPlot Size: 5' x 30', Reps 4Herbicides Applied: 10-21-81Planted: 10-20-81Variety: SP H-9Evaluated: 2-1-82

| Herbicide   | Lb ai/A | WEED CONTROL AND SUGAR BEET VIGOR <sup>1/</sup> |                  |              |            |
|-------------|---------|-------------------------------------------------|------------------|--------------|------------|
|             |         | Rye Gr. Cont.                                   | Vol. Wheat Cont. | Brdlf. Cont. | S.B. Vigor |
| A Antor     | 2.0     | 7.0                                             | 3.3              | 3.3          | 8.0        |
| B Antor     | 4.0     | 9.1                                             | 4.3              | 5.0          | 7.0        |
| C Nortron   | 2.0     | 10.0                                            | 10.0             | 0.7          | 8.5        |
| D Antor     | 2.0     | 8.2                                             | 9.5              | 4.2          | 7.2        |
| Nortron     | 2.0     |                                                 |                  |              |            |
| E Pyramin   | 3.0     | 8.6                                             | 3.3              | 7.6          | 7.3        |
| Antor       | 2.0     |                                                 |                  |              |            |
| F Pyramin   | 3.0     | 9.7                                             | 10.0             | 6.7          | 9.0        |
| Nortron     | 2.0     |                                                 |                  |              |            |
| G Pyramin   | 2.0     | 7.5                                             | 9.3              | 5.7          | 8.7        |
| Nortron     | 2.0     |                                                 |                  |              |            |
| Antor       | 2.0     |                                                 |                  |              |            |
| H Pyramin   | 4.0     | 6.7                                             | 9.2              | 9.5          | 5.7        |
| Dalapon     | 2.0     |                                                 |                  |              |            |
| J Antor     | 2.0     | 4.7                                             | 9.5              | 3.2          | 8.7        |
| Nortron     | 1.5     |                                                 |                  |              |            |
| K Untreated | ---     | 0                                               | 2.5              | 2.6          | 6.2        |

<sup>1/</sup> Evaluations are based on a 0 to 10 scale. 0 = no weed control or poor beet vigor;  
10 = perfect weed control, or, as a vigor rating, vigorously growing beets.

Remarks: Evaluations are based on an average of 4 replications.



TABLE 5 - EFFECT OF PREEMERGENCE AND POSTEMERGENCE APPLIED HERBICIDES ON  
SUGARBEET WEED CONTROL AND VIGOR

302, 425, 81, 10 82-2

Location: Hwy. 33, 4 m. N. of Adams Ave.  
Murrieta Farms

Irrigation Method: Sprinkler

Soil Type: Oxali's silty clay

Plot Size: 5' x 30', Reps 4

Herbicides Applied: 10-21-81, 12-3-81

Planted: 10-20-81

Variety: SP H-9

Evaluated: 12-14-81

Weed Control and Sugarbeet Vigor <sup>1/</sup>

| Herbicide                          | Lb.ai/<br>Acre    | Date of<br>Treat.   | Rye<br>Grass<br>Control | Volunteer<br>Wheat<br>Control | Brdlf.<br>Control | Beet<br>Vigor |
|------------------------------------|-------------------|---------------------|-------------------------|-------------------------------|-------------------|---------------|
| A Antor                            | 2.0               | 10-21-82            | 9.1                     | 1.7                           | 2.2               | 8.7           |
| B Antor                            | 4.0               | 10-21-82            | 9.7                     | 5.3                           | 4.0               | 7.5           |
| C Nortron<br>Poast *               | 2.0<br>0.5        | 10-21-82<br>12-3-82 | 1.2                     | 8.5                           | 2.2               | 9.0           |
| D Antor<br>Nortron                 | 2.0<br>2.0        | 10-21-82            | 9.5                     | 9.7                           | 6.2               | 7.6           |
| E Pyramin<br>Antor                 | 3.0<br>2.0        | 10-21-82            | 9.3                     | 3.3                           | 9.4               | 9.1           |
| F Pyramin<br>Nortron<br>Fusilade * | 3.0<br>2.0<br>0.5 | 10-21-82<br>12-3-82 | 5.1                     | 9.8                           | 8.5               | 8.8           |
| G Pyramin<br>Nortron<br>Antor      | 2.0<br>2.0<br>2.0 | 10-21-82            | 9.2                     | 10.0                          | 9.7               | 9.0           |
| H Pyramin<br>Dalapon *             | 4.0<br>2.0        | 12-3-82             | 1.2                     | 7.5                           | 9.7               | 9.3           |
| J Antor<br>Nortron                 | 2.0<br>1.5        | 10-21-82            | 9.1                     | 9.8                           | 3.0               | 9.2           |
| K Untreated                        | ---               | ---                 | 0                       | 2.5                           | 2.5               | 9.7           |

\* Surfel added at 1 qt./acre.

<sup>1/</sup> Evaluations are based on a 0 to 10 scale. 0 = no weed control or poor beet vigor;  
10 = perfect weed control or, as a vigor rating, vigorously growing beets.

Remarks: Evaluations are based on an average of 4 replications.



TABLE 6 - EFFECT OF PREEMERGENCE APPLIED HERBICIDES ON BROADLEAF CONTROL  
AND SUGARBEET VIGOR

302, 425, 81, 10, 82-1

|                            |                    |                    |                          |
|----------------------------|--------------------|--------------------|--------------------------|
| <u>Location:</u>           | Murrieta Farms     | <u>Irrigation:</u> | Sprinkler                |
| <u>Soil Type:</u>          | Panoche silty clay | <u>Plot Size:</u>  | 2 beds (12" based) x 30' |
| <u>Herbicides Applied:</u> | 10-12-81           |                    | 4 reps                   |
| <u>Variety:</u>            | SPH-9              | <u>Planted:</u>    | 10-12-81                 |

|             |                | Beet Vigor and Weed Control Evaluation |                             |                   |                                |
|-------------|----------------|----------------------------------------|-----------------------------|-------------------|--------------------------------|
|             |                | 10-30-83                               |                             | 12-2-81           |                                |
| Herbicide   | Lb.ai/<br>Acre | Stand<br>Count                         | Beet <sup>1/</sup><br>Vigor | % Weed<br>Control | Weeds <sup>2/</sup><br>Present |
| A Antor     | 2.0            | 2.8                                    | 8.0                         | 20                | Go,L,M,P,S,So                  |
| B Antor     | 4.0            | 2.4                                    | 7.2                         | 32                | Go,L,M,P,S,So                  |
| C Nortron   | 2.0            | 2.1                                    | 9.5                         | 12                | Go,L,M,P,S,So                  |
| D Antor     | 2.0            | 2.5                                    | 7.5                         | 20                | Go,L,S,So                      |
| Nortron     | 2.0            |                                        |                             |                   |                                |
| E Pyramin   | 3.0            | 2.8                                    | 7.0                         | 85                | So retarded                    |
| Antor       | 2.0            |                                        |                             |                   |                                |
| F Pyramin   | 3.0            | 2.7                                    | 6.2                         | 91                | So                             |
| Nortron     | 2.0            |                                        |                             |                   |                                |
| G Antor     | 4.0            | 2.8                                    | 6.5                         | 45                | Go,S,So                        |
| Nortron     | 2.0            |                                        |                             |                   |                                |
| H Pyramin   | 2.0            | 2.1                                    | 7.0                         | 76                | Go,S,So                        |
| Nortron     | 2.0            |                                        |                             |                   |                                |
| Antor       | 2.0            |                                        |                             |                   |                                |
| J Untreated | ---            | 2.5                                    | 9.0                         | 0                 | Go,L,M,P,S,So                  |

<sup>1/</sup> Beet vigor evaluation based on a 1 to 10 scale. 0=poor vigor, 10=vigorously growing seedlings.

<sup>2/</sup> Weeds present: Go= groundsel, L=London rocket, M=black mustard, P=prickly lettuce, s=shepherd's purse, So=sowthistle.



**TABLE 7 -EFFECT OF PREEMERGENCE AND POSTEMERGENCE APPLIED HERBICIDES ON  
SUGARBEET WEED CONTROL AND VIGOR**

302, 425, 81, 10, 82-2A

Location: Hwy. 33, 4 m. N. of Adams Ave.  
Murrieta Farms

Irrigation Method: Sprinkler

Soil Type: Oxali's silty clay

Plot Size: 5' x 30', Reps 4

Herbicides Applied: 10-21-81, 12-3-81

Planted: 10-20-81

Variety: SP H-9

Evaluated: 2-1-82

Weed Control and Sugarbeet Vigor <sup>1/</sup>

| Herbicide                          | Lb.ai/<br>Acre    | Date of<br>Treat.   | Rye<br>Grass<br>Control | Volunteer<br>Wheat<br>Control | Brdlf.<br>Control | Beet<br>Vigor |
|------------------------------------|-------------------|---------------------|-------------------------|-------------------------------|-------------------|---------------|
| A Antor                            | 2.0               | 10-21-82            | 7.0                     | 3.3                           | 3.3               | 8.0           |
| B Antor                            | 4.0               | 10-21-82            | 9.1                     | 4.3                           | 5.0               | 7.0           |
| C Nortron<br>Poast *               | 2.0<br>0.5        | 10-21-82<br>12-3-82 | 10.0                    | 10.0                          | 0.7               | 8.5           |
| D Antor<br>Nortron                 | 2.0<br>2.0        | 10-21-82            | 8.2                     | 9.5                           | 4.2               | 7.2           |
| E Pyramin<br>Antor                 | 3.0<br>2.0        | 10-21-82            | 8.6                     | 3.3                           | 7.6               | 7.3           |
| F Pyramin<br>Nortron<br>Fusilade * | 3.0<br>2.0<br>0.5 | 10-21-82<br>12-3-82 | 9.7                     | 10.0                          | 6.7               | 9.0           |
| G Pyramin<br>Nortron<br>Antor      | 2.0<br>2.0<br>2.0 | 10-21-82            | 7.5                     | 9.3                           | 5.7               | 8.7           |
| H Pyramin<br>Dalapon *             | 4.0<br>2.0        | 12-3-82             | 6.7                     | 9.2                           | 9.5               | 5.7           |
| J Antor<br>Nortron                 | 2.0<br>1.5        | 10-21-82            | 4.7                     | 9.5                           | 3.2               | 8.7           |
| K Untreated                        | ---               | ---                 | 0                       | 2.5                           | 2.6               | 6.2           |

\* Surfel added at 1 qt./acre.

<sup>1/</sup> Evaluations are based on a 0 to 10 scale. 0 = no weed control or poor beet vigor;  
10 = perfect weed control or, as a vigor rating, vigorously growing beets.

Remarks: Evaluations are based on an average of 4 replications.



**TABLE 8 - EFFECT OF PREEMERGENCE AND POSTEMERGENCE APPLIED HERBICIDES ON  
SUGARBEET WEED CONTROL AND VIGOR**

302, 425, 81, 10, 82-2B

Location: Hw. 33, 4 mi. N of Adams (Murrieta Farms)  
Soil Type: Oxalis silty clay  
Herbicides Applied: 10-21-81; 12-3-81, 2-12-82  
Beet Variety: SP H-9

Irrigation Method: Sprinkler-Furrow  
Plot Size: 5' x 30', Reps 4  
Beets Planted: 10-20-81  
Evaluated: 3-8-82

| Herbicide                                          | Lb ai/<br>Acre                   | Date<br>Herbicides<br>Applied | Weed Control and Beet Vigor Evaluation <sup>1/</sup> |                          |                  |               |
|----------------------------------------------------|----------------------------------|-------------------------------|------------------------------------------------------|--------------------------|------------------|---------------|
|                                                    |                                  |                               | Rye<br>Grass<br>Control                              | Vol.<br>Wheat<br>Control | Bdlf.<br>Control | Beet<br>Vigor |
| A Antor<br>Betamix                                 | 2.0<br>1.3                       | 10-21-81<br>2-12-82 >         | 5.2                                                  | 0                        | 7.2              | 7.7           |
| B Antor<br>CGA-82725 *<br>Endothal 273             | 4.0<br>0.5 ><br>0.5 >            | 10-21-81<br>2-12-82 >         | 9.2                                                  | 3.0                      | 4.0              | 8.5           |
| C Nortron<br>Poast *                               | 2.0<br>0.5                       | 10-21-81<br>12-3-81 >         | 9.7                                                  | 10.0                     | 0.5              | 9.0           |
| D Antor<br>Nortron                                 | 2.0 ><br>2.0 >                   | 10-21-81                      | 5.2                                                  | 9.7                      | 2.5              | 8.5           |
| E Pyramin<br>Antor<br>Fusilade *<br>Endothal 273   | 3.0 ><br>2.0 ><br>0.5 ><br>1.0 > | 10-21-81<br>2-12-82 >         | 8.2                                                  | 8.5                      | 7.2              | 8.7           |
| F Pyramin<br>Nortron<br>Fusilade *                 | 3.0 ><br>2.0 ><br>0.5            | 10-21-81<br>12-3-81 >         | 6.2                                                  | 10.0                     | 2.0              | 9.7           |
| G Pyramin<br>Nortron<br>Antor                      | 2.0 ><br>2.0 ><br>2.0 >          | 10-21-81                      | 2.5                                                  | 8.7                      | 5.5              | 9.2           |
| H Pyramin<br>Dalapon<br>Fusilade *<br>Endothal 273 | 4.0 ><br>2.0 ><br>0.5 ><br>0.5 > | 12-3-81<br>2-12-82 >          | 8.0                                                  | 8.0                      | 9.3              | 8.0           |
| J Antor<br>Nortron<br>Betamix                      | 2.0 ><br>1.5 ><br>1.3            | 10-21-81<br>2-12-82 >         | 1.7                                                  | 6.2                      | 7.2              | 8.7           |
| K Untreated<br>Poast *<br>Endothal 273             | ---<br>0.5 ><br>0.5 >            | 2-12-82                       | 7.0                                                  | 7.5                      | 8.0              | 4.2           |

\* Surfel added at 1 qt. ai/A

<sup>1/</sup> Evaluations based on a 0 to 10 scale. 0 - no weed control or very poor vigor, 10 = perfect weed control or vigorously growing plants.



TABLE 9 - EFFECT OF PREEMERGENCE APPLIED HERBICIDES ON SUGARBEET STAND,  
BEET VIGOR AND WEED CONTROL

302, 425, 81, 10, 82-5

Location: Spreckels Farm 41, Mendota  
Soil Type: Merced clay  
Beets Planted: 2-8-82  
Beet Variety: SP H-9

Irrigation Method: Sprinkler  
Plot Size: 2 beds (12" x 30'), Reps 4  
Herbicide Applied: 2-9-82  
Evaluated: 3-23-82, 4-9-82

| Herbicides                    | Lb.ai/<br>Acre    | Stand Count, Beet Vigor and Weed Control Evaluations |                            |                                  |                |                    |                  |
|-------------------------------|-------------------|------------------------------------------------------|----------------------------|----------------------------------|----------------|--------------------|------------------|
|                               |                   | 3-23-82                                              |                            |                                  | 4-9-82         |                    |                  |
|                               |                   | Beets/<br>Ft. of Row                                 | Beet<br>Stand<br>%Untreat. | Brdlf.<br>Weeds in<br>4'x6" Area | Beet<br>Injury | %Brdlf.<br>Control | Weeds<br>Present |
| A Antor                       | 3.0               | 4.1                                                  | 82                         | 3.0                              | 1.0            | 71                 | Fb,Gf,L,Lr,Sp    |
| B Antor<br>Nortron            | 2.0<br>2.0        | 3.2                                                  | 64                         | 1.4                              | 4.5            | 93                 | Fb,Gf,Lr,Sp      |
| C Antor<br>Nortron<br>Pyramin | 2.0<br>2.0<br>2.0 | 2.3                                                  | 46                         | 0                                | 4.2            | 98                 | Fb,Gf            |
| D Nortron<br>Pyramin          | 2.0<br>3.0        | 2.8                                                  | 56                         | 0.1                              | 4.0            | 97                 | Fb,Gf,K,L,Lr     |
| E Antor<br>Pyramin            | 2.0<br>3.0        | 1.6                                                  | 32                         | 0                                | 3.8            | 99                 | Fb               |
| F TCA<br>Pyramin              | 6.0<br>2.0        | 3.1                                                  | 62                         | 0.1                              | 2.0            | 98                 | Fb,Gf            |
| G TCA<br>Pyramin              | 8.0<br>2.0        | 2.9                                                  | 58                         | 0.6                              | 2.2            | 98                 | Fb,Gf,K          |
| H TCA<br>Pyramin              | 6.0<br>3.0        | 3.2                                                  | 64                         | 0                                | 3.0            | 99                 | Fb               |
| J Nortron<br>Endothal         | 2.0<br>4.0        | 3.9                                                  | 78                         | 5.2                              | 0.8            | 77                 | Fb,Gf,K,L,Lr     |
| K TCA<br>Pyramin              | 8.0<br>3.0        | 2.8                                                  | 56                         | 0                                | 3.0            | 99                 | Gf,K             |
| L Antor<br>Nortron            | 3.0<br>1.0        | 2.7                                                  | 54                         | 0.5                              | 3.0            | 94                 | K,Lr             |
| M Untreated                   | ---               | 5.0                                                  | 100                        | 22.5                             | 0.2            | 0                  | Fb,Gf,K,L,Lr,Sp  |

1/Beet injury rating based on a 0 to 10 scale. 0 = no injury, 10 = very severe injury

2/Weeds present: Fb = fivehook bassia, Gf = goosefoot, L = lambsquarter, Lr = London rocket, K = knotweed, Sp = shepherd's purse



TABLE 10 -EFFECT OF PREEMERGENCE APPLIED HERBICIDES ON SUGARBEET STAND, BEET VIGOR  
AND WEED CONTROL

302, 425, 81, 10, 82-6

Location: Spreckels Farm 41, Mendota

Soil Type: Chino loam

Beets Planted: 2-8-82

Beet Variety: SP H-9

Evaluated: 3-23-82

Irrigation Method: Sprinkler

Plot Size: 2 beds (12" band) x 40', Reps 4

Soil Condition: Dry and cloddy

Herbicides Applied: 2-9-82

Beet Stand, Beet Vigor and Weed Control Evaluation

| Herbicides  | Lb. ai/<br>Acre | Beets/ <sup>1/</sup><br>Ft.of Row | Beet Stand<br>%of Untreat. | Beet <sup>2/</sup><br>Vigor | Weeds in <sup>3/</sup><br>8 Ft.of Row |         |
|-------------|-----------------|-----------------------------------|----------------------------|-----------------------------|---------------------------------------|---------|
|             |                 |                                   |                            |                             | Brdlf.                                | Grasses |
| A Antor     | 2.0             | 4.5                               | 92                         | 7.1                         | 0                                     | 0.2     |
| Nortron     | 2.0             |                                   |                            |                             |                                       |         |
| B Pyramin   | 2.0             | 4.2                               | 86                         | 7.5                         | 0.2                                   | 0       |
| Nortron     | 2.0             |                                   |                            |                             |                                       |         |
| Antor       | 2.0             |                                   |                            |                             |                                       |         |
| C Nortron   | 2.0             | 4.7                               | 96                         | 8.7                         | 0.2                                   | 0       |
| TCA         | 8.0             |                                   |                            |                             |                                       |         |
| D Pyramin   | 3.0             | 4.4                               | 90                         | 9.0                         | 0.2                                   | 0.5     |
| TCA         | 8.0             |                                   |                            |                             |                                       |         |
| E Tillam    | 6.0             | 4.8                               | 99                         | 10.0                        | 6.7                                   | 12.2    |
| F Antor     | 4.0             | 4.9                               | 100                        | 9.1                         | 1.5                                   | 0.2     |
| G Nortron   | 2.0             | 4.7                               | 96                         | 8.7                         | 0                                     | 0.2     |
| H Pyramin   | 3.0             | 3.7                               | 75                         | 8.8                         | 0                                     | 0.2     |
| Antor       | 3.0             |                                   |                            |                             |                                       |         |
| J Nortron   | 2.0             | 4.6                               | 94                         | 8.6                         | 0.2                                   | 0.5     |
| Endothal    | 4.0             |                                   |                            |                             |                                       |         |
| K Pyramin   | 3.0             | 4.2                               | 86                         | 9.5                         | 0.2                                   | 1.2     |
| TCA         | 6.0             |                                   |                            |                             |                                       |         |
| L Pyramin   | 3.0             | 3.6                               | 73                         | 8.1                         | 0.2                                   | 0       |
| Antor       | 2.0             |                                   |                            |                             |                                       |         |
| M Untreated | ---             | 4.9                               | 100                        | 10.0                        | 5.5                                   | 16.2    |

<sup>1/</sup> Beet counts made in two 4' x 6" areas in each plot. Values are the average number per foot of row.

<sup>2/</sup> Vigor evaluation based on a 0 to 10 scale. 0 = very poor vigor, 10 = vigorously growing beet seedlings.

<sup>3/</sup> The weed infestation was sparse in the trial area. Values are the average number of weeds per eight (8) foot of row.



## POSTEMERGENCE STUDIES

Until fairly recently only dalapon (Dowpon) was available for the postemergence control of grasses in sugarbeets. Its use was limited because it caused temporary injury, retardation in the growth of beet seedlings and often the results obtained were erratic. Dalapon was also used in combination with Endothal for the control of volunteer cereals. This combination also caused injury to the beets and, in the central San Joaquin Valley, its effectiveness diminished significantly when applied after the end of January for the control of volunteer barley and wheat.

A few years ago two experimental herbicides were introduced that provided effective control of annual and perennial grasses with excellent selectivity on most broadleaf plants. More recently a number of chemically related compounds were developed and are being evaluated by several chemical companies. Summaries of our earlier studies were reported in the 1980 and 1981 progress reports.\*

The evaluation of seven "grass herbicides" were pursued in 1982 and 1983. They were included in trials for the control of annual and perennial grasses as well as for the control of volunteer cereals, volunteer corn and sorghum. Since these herbicides do not control broadleaf weeds they were also evaluated in combination and as sequential applications with Betamix.

In Tables 1 through 13 following this narrative section (on green paper), some of the trials conducted during 1982 and 1983 are summarized. Information regarding the time of treatment, stage of beet and weed growth, soil type, method of irrigation and other pertinent information are given in the tables summarizing the results of specific trials. In earlier studies it was repeatedly demonstrated that the use of postemergence herbicides did not adversely affect the yield and sucrose percentage; therefore, yield data were obtained only in one trial, summarized in Table 12.

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\*Sugar Beets - Applied Research studies - Runcina, B. Fischer, L. Burtch, and L. Brown, Vol. 21, Nov. 1980, U. C. Cooperative Extension, Fresno, California; Applied Research Studies in Sugar Beet Production, B. Fischer, October 1981, U. C. Cooperative Extension, Fresno, California.



Based on the observations made in the trials summarized in Tables 1 through 13 and in many other trials conducted in numerous other crops, the grass herbicides can be grouped as follows:

Grass Herbicides Evaluated and Their Relative Performance

| Common Name or Code No.                  | Trade Name or Code No.   | Being Developed By              | Observations in Fresno County                                                                                                            |
|------------------------------------------|--------------------------|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Heloxyfop methyl                         | Verdict                  | Dow Chem. Co.                   | Most Active.                                                                                                                             |
| DuPont                                   | DPX Y6202                | Assure                          | As active and selective on sugarbeets as Dowco-453 but less selective on certain other crops.                                            |
| Sethoxydim<br>fluazifop-butyl<br>SC-1084 | Poast<br>Fusilade<br>--- | BASF<br>ICI America<br>Stauffer | Very similar in activity and selectivity with minor differences.                                                                         |
| RE-36290                                 | Selectone                | Ortho                           | Similar in selectivity to the above group; however, it is much less effective on johnsongrass.                                           |
| HUE-00581                                | ---                      | American Hoechst                | Somewhat less effective than the others evaluated and produced more symptoms on several broadleaf crops.                                 |
| CGA-82725                                | ---                      | Ciba Geigy                      | Its effectiveness was more variable than the results obtained with other herbicides. The development of CGA-82725 has been discontinued. |

The results obtained and the observations made can be briefly summarized as follows:

- \* All grass herbicides provided the most effective control when applied on vigorously growing seedling grasses.
- \* Applied when the grasses were moisture stressed resulted in poor or no control. However, if irrigated within one or two days following treatment excellent control was obtained.



- \* A paraffin based adjuvant at 1.0 qt/A was needed to obtain good control with all grass herbicides evaluated.
- \* They have very limited soil activity especially at rates of 0.125 to 0.5 lbai/A.
- \* Dowco-453 and Assure (DPX-Y6202) provided as effective control at half the rate of active ingredient per acre as was obtained with the other herbicides.
- \* Applied on vigorously growing seedling grasses at 0.25 lbai/A, good control of annual grasses and seedling perennial johnsongrass and bermudagrass control can be obtained with all these herbicides. However Dowco 453 and Assure will provide as effective control at 0.125 lbai/A.
- \* In most trials more effective control was obtained when these herbicides were used at 0.5 lbai/A. Dowco-453 and Assure provided as effective control at 0.25 lbai/A.
- \* None of these effectively controlled annual bluegrass; however, Dowco 453 was more effective than the others.
- \* Poast was somewhat more effective on barnyardgrass than Fusilade.
- \* Fusilade was somewhat more effective on johnsongrass than Poast.

The mode of action of these herbicides are not as yet well understood. They are translocated in both the xylem and phloem and appear to disrupt cell division. Following application, the growth of the grasses stops, but they are relatively slow to die. Perennial grasses, growing from rhizomes, have to be treated twice: first, following emergence when they are 5 to 6 inches tall and second, when regrowth occurs 4 to 6 weeks after the first application.

The most important factors that influence the effectiveness of the herbicides on the susceptible grasses are:



- a. the vigor of growth,
- b. the stage of growth, and
- c. the amount of herbicide applied.

Weeds beyond their seedling stage of growth may require higher rates. Certain grasses like sprangletop were effectively controlled in the seedling stage but not when they had 4 to 5 leaves.

In some trials the use of additional adjuvant, 2 qts/A instead of 1 qt/A, improved the control obtained when Poast or Fusilade were used at 0.25 lbai/A.

Additional studies are needed to more precisely determine the rates of herbicides needed to obtain the most effective economical rates of application.

#### Postemergence Combination Treatments

Broadleaf weeds of many kinds are found infesting beet fields in mixed populations with grasses. Therefore, the newly introduced grass herbicides were evaluated in combinations and/or in sequential applications with Betamix, Pyramin and Endothal. Tables 1 through 13, following this narrative section, contain summaries of several applied research trials.

The herbicides were applied with an experimental sprayrig where the spray propellant was compressed air or with a CO<sub>2</sub> constant pressure backpack sprayer. All pertinent information regarding treatment dates, soil type, herbicides used, etc., are given in each table.

The results obtained and observations made clearly indicate that:

- \* Good control of broadleaf weeds and grasses can be obtained by combining Betamix with all the grass herbicides evaluated.
- \* Betamix applied as a "tank-mix" with the grass herbicides resulted in pronounced injury symptoms on the beet seedlings. The symptoms were evident for two or three weeks on the leaves sprayed, but rarely observable on the leaves developing after treatment.



- \* In sequential applications, Betamix caused similar symptoms whether applied two or more days prior to, or following, the application of grass herbicides. See Table 12.
- \* In combinations with Betamix the addition of a paraffin-based adjuvant significantly improved the grass control where low rates (0.125 to 0.25 lbai/A) of the grass herbicides were used. The addition of an adjuvant was not required when higher rates (0.25 to 0.5 lbai/A) of the grass herbicides were used. See Tables 1, 2, 3, and 13.
- \* The timing of the application of Betamix relative to the growth of the broadleaf weeds was more critical than the application of the grass herbicides. Several species of broadleaf weeds were not effectively controlled beyond their 2 to 4 true-leaf stage of growth (i.e. purslane, puncturevine, wild sunflower, knotweed, pigweed, etc.).
- \* To obtain effective control of weeds and minimal injury to the beet seedlings, it is essential that they be growing vigorously. Adequate supply of water can be insured by irrigating soon after treatment. Irrigating prior to the application of herbicide may prevent entry into the field.
- \* Pyramin in combination with the grass herbicide looks promising. This combination may be desirable where residual control is desired.

Upon registration of the grass herbicides, their use in combination with Betamix can provide sugarbeet growers the option of using postemergence treatments to control most of the broadleaf and grass weeds infesting their fields. Additional studies are needed to refine rates of application.



TABLE 1 - EFFECT OF POSTEMERGENCE APPLIED HERBICIDES ON WEED CONTROL AND SUGARBEET INJURY

302, 425, 81, 10, 83-3

Location: Westside Field Station

Soil Type: Panoche clay loam

Variety: SSE-1

Herbicides Applied: 5-4-83 (except as noted

Irrigation Method: Furrow

Plot Size: 2 beds (12" x 32'), Reps 4

Planted: 4-1-83

Evaluated: See below

in treatments D & H Betamix applied  
5-11-83.

## SUGARBEET WEED CONTROL AND INJURY

| Herbicides    | Lb ai/<br>Acre | 5-11-83            |                               |                              | 5-19-83            |                               |                              |
|---------------|----------------|--------------------|-------------------------------|------------------------------|--------------------|-------------------------------|------------------------------|
|               |                | %Barley<br>Control | %Barnyard<br>Grass<br>Control | Beet <sup>1/</sup><br>Injury | %Barley<br>Control | %Barnyard<br>Grass<br>Control | Beet <sup>1/</sup><br>Injury |
| A Fusilade *  | 0.2            | 72                 | 98                            | 3.8                          | 86                 | 93                            | 1.8                          |
| Betamix       | 1.0            |                    |                               |                              |                    |                               |                              |
| B Fusilade *  | 0.4            | 75                 | 98                            | 3.8                          | 87                 | 99                            | 1.2                          |
| Betamix       | 1.0            |                    |                               |                              |                    |                               |                              |
| C Fusilade    | 0.4            | 72                 | 92                            | 3.8                          | 90                 | 98                            | 1.8                          |
| Betamix       | 1.0            |                    |                               |                              |                    |                               |                              |
| D Fusilade ** | 0.2            | 32                 | 40                            | 1.5                          | 81                 | 87                            | 1.8                          |
| Betamix(5-11) | 1.0            |                    |                               |                              |                    |                               |                              |
| E Poast *     | 0.2            | 70                 | 95                            | 3.8                          | 82                 | 91                            | 1.2                          |
| Betamix       | 1.0            |                    |                               |                              |                    |                               |                              |
| F Poast *     | 0.4            | 78                 | 100                           | 3.5                          | 89                 | 98                            | 1.5                          |
| Betamix       | 1.0            |                    |                               |                              |                    |                               |                              |
| G Poast       | 0.4            | 72                 | 98                            | 2.2                          | 72                 | 87                            | 1.0                          |
| Betamix       | 1.0            |                    |                               |                              |                    |                               |                              |
| H Poast **    | 0.2            | 52                 | 58                            | 1.6                          | 85                 | 87                            | 2.0                          |
| Betamix(5-11) | 1.0            |                    |                               |                              |                    |                               |                              |
| J Dowco 453ME | 0.1            | 58                 | 72                            | 3.0                          | 97                 | 99                            | 2.0                          |
| Betamix       | 1.0            |                    |                               |                              |                    |                               |                              |
| K Dowco 453ME | 0.2            | 40                 | 47                            | 2.0                          | 67                 | 66                            | 2.0                          |
| Betamix       | 1.0            |                    |                               |                              |                    |                               |                              |
| L Dowco 453ME | 0.4            | 78                 | 98                            | 2.8                          | 99                 | 100                           | 1.5                          |
| Betamix       | 1.0            |                    |                               |                              |                    |                               |                              |
| M HOE 00581*  | 0.2            | 70                 | 80                            | 3.0                          | 67                 | 77                            | 1.5                          |
| Betamix       | 1.0            |                    |                               |                              |                    |                               |                              |
| N HOE 00581*  | 0.4            | 70                 | 90                            | 3.0                          | 65                 | 68                            | 1.0                          |
| Betamix       | 1.0            |                    |                               |                              |                    |                               |                              |
| P Betamix     | 1.0            | 73                 | 90                            | 4.7                          | 54                 | 60                            | 1.2                          |
| Endothal      | 0.5            |                    |                               |                              |                    |                               |                              |
| Dowpon        | 2.0            |                    |                               |                              |                    |                               |                              |
| Q Untreated   | ---            | 0                  | 0                             | 0                            | 0                  | 0                             | 0                            |

\*Surfel added, 1 qt/A

\*\*Surfel added, 2 qt/A

<sup>1/</sup>Injury rating based on a scale of 0 to 10. 0 = no injury, 10 = severe injury.

Remarks: Broadleaf control was 100% in all plots except the untreated.



TABLE 2-EFFECT OF POSTEMERGENCE APPLIED HERBICIDES ON WEED CONTROL IN SUGARBEETS  
302, 425, 91, 10, 83-1

Location: ½ mi. E. of San Diego and California

Soil Type: Oxali's silty clay

Variety: SSE-1

Herbicides Applied: Preemergence: Pyramin @3.0 ai/A+Nortron @2.0 ai/A applied in a 10" band and the field was sprinkler irrigated to establish a stand.  
Postemergence: Herbicides below applied 12-8-82

Irrigation Method: Sprinkler-Furrow

Plot Size: 2.5' x 30', Reps 3

Planted: 10-17-82

SUGARBEET INJURY AND WEED CONTROL EVALUATIONS

| Herbicides     | Lb ai/<br>Acre | 12-28-82              |                        |                       |                        |                      | 1-11-83               |                        |
|----------------|----------------|-----------------------|------------------------|-----------------------|------------------------|----------------------|-----------------------|------------------------|
|                |                | Bed Top               |                        | Furrow                |                        | 1/<br>Beet<br>Injury | Bed Top & Furrow      |                        |
|                |                | %<br>Grass<br>Control | %<br>Brdlf.<br>Control | %<br>Grass<br>Control | %<br>Brdlf.<br>Control |                      | %<br>Grass<br>Control | %<br>Brdlf.<br>Control |
|                |                |                       |                        |                       |                        |                      |                       |                        |
| A Fusilade *   | 0.25           | 53                    | 93                     | 43                    | 0                      | 1.3                  | 70                    | 3                      |
| B Fusilade *   | 0.5            | 70                    | 83                     | 57                    | 0                      | 1.3                  | 97                    | 13                     |
| C Poast *      | 0.25           | 63                    | 97                     | 57                    | 0                      | 1.0                  | 83                    | 17                     |
| D Poast *      | 0.5            | 80                    | 93                     | 67                    | 0                      | 1.0                  | 80                    | 20                     |
| E Fusilade *   | 0.25           | 83                    | 100                    | 70                    | 0                      | 1.3                  | 97                    | 20                     |
| Betamix        | 1.0            |                       |                        |                       |                        |                      |                       |                        |
| F Fusilade *   | 0.5            | 83                    | 100                    | 77                    | 0                      | 1.7                  | 97                    | 30                     |
| Betamix        | 1.0            |                       |                        |                       |                        |                      |                       |                        |
| G Fusilade     | 0.5            | 93                    | 100                    | 73                    | 0                      | 1.3                  | 100                   | 17                     |
| Betamix        | 1.0            |                       |                        |                       |                        |                      |                       |                        |
| H Endothal 273 | 0.5            | 80                    | 97                     | 80                    | 0                      | 2.3                  | 77                    | 30                     |
| Dalapon        | 2.0            |                       |                        |                       |                        |                      |                       |                        |
| X-77 ½%        | 1.0            |                       |                        |                       |                        |                      |                       |                        |
| J Endothal 273 | 1.0            | 97                    | 100                    | 93                    | 0                      | 2.7                  | 83                    | 37                     |
| Dalapon        | 2.0            |                       |                        |                       |                        |                      |                       |                        |
| X-77 ½%        | 1.0            |                       |                        |                       |                        |                      |                       |                        |
| K Kerb         | 1.5            | 97                    | 100                    | 93                    | 3.3                    | 5.0                  | 90                    | 63                     |
| Endothal       | 1.0            |                       |                        |                       |                        |                      |                       |                        |
| L Pyramin      | 3.0            | 63                    | 97                     | 47                    | 0                      | 2.3                  | 67                    | 30                     |
| Dalapon        | 2.0            |                       |                        |                       |                        |                      |                       |                        |
| Surfel 1 qt.   | 1.0            |                       |                        |                       |                        |                      |                       |                        |
| M Pyramin      | 3.0            | 60                    | 93                     | 57                    | 0                      | 2.0                  | 80                    | 20                     |
| Poast          | 0.5            |                       |                        |                       |                        |                      |                       |                        |
| Surfel 1 qt.   | 1.0            |                       |                        |                       |                        |                      |                       |                        |
| N Pyramin      | 3.0            | 67                    | 97                     | 63                    | 0                      | 2.3                  | 70                    | 30                     |
| Fusilade       | 0.5            |                       |                        |                       |                        |                      |                       |                        |
| Surfel 1 qt.   | 1.0            |                       |                        |                       |                        |                      |                       |                        |
| P Untreated    | ---            | 27                    | 93                     | 23                    | 0                      | 1.3                  | 23                    | 23                     |

\*Surfel added at 1 qt/Acre.

1/Injury rating based on a scale of 0 to 10. 0 = no injury, 10 = severe injury to beets.

Remarks: Weeds present at the time of postemergence herbicide application on bed top were cheeseweed, volunteer cereal and ryegrass. In the furrows, same as on bed top plus London rocket, shepherd's purse, groundsel and sowthistle.



TABLE 3 - EFFECT OF POSTEMERGENCE APPLIED HERBICIDES ON GRASS CONTROL IN SUGARBEETS

302, 425, 91, 10, 83-4

Location: Des Jardins Farm, Field 2, Des-Cor Property    Irrigation Method: Furrow  
Soil Type: Merced clay    Plot Size: 2.5 x 30', Reps 4  
Herbicides Applied: 6-1-83    Planted: 5-20-83  
Variety: SS-E1    Evaluated: 6-15-83

| Herbicides  | Lb ai/<br>Acre | Surfel<br>Added@ | Percent Grass Control |
|-------------|----------------|------------------|-----------------------|
| A Poast     | 0.25           | 2 qt/A           | 97                    |
| B Poast     | 0.50           | 1 qt/A           | 95                    |
| C Fusilade  | 0.25           | 2 qt/A           | 93                    |
| D Fusliade  | 0.50           | 1 qt/A           | 90 *                  |
| E Selectone | 0.25           | 2 qt/A           | 93                    |
| F Selectone | 0.50           | 1 qt/A           | 96                    |
| G Dowco 453 | 0.125          | 2 qt/A           | 96                    |
| H Dowco 453 | 0.25           | 2 qt/A           | 94                    |
| J Dowco 453 | 0.50           | 1 qt/A           | 97                    |
| K Hoe 00581 | 0.25           | 2 qt/A           | 98                    |
| L Hoe 00581 | 0.50           | 1 qt/A           | 95                    |
| M SC-1084   | 0.25           | 2 qt/A           | 93                    |
| N SC-1084   | 0.50           | 1 qt/A           | 98                    |
| P Untreated | ----           | ---              | 42                    |

\*Sugarbeets showing some marginal burn.

Remarks: Grasses present: barnyardgrass, prairie cupgrass.

Sugarbeets in cotyledon to 2 true-leaf stage.



TABLE 4 - EFFECT OF POSTEMERGENCE APPLIED HERBICIDES FOR VOLUNTEER  
CORN CONTROL IN SUGARBEETS

302, 425, 91, 10, 83-7

Location: Newhall Land - Farming

Irrigation Method: Furrow

Soil Type: Merced clay

Plot Size: 40" x 20', Reps 4

Variety: SSE-1

Herbicides Applied: 6-16-83

Evaluated: See below

Beets: 2 pairs true leaves  
Corn: 5" to 12" tall

CORN CONTROL EVALUATIONS

| Herbicides  | Lb ai/<br>Acre | Surfel<br>Added @ | 6-28-83         | 7-11-83         |
|-------------|----------------|-------------------|-----------------|-----------------|
|             |                |                   | Corn<br>Control | Corn<br>Control |
| A Poast     | 0.125          | 2 qt/A            | 74              | 61              |
| B Poast     | 0.25           | 2 qt/A            | 75              | 75              |
| C Poast     | 0.5            | 1 qt/A            | 87              | 96              |
| D Fusilade  | 0.25           | 2 qt/A            | 89              | 99              |
| E Fusilade  | 0.5            | 1 qt/A            | 91              | 98              |
| F Dowco 453 | 0.125          | 2 qt/A            | 94              | 99              |
| G Dowco 453 | 0.25           | 2 qt/A            | 97              | 99              |
| H Dowco 453 | 0.5            | 1 qt/A            | 99              | 99              |
| J Selectone | 0.25           | 2 qt/A            | 94              | 74              |
| K Selectone | 0.5            | 1 qt/A            | 94              | 86              |
| L SC-1084   | 0.25           | 2 qt/A            | 82              | 79              |
| M SC-1084   | 0.5            | 1 qt/A            | 90              | 96              |
| N ASSURE    | 0.25           | 2 qt/A            | 98              | 100             |
| P ASSURE    | 0.5            | 1 qt/A            | 99              | 100             |
| Q ASSURE    | 1.0            | 1 qt/A            | 100             | 100             |
| R Untreated | ---            | 2 qt/A            | 0               | 17              |

Remarks: In some of the plots treated with DPX-Y6202 at 1.0 lb ai/A spotting is visible on the sugarbeet leaves.



TABLE 5 - EFFECT OF POSTEMERGENCE APPLIED HERBICIDES ON  
GRASS CONTROL IN SUGARBEETS

302, 425, 91, 10, 83-6

Location: Newhall Land & Farming, Field 52,  
N.W. corner of Washington Ave., E.  
side of Bypass

Soil Type: Merced clay

Planted: 5-15-83

Evaluated: See below

Irrigation Method: Furrow

Plot Size: 40" x 20', Reps 4

Variety: SSE-1

Herbicides Applied: 6-1-83

Beets: 4 to 6 leaf stage

Grasses: 2 to 4 leaf stage

(Barnyardgrass & Prairie Cupgrass)

| WEED CONTROL EVALUATIONS |                  |                         |                         |
|--------------------------|------------------|-------------------------|-------------------------|
| Herbicides               | Lb ai/<br>Acre * | 6-28-83 <sup>1/</sup>   | 7-11-83 <sup>2/</sup>   |
|                          |                  | Percent<br>Weed Control | Percent<br>Weed Control |
| A Poast                  | 0.25             | 99                      | 91                      |
| B Poast                  | 0.5              | 100                     | 99                      |
| C Fusilade               | 0.25             | 92                      | 82 **                   |
| D Fusilade               | 0.5              | 95                      | 92                      |
| E Dowco 453              | 0.125            | 99                      | 92                      |
| F Dowco 453              | 0.25             | 99                      | 92                      |
| G Dowco 453              | 0.5              | 100                     | 100                     |
| H Selectone              | 0.25             | 99                      | 97                      |
| J Selectone              | 0.5              | 100                     | 98                      |
| K SC-1084                | 0.25             | 95                      | 86 **                   |
| L SC-1084                | 0.5              | 94                      | 87                      |
| M Untreated              | ---              | 24                      | 0                       |

\*Surfel @1 qt/A added to all treatments.

\*\*Surviving grasses are severely retarded in growth.

<sup>1/</sup>The field has not been irrigated since the treatment was applied.

<sup>2/</sup>The field irrigated 7-1-83.



TABLE 6 - EFFECT OF POSTEMERGENCE APPLIED HERBICIDES FOR JOHNSONGRASS CONTROLIN SUGARBEETS

302, 425, 91, 10, 83-5

Location: S.E. corner Linden and Arroyo, Tom Teixeira Farm Irrigation Method: FurrowSoil Type: Merced clayPlot Size: 2.5' x 30', Reps 3Variety: USH-11Planted: 5-15-83

Herbicides Applied: 6-1-83, Betamix @0.75 lb ai/A plus  
1 qt/A of Surfel added to all treatments.  
7-7-83, Only grass herbicides applied with Surfel  
@ 1.0(\*) and 2.0(\*\*) qts/A as indicated in the table.

| Herbicide     | Lb ai/<br>Acre | WEED CONTROL AND BEET INJURY RATING |                                  |                      |                                         |         |          |
|---------------|----------------|-------------------------------------|----------------------------------|----------------------|-----------------------------------------|---------|----------|
|               |                | 6-15-83                             |                                  |                      |                                         |         |          |
|               |                | Percent<br>Johnsongrass<br>Control  | Percent<br>Brdlf.Weed<br>Control | 1/<br>Beet<br>Injury | Percent Johnsongrass Control<br>7-29-83 | 8-25-83 | 10-19-83 |
| A Poast       | ** 0.25        | 78                                  | 100                              | 1.0                  | 80                                      | 47      | 33       |
| B Poast       | * 0.5          | 88                                  | 100                              | 1.0                  | 90                                      | 80      | 82       |
| C Fusilade    | ** 0.25        | 80                                  | 100                              | 1.0                  | 85                                      | 87      | 72       |
| D Fusilade    | * 0.5          | 90                                  | 100                              | 1.0                  | 94                                      | 96      | 87       |
| E Dowco 453** | 0.25           | 93                                  | 100                              | 1.2                  | 92                                      | 98      | 92       |
| F Dowco 453 * | 0.5            | 93                                  | 100                              | 1.5                  | 93                                      | 99      | 85       |
| G SC-1084     | ** 0.25        | 78                                  | 100                              | 1.0                  | 94                                      | 92      | 63       |
| H SC-1084     | * 0.5          | 91                                  | 100                              | 1.0                  | 88                                      | 96      | 82       |
| J Untreated   | ---            | 0                                   | 0                                | 0                    | 0                                       | 5       | 0        |

1/ Injury rating based on a scale of 0 - 10. 0 = no injury, 10 = severely injured sugarbeets.

\* & \*\* (as noted in "Herbicides Applied" above table)

Remarks: 6/1/83, Barnyardgrass, 2 to 4 lvs.  
Johnsongrass, 2 to 18"  
Beets, 2 to 4 leaves



TABLE 7-EFFECT OF POSTEMERGENCE APPLIED HERBICIDES FOR JOHNSONGRASS CONTROL IN  
SUGARBEETS

302, 425, 91, 10, 83-8

Location: S.E. Corner Linden and Arroyo,  
Tom Texeira Farm

Irrigation Method: Furrow

Soil Type: Merced clay

Plot Size: 20' x 30", Reps 3

Variety: USH-11

Planted: 5-15-83

Herbicides Applied: 7-7-83

Evaluated: See below

| Herbicides  | Lb ai/<br>Acre * | JOHNSONGRASS CONTROL EVALUATIONS |                               |                                |
|-------------|------------------|----------------------------------|-------------------------------|--------------------------------|
|             |                  | 7-29-83<br>Percent<br>Control    | 8-25-83<br>Percent<br>Control | 10-19-83<br>Percent<br>Control |
| A ASSURE    | .06              | 94                               | 97                            | 86                             |
| B ASSURE    | .125             | 94                               | 98                            | 77                             |
| C ASSURE    | .25              | 95                               | 97                            | 77                             |
| D Dowco 453 | .06              | 83                               | 82                            | 20                             |
| E Dowco 453 | .125             | 85                               | 86                            | 35                             |
| F Dowco 453 | .25              | 88                               | 98                            | 78                             |
| G Fusilade  | .50              | 82                               | 77                            | 48                             |
| H Poast     | .50              | 94                               | 93                            | 58                             |
| J Untreated | ---              | 0                                | 18                            | 23                             |

\*Surfel at 1 qt/A added to all treatments.

Remarks: The field was cultivated and johnsongrass hoed 6-2-83.

The johnsongrass was 16" to 20" tall when treated.



TABLE 8 - SUGAR BEET WEED CONTROL - POSTEMERGENCE

302, 425, 81, 10, 82-3

Location: Hwy. 33, 4 m. N. of Adams Ave.  
Murrieta FarmsIrrigation Method: FurrowSoil Type: Oxali's silty clayPlot Size: 5' x 30', Reps 4Herbicides Applied: 12-3-81Planted: 10-20-81Variety: SP H-9Evaluated: 2-1-82

| Herbicide                       | Lb ai/A             | WEED CONTROL AND SUGAR BEET VIGOR <sup>1/</sup> |              |                  |              |            |
|---------------------------------|---------------------|-------------------------------------------------|--------------|------------------|--------------|------------|
|                                 |                     | 12-28-81<br>Grass<br>Cont.                      | Rye Gr.Cont. | Vol. Wheat Cont. | Brdlf. Cont. | S.B. Vigor |
| A Betamix<br>Poast              | 1.3<br>0.25         | 6.3                                             | 8.3          | 8.0              | 9.0          | 8.0        |
| B Betamix<br>Poast              | 1.3<br>0.5          | 7.9                                             | 9.6          | 9.5              | 9.2          | 8.2        |
| C Betamix<br>Fusilade           | 1.3<br>0.25         | 6.0                                             | 7.8          | 9.2              | 9.0          | 7.8        |
| D Betamix<br>Fusilade           | 1.3<br>0.5          | 6.3                                             | 8.3          | 9.7              | 9.0          | 8.0        |
| E Betamix<br>CGA-82725          | 1.3<br>0.25         | 5.2                                             | 8.8          | 6.7              | 9.2          | 7.5        |
| F Betamix<br>CGA-82725          | 1.3<br>0.5          | 6.2                                             | 9.6          | 7.8              | 9.3          | 8.0        |
| G Pyramin<br>Dowpon<br>Surfel   | 4.0<br>2.0<br>1 qt. | 3.0                                             | 3.4          | 7.2              | 9.5          | 5.5        |
| H Pyramin<br>Poast<br>Surfel    | 4.0<br>0.5<br>1 qt. | 5.0                                             | 9.3          | 7.8              | 9.5          | 8.0        |
| J Pyramin<br>Fusilade<br>Surfel | 4.0<br>0.5<br>1 qt. | 5.7                                             | 9.5          | 9.5              | 0            | 7.2        |
| K Poast<br>Surfel               | 0.5<br>1 qt.        | 7.5                                             | 9.8          | 9.5              | 0            | 8.2        |
| L Untreated                     | ---                 | 0                                               | 0            | 0                | 0            | 0          |

<sup>1/</sup> Evaluations are based on a 0 to 10 scale. 0 = no weed control or poor beet vigor;  
10 = perfect weed control, or, as a vigor rating, vigorously growing beets.

Remarks: Evaluations are based on an average of 4 replications.



TABLE 9 - EFFECT OF POSTEMERGENCE APPLIED HERBICIDES ON WEED CONTROL  
AND SUGARBEET VIGOR

302, 425, 81, 10, 82-3A\*

Location: Hwy. 33, 4 m. N. of Adams Ave.  
Murrieta Farms

Irrigation Method: Furrow

Soil Type: Oxali's silty clay

Plot Size: 5' x 30', Reps 4

Herbicides Applied: 12-3-81, 2-12-82

Planted: 10-20-81

Variety: SP H-9

Evaluated: 3-8-82

WEED CONTROL AND SUGARBEET VIGOR<sup>1/</sup>

| Herbicide                                | Lb.ai/<br>Acre           | Date of<br>Treat.  | Volunteer           |                  |                   |               |
|------------------------------------------|--------------------------|--------------------|---------------------|------------------|-------------------|---------------|
|                                          |                          |                    | Ryegrass<br>Control | Wheat<br>Control | Brdlf.<br>Control | Beet<br>Vigor |
| A Betamix<br>Poast                       | 1.3<br>0.25              | 12-3-81            | 6.6                 | 6.0              | 9.6               | 8.6           |
| B Betamix<br>Poast                       | 1.3<br>0.5               | 12-3-81            | 9.0                 | 9.2              | 9.2               | 9.7           |
| C Betamix<br>Fusilade                    | 1.3<br>0.25              | 12-3-81            | 6.1                 | 9.5              | 9.5               | 9.2           |
| D Betamix<br>Fusilade                    | 1.3<br>0.5               | 12-3-81            | 6.3                 | 9.0              | 9.0               | 9.3           |
| E Betamix<br>CGA-82725                   | 1.3<br>0.25              | 12-3-81            | 7.5                 | 5.0              | 9.0               | 9.5           |
| F Betamix<br>CGA-82725                   | 1.3<br>0.5               | 12-3-81            | 9.0                 | 6.2              | 9.2               | 9.5           |
| G Pyramin<br>Dowpon<br>Poast<br>Endothal | 4.0<br>2.0<br>0.5<br>0.5 | 12-3-81<br>2-12-82 | 8.5                 | 8.7              | 9.7               | 6.7           |
| H Pyramin<br>Poast                       | 4.0<br>0.5               | 12-3-81            | 8.5                 | 7.2              | 8.7               | 9.2           |
| J Pyramin<br>Fusilade<br>Betamix         | 4.0<br>0.5<br>1.3        | 12-3-81<br>2-12-82 | 9.0                 | 9.6              | 6.0               | 8.5           |
| K Poast<br>Betamix                       | 0.5<br>1.3               | 12-3-81<br>2-12-82 | 9.2                 | 9.0              | 6.7               | 9.2           |
| L Untreated                              | ---                      | ---                | 0                   | 0                | 0                 | 0             |

\* This trial superimposed on trial designated as 302, 425, 81, 10, 82-3 (summarized on Table 5).

\*\* Surfel added at 1 qt. ai/A.

<sup>1/</sup> Evaluations based on a 0 to 10 scale. 0 = no weed control or very poor vigor. 10 = perfect weed control or vigorously growing plants.



TABLE 10 - EFFECT OF POSTEMERGENCE APPLIED HERBICIDES ON WEED CONTROLAND SUGARBEET INJURY

302, 425, 81, 10, 82-7

Location: Spreckels Farm 41, MendotaIrrigation Method: SprinklerSoil Type: Merced clayPlot Size: 5' x 30' - Reps 4Beets Planted: 2-8-82Herbicides Applied: 4-5-82Beet Variety: SD H-9Evaluated: 4-9-82, 4-16-82

| Herbicide    | Lb.ai/<br>Acre | Weed Control and Sugarbeet Injury Evaluations |                     |               |                     |                            |
|--------------|----------------|-----------------------------------------------|---------------------|---------------|---------------------|----------------------------|
|              |                | April 9, 1982                                 |                     | May 16, 1982  |                     | Weeds <u>2/</u><br>Present |
|              |                | % Weed Contr.                                 | Beet Inj. <u>1/</u> | % Weed Contr. | Beet Inj. <u>1/</u> |                            |
| A Betamix    | 1.0            | 12                                            | 0                   | 78            | 1.3                 | K, Lr                      |
| B Betamix    | 1.2            | 27                                            | 1.7                 | 83            | 2.3                 | K, Lr                      |
| C Betamix    | 1.2            | 55                                            | 2.8                 | 85            | 2.0                 | K, Lr                      |
| Endothal 273 | 0.5            |                                               |                     |               |                     |                            |
| D Betamix    | 1.2            | 80                                            | 4.5                 | 90            | 4.0                 | K                          |
| Endothal     | 1.0            |                                               |                     |               |                     |                            |
| E Betamix    | 1.2            | 30                                            | 1.7                 | 85            | 1.8                 | K, Lr                      |
| Poast        | 0.5            |                                               |                     |               |                     |                            |
| F Betamix    | 1.2            | 32                                            | 2.0                 | 78            | 2.8                 | K, Lr                      |
| Fusilade     | 0.5            |                                               |                     |               |                     |                            |
| G Betamix    | 1.2            | 52                                            | 2.2                 | 85            | 1.8                 | K                          |
| Poast        | 0.5            |                                               |                     |               |                     |                            |
| Surfel       | 1 qt.          |                                               |                     |               |                     |                            |
| H Betamix    | 1.2            | 47                                            | 1.8                 | 75            | 2.8                 | Lr                         |
| Fusilade     | 0.5            |                                               |                     |               |                     |                            |
| Surfel       | 1 qt.          |                                               |                     |               |                     |                            |
| J Untreated  | ---            | 0                                             | 0                   | 15            | 1.3                 | Fd, G, K, Lr               |

1/ Beet injury evaluation based on a 0 to 10 scale. 0 = no injury, 10 = very severely injured beet seedlings.

2/ Weeds present: Fd = fiddleneck, G = groundsel, K = knotweed, Lr = London rocket



TABLE 11 - EFFECT OF POSTEMERGENCE APPLICATION OF ENDOTHAL PLUS BETAMIX ON  
SUGARBEETS

302, 425, 81, 10, 82-11

Location: West Side Field Station

Irrigation Method: Furrow

Soil Type: Panoche clay loam

Plot Size: 5' x 90' - 4 reps

Beets Planted: 4-20-82

Herbicides Applied: 5-13-82

Beet Variety: SP H-9E

Beet Growth Stage: 2 to 4 true leaves

Evaluated: 5-19 and 6-18-82

| Herbicides  | lb.ai/<br>Acre | Beet Injury Evaluations |         |
|-------------|----------------|-------------------------|---------|
|             |                | 5-19-82                 | 6-18-82 |
| A Betamix   | 1.0            | 1.25                    | 0       |
| Endothal    | 0.25           |                         |         |
| B Betamix   | 1.0            | 1.5                     | 0.2     |
| Endothal    | 0.5            |                         |         |
| C Betamix   | 1.0            | 3.2                     | 1.0     |
| Endothal    | 1.0            |                         |         |
| D Untreated | ---            | 0                       | 0       |

Injury evaluation based on a 0 to 10 scale. 0 = no injury, 10 = severe injury.



TABLE 12 - EFFECT OF POSTEMERGENCE APPLIED HERBICIDES ON WEED CONTROL AND BEET YIELD

302, 425, 81, 10, 82-10

Location: West Side Field Station  
 Soil Type: Panoche Clay Loam  
 Herbicides Applied: 5-11-82, 5-13-82\*  
 Variety: SP-H-9E

Irrigation: Furrow  
 Plot Size: 5' x 45', Reps. 4  
 Planted: 4-20-82  
 Evaluated: 5-19-82  
 Harvested: 11-1-82

| Herbicide              | Lb.ai/<br>Acre    | Treat.<br>Date             | Weed Control & Injury Rating |                            |                  | Yield Data              |                |                         |                        |
|------------------------|-------------------|----------------------------|------------------------------|----------------------------|------------------|-------------------------|----------------|-------------------------|------------------------|
|                        |                   |                            | %<br>Barley<br>Cont.         | %<br>Millet &<br>Rye Cont. | Beet<br>Injury** | Mean<br>Beets<br>Tons/A | Mean%<br>Sugar | Mean<br>Sugar<br>Tons/A | Mean<br>PPM<br>Nitrate |
| A Betamix<br>Poast     | 1.2<br>0.5        | 5-11-82                    | 80                           | 87                         | 3.5              | 36.7                    | 13.7           | 5.0                     | 30.5                   |
| B Betamix<br>Fusilade  | 1.2<br>0.5        | 5-11-82                    | 88                           | 92                         | 3.8              | 33.5                    | 13.4           | 4.5                     | 32.5                   |
| C Betamix<br>CGA-82725 | 1.2<br>0.5        | 5-11-82                    | 80                           | 88                         | 2.8              | 36.3                    | 13.8           | 5.0                     | 26.5                   |
| D Betamix<br>HOE-00581 | 1.2<br>0.5        | 5-11-82                    | 84                           | 86                         | 4.8              | 33.8                    | 13.3           | 4.5                     | 28.5                   |
| E Poast<br>Betamix     | 1/<br>0.5<br>1.2  | 5-11-82<br>5-13-82         | 83                           | 91                         | 2.8              | 33.4                    | 14.1           | 4.7                     | 22.5                   |
| F Fusilade<br>Betamix  | 1/<br>0.5<br>1.2  | 5-11-82<br>5-13-82         | 83                           | 88                         | 2.5              | 35.9                    | 13.8           | 4.9                     | 25.8                   |
| G CGA-82725<br>Betamix | 1/<br>0.5<br>1.5  | 5-11-82<br>5-13-82         | 82                           | 88                         | 2.5              | 34.5                    | 13.4           | 4.6                     | 33.0                   |
| H Hoe-00581<br>Betamix | 1/<br>0.25<br>1.2 | 5-11-82<br>5-13-82         | 80                           | 90                         | 2.0              | 34.6                    | 13.7           | 4.8                     | 27.5                   |
| J Hoe-00581<br>Betamix | 1/<br>0.5<br>1.2  | 5-11-82<br>5-13-82         | 82                           | 91                         | 3.8              | 34.4                    | 13.9           | 4.8                     | 28.0                   |
| K Betamix<br>Poast     | 1.2<br>1/<br>0.5  | 5-11-82<br>5-13-82         | 77                           | 82                         | 3.5              | 35.2                    | 13.9           | 4.9                     | 26.8                   |
| L Betamix<br>Fusilade  | 1.2<br>1/<br>0.5  | 5-11-82<br>5-13-82         | 77                           | 78                         | 3.8              | 35.2                    | 14.0           | 4.9                     | 29.3                   |
| M Betamix<br>CGA-82725 | 1.2<br>1/<br>0.5  | 5-11-82<br>5-13-82         | 80                           | 85                         | 4.2              | 36.8                    | 13.7           | 5.1                     | 29.0                   |
| N Betamix<br>Hoe-00581 | 1.2<br>1/<br>0.5  | 5-11-82<br>5-13-82         | 77                           | 82                         | 4.0              | 34.6                    | 13.7           | 4.7                     | 29.3                   |
| P Betamix<br>Poast     | 1.2<br>1/<br>0.5  | 2/<br>2/5-11-82<br>5-11-82 | 85                           | 94                         | 3.5              | 36.6                    | 13.9           | 5.1                     | 24.3                   |
| Q Untreated            | ---               | ---                        | 13                           | 20                         | 0.8              | 34.4                    | 13.5           | 4.6                     | 33.0                   |

STATISTICAL NOTATION: %C.V. = 7.57 N.S. N.S. N.S. N.S.

\*Herbicides applied: 5-11, after 3 p.m., T. 72°F; 5-13, after 2 p.m., T. 78°F

\*\*Injury rating based on a scale of 0-10. 0=no beet injury, 10=severe injury.

1/Surfel added at 1 qt./A

2/Applied the same day through separate boom - not tank mixed



TABLE 13 - EFFECT OF POSTEMERGENCE APPLIED HERBICIDES ON WEED CONTROL  
AND SUGARBEET INJURY

302, 425, 81, 10, 82-14

Location: Des Jardins Farms - Firebaugh  
Soil Type: Merced Clay  
Herbicides Applied: 6-5-82  
Variety: SS E-1

Irrigation: Furrow  
Plot Size: 5' x 40', 4 reps  
Beet Growth: 2 to 4 true lvs  
Evaluated: 6-15, 6-18, 6-24-82

| Herbicide             | Lb.ai/<br>Acre                      | Weed Control and Beet Injury Evaluations <sup>1/</sup> |      |      |               |      |      |                  |      |      |
|-----------------------|-------------------------------------|--------------------------------------------------------|------|------|---------------|------|------|------------------|------|------|
|                       |                                     | Grass Controlled                                       |      |      | Bdlf. Control |      |      | Sugarbeet Injury |      |      |
|                       |                                     | 6/15                                                   | 6/18 | 6/24 | 6/15          | 6/18 | 6/24 | 6/15             | 6/18 | 6/24 |
| <hr/>                 |                                     |                                                        |      |      |               |      |      |                  |      |      |
| Betamix               | 1.0 lb.ai/A added to treatments A-K |                                                        |      |      |               |      |      |                  |      |      |
| <hr/>                 |                                     |                                                        |      |      |               |      |      |                  |      |      |
| A Poast               | 0.5                                 | 8.7                                                    | 9.4  | 9.0  | 8.5           | 8.8  | 8.0  | 3.2              | 0    | 1.5  |
| B Fusilade            | 0.5                                 | 8.4                                                    | 9.2  | 7.1  | 8.0           | 9.0  | 6.2  | 3.0              | 0    | 1.0  |
| C CGA-82725           | 0.5                                 | 8.1                                                    | 9.2  | 8.9  | 8.0           | 8.8  | 6.5  | 2.0              | 0    | 1.0  |
| D Hoe-00581           | 0.125                               | 6.5                                                    | 6.4  | 4.5  | 7.7           | 8.4  | 7.6  | 3.2              | 0.5  | 1.8  |
| E Hoe-00581           | 0.25                                | 7.6                                                    | 8.1  | 6.7  | 7.7           | 8.7  | 7.5  | 3.5              | 1.2  | 1.5  |
| F Hoe-00581           | 0.5                                 | 8.1                                                    | 8.6  | 7.5  | 8.0           | 8.8  | 7.0  | 4.2              | 1.5  | 1.8  |
| G Poast<br>Surfel     | 0.25<br>1 qt. >                     | 8.8                                                    | 9.7  | 9.0  | 8.4           | 9.1  | 7.7  | 2.8              | 0    | 1.2  |
| H Fusilade<br>Surfel  | 0.25<br>1 qt. >                     | 8.7                                                    | 8.5  | 7.6  | 8.9           | 8.7  | 7.5  | 3.8              | 0.5  | 1.5  |
| J CGA-82725<br>Surfel | 0.25<br>1 qt. >                     | 8.7                                                    | 9.4  | 9.0  | 8.5           | 8.8  | 7.5  | 3.0              | 0.7  | 1.8  |
| K Hoe-00581<br>Surfel | 0.25<br>1 qt. >                     | 8.2                                                    | 8.7  | 7.7  | 8.4           | 8.7  | 4.5  | 4.0              | 1.5  | 2.8  |
| Betamix               | 1.3 added to treatments L-P         |                                                        |      |      |               |      |      |                  |      |      |
| <hr/>                 |                                     |                                                        |      |      |               |      |      |                  |      |      |
| L Poast               | 0.5                                 | 8.1                                                    | 9.0  | 8.0  | 7.5           | 8.6  | 6.3  | 2.7              | 0.3  | 1.0  |
| M Fusilade            | 0.5                                 | 8.6                                                    | 9.1  | 8.0  | 9.0           | 9.2  | 8.7  | 4.0              | 1.2  | 1.5  |
| N CGA-82725           | 0.5                                 | 8.5                                                    | 8.9  | 7.9  | 8.5           | 9.0  | 8.5  | 2.8              | 0    | 1.2  |
| P Hoe-00581           | 0.5                                 | 7.9                                                    | 8.4  | 6.7  | 8.9           | 9.1  | 8.0  | 4.2              | 1.5  | 1.8  |
| Q Untreated           | ---                                 | 0                                                      | 0    | 0.8  | 0             | 0    | 0    | 0                | 0    | 1.0  |

<sup>1/</sup>Weed control and beet injury ratings are based on a 0 to 10 scale. 0 = no weed control or no injury, 10 = perfect weed control or, as an injury rating, severe beet injury.

Remarks: In many of the plots very sparse infestation of sprangle top was present and were not controlled effectively.



## POWDERY MILDEW CONTROL STUDIES

### Introduction

Numerous applied research trials have been conducted in the Central San Joaquin Valley since 1974 evaluating the effectiveness of sulfur and numerous systemic fungicides for the control of powdery mildew. Beets are planted in this area from October through June; therefore, the first appearance of the disease will vary from field to field.

The fungus disease caused by Erysiphe poligoni D.C., also known as E. betae (Vanha), generally appear as small, white or grayish areas on the underside of the leaves. The fungus filaments (mycelium) grow rapidly and can cover both surfaces of the leaf blade. To obtain nutrition it develops root-like structures (haustoria) that enter the cells of the leaf tissue. Spores (conidia) are produced on the outside of the leaves giving it a powdery, grayish white appearance.

Powdery mildew generally appears in fields when the beets are growing vigorously and their foliage nearly covers the area between the rows or beds. It is favored by a warm dry climate. The optimum temperature for its growth is between 68<sup>0</sup> and 85<sup>0</sup>F.

In Central California the infestation varies from year to year, from area to area and from field to field. It has been observed that in certain fields the disease did not develop even though early symptoms were detected. Therefore, judicious monitoring is essential for effective economical control.

Bayleton, a systemic fungicide, has been evaluated and demonstrated to be effective for the control of powdery mildew in many trials. In addition to Bayleton, two other systemic fungicides, CGA-64250 (Tilt) and EL-228 (Trimidol) were included in numerous trials. These studies were published in earlier progress reports.

### Studies Conducted in 1982 and 1983

The trials conducted during 1982 and 1983 are summarized in Tables 1 through 9 following this narrative section. The fungicides were applied with an



experimental sprayrig as a broadcast or crown application. In the crown application the fungicides were sprayed in a narrow band (using 1506 orifices) into the crown of the sugarbeets, using approximately the same volume of spray solution as in the broadcast treatment (with 11006 orifice).

The fungicides used, rate and timing of application, and methods of evaluation are given in the tables. Yield data were obtained by harvesting the center two rows in each four row plot with a modified one-row commercial harvester equipped with a weighing scale. Two or more subsamples were collected from each plot for tare, sucrose, and nitrate determinations at the Spreckels tare laboratory near Mendota.

#### Results and Observations - 1982 Trials

During 1982, powdery mildew infestation in both trials at the Westside Field Station and Spreckels Farm 41, Mendota, did not develop until late in the season. At the Westside Field Station significant mildew infestation was recorded approximately 100 days after planting and 60 days following the application of the fungicides. The mean percent of mature leaf area diseased did not exceed 39% in the fungicide treated plots and 55% in the untreated areas (see Table 6).

Near Mendota, the infestation was very light until September when the mature leaf area diseased in the untreated plots averaged 40% and the mean for the season was less than 12% (see Table 8).

No statistically significant differences in yield were obtained in the 1982 trials.

#### 1983 Trial I - Westside Field Station

During 1983, powdery mildew infestation at the Westside Field Station was evident early in the season. Ninety days following planting and 29 days following the application of fungicides, fairly severe infestation (39%) was observed in the untreated areas. Two weeks later, in the untreated areas 82% of the mature leaf area was diseased, but mildew started to develop in all plots. The infestation continued to develop until harvest as shown in Table 1.



It is interesting to note that Bayleton at the high rate of 0.75 lbai/A failed to provide effective seasonal control. This is in contrast to earlier studies when 0.5 lbai/A of Bayleton applied in the crown provided effective seasonal control of mildew.

Superimposing sulfur treatments at early evidence of reinfestation in areas treated with Bayleton or EL-228 resulted in prolonged control. However, if the reinfestation was more severe at the time of the sulfur application, 30% MLAD (mature leaf area diseased), the control was much less effective (see Table 1).

EL-228 (Trimidol) provided somewhat better and longer lasting control than Bayleton. This was not reflected in statistically significant yield differences.

All treatments resulted in statistically significant yield increases when compared with yields from the untreated areas. Although differences in effectiveness of control among the treatments were evident, these differences were not reflected in statistically significant yield differences per acre of beets or sucrose (see Table 2).

#### 1983 Trial II - Westside Field Station

Tilt (CGA-64250) and XE-779 were evaluated in a second trial summarized in Tables 3 and 4. Unlike in earlier studies, in which CGA-64250 at 0.25 lbai/A provided excellent long lasting powdery mildew control, in this trial it provided only short-lived control at 0.375 lbai/A as a broadcast application. As a crown application at the same rate per acre it was ineffective. The differences obtained in earlier studies and in 1983 were so strikingly different that it made us question whether Tilt is the same compound as CGA-64250 that was used in earlier studies.

XE-779, a newly introduced fungicide, at 0.375 lbai/A as a crown application, provided much better control than as a broadcast application (see Table 3).

The yield data obtained, summarized in Table 4, is somewhat inconsistent. Sucrose percentage and sugar of per acre were significantly higher in the XE-779 crown treated areas when compared with the untreated. However, root



yield per acre and tons sugar per acre were not statistically significant among the fungicide treated plots (see Table 4).

XE-779 as a crown treatment, Tilt and possibly the earlier evaluated fungicide coded CGA-64250, warrant further evaluation.

#### 1983 Trial - Spreckels Farm 41

Powdery mildew infestation did not develop until late in the season -- September 6. The last evaluation was made October 19. On this date only areas in which EL-228 applied as a crown treatment at 0.75 lbai/A were free of mildew infestation (see Table 5). Crown application at 0.37 lbai/A also maintained better control than was obtained in the Bayleton treated areas.

DPX-H653 applied at 0.125 lbai/A as a crown treatment failed to provide effective control.

The yield data, summarized in Table 5, indicates significant beet root and sucrose yield increases in the EL-228 treated areas.

#### In Conclusion

The 1982 and 1983 powdery mildew control trials raised more questions than they provided answers. The observations made and results obtained indicate that:

- \* Powdery mildew infestation can vary greatly from season to season and from field to field.
- \* Controlling powdery mildew approximately 100 to 120 days following planting may be sufficient to obtain maximum yields.
- \* It is not necessary to maintain mildew control until harvest in the Central San Joaquin Valley.
- \* A single treatment with Bayleton can provide effective seasonal control in years of light infestation. In years of severe infestations, multiple treatments may be required.



- \* It is possible that a more virulent strain of the fungus is appearing or resistance to the fungicide is developing. This is being investigated.

- \* EL-228 (Trimidol) provided more effective and longer lasting control than Bayleton; however, this was not reflected in yield increases.

The results obtained in the trials conducted in the San Joaquin Valley differ from those conducted at Davis and Imperial County. It is obvious that additional studies are needed to investigate:

- \* Multiple application of fungicides.

- \* Length of time that mildew control is needed in relation to the growth of beets to obtain maximum economical yield.

- \* Whether more virulent or Bayleton resistant strains of E. poligoni D.C. are present in the San Joaquin Valley.

- \* The effectiveness of late season sulfur application on beets treated earlier with systemic fungicides.



TABLE 1 -EFFECT OF FOLIAR APPLIED FUNGICIDES ON POWDERY MILDEW CONTROL IN SUGARBEETS  
302, 422, 81, 10, 83-1

Location: Westside Field Station, Field 44

Soil Type: Panoche clay loam

Variety: SSE-1

Fungicides Applied: 6-9-83, 7-25-83 Volume: Crown 24.5gpa, Bdcst. 26.0gpa

Irrigation Method: Furrow

Plot Size: 10' x 40', Reps 6

Planted: 4-1-83

Evaluated: See below

| Fungicide                 | Lb ai/<br>Acre | Date<br>Applied   | Method            | PERCENT MATURE LEAF AREA DISEASED ON DATES SHOWN <sup>1/</sup> |          |           |          |           |           |
|---------------------------|----------------|-------------------|-------------------|----------------------------------------------------------------|----------|-----------|----------|-----------|-----------|
|                           |                |                   |                   | 6-24(15)*                                                      | 7/8(29)* | 7/22(43)* | 8/3(55)* | 8/19(71)* | 8/29(81)* |
| A Bayleton 50WP<br>Sulfur | 0.25<br>20.0   | 6-9-83<br>7-25-83 | Crown<br>Bdcst. > | 0                                                              | 0.77     | 34.3      | 52.5     | 12.0      | 37.0      |
| B Bayleton 50WP<br>Sulfur | 0.375<br>20.0  | 6-9-83<br>7-25-83 | Crown<br>Bdcst. > | 0                                                              | 0        | 9.2       | 33.2     | 26.1      | 59.0      |
| C Bayleton 50WP           | 0.375          | 6-9-83            | Crown             | 0                                                              | 0        | 11.7      | 59.0     | 30.4      | 64.0      |
| D Bayleton 50WP           | 0.75           | 6-9-83            | Crown             | 0                                                              | 1.3      | 9.3       | 37.6     | 16.0      | 65.0      |
| E EL-228WP                | 0.25           | 6-9-83            | Crown             | 0                                                              | 0        | 17.6      | 44.6     | 40.6      | 78.0      |
| F EL-228WP<br>Sulfur      | 0.375<br>20.0  | 6-9-83<br>7-25-83 | Crown<br>Bdcst. > | 0                                                              | 0        | 8.8       | 15.2     | 18.1      | 60.0      |
| G EL-228WP<br>Sulfur      | 0.375<br>20.0  | 6-9-83<br>7-25-82 | Crown<br>Bdcst. > | 0                                                              | 0        | 6.1       | 11.9     | 15.5      | 33.0      |
| H EL-228WP                | 0.375          | 6-9-83            | Crown             | 0                                                              | 0        | 2.9       | 15.2     | 22.9      | 82.0      |
| J EL-228WP                | 0.75           | 6-9-83            | Crown             | 0                                                              | 0        | 0.4       | 6.8      | 11.8      | 43.0      |
| K EL-228EC<br>Sulfur      | 0.375<br>20.0  | 6-9-83<br>7-25-82 | Crown<br>Bdcst. > | 0                                                              | 0        | 7.3       | 14.1     | 17.6      | 61.0      |
| L Untreated               | ---            | ---               | ---               | 1.07                                                           | 39.7     | 82.0      | 92.5     | 28.1      | 69.0      |

<sup>1/</sup>The most recently matured leaf was used on 25 plants in each plot to determine the percent of mildew infestation.

\*The numbers within the parentheses represent the number of days following treatment that the evaluation was made.

Remarks: On the crown application, these fungicides were sprayed into the crown using a 1506 orifice; the broadcast application was applied using a 11006 orifice.



TABLE 2 - EFFECT OF FOLIAR APPLIED FUNGICIDES ON SUGARBEET YIELD, POWDERY MILDEW CONTROL  
AND SUCROSE CONTENT  
302, 422, 81, 10, 83-1

Location: Westside Field Station, Field 44

Soil Type: Panoche clay loam

Variety: SSE-1

Fungicides Applied: 6-9-83, 7-25-83

Volume: Crown 24.5gpa, Bdcst. 26.0gpa

Irrigation Method: Furrow

Plot Size: 10' x 40', Reps 6

Planted: 4-1-83

Harvested: 9-22-83

| Fungicide                 | Lb ai/<br>Acre | Date<br>Applied   | Method            | SUGARBEET YIELD, POWDERY MILDEW CONTROL AND SUCROSE CONTROL EVALUATIONS |                        |                    |                        |                          |
|---------------------------|----------------|-------------------|-------------------|-------------------------------------------------------------------------|------------------------|--------------------|------------------------|--------------------------|
|                           |                |                   |                   | Root Yield 1/<br>lbs/hvst.area                                          | Percent<br>Clean Beets | Percent<br>Sucrose | Tons Sugar<br>Per Acre | Tons Clean<br>Beets/Acre |
|                           |                |                   |                   | *                                                                       |                        | *                  | *                      |                          |
| A Bayleton 50WP<br>Sulfur | 0.25<br>20.0   | 6-9-83<br>7-25-83 | Crown<br>Bdcst. > | 240.0 a                                                                 | 94.6                   | 13.4 a             | 3.44 a                 | 24.7                     |
| B Bayleton 50WP<br>Sulfur | 0.375<br>20.0  | 6-9-83<br>7-25-83 | Crown<br>Bdcst. > | 239.2 a                                                                 | 95.4                   | 13.1 a             | 3.50 a                 | 24.8                     |
| C Bayleton 50WP           | 0.375          | 6-9-83            | Crown             | 245.3 a                                                                 | 93.4                   | 12.6 ab            | 3.46 a                 | 24.9                     |
| D Bayleton 50WP           | 0.75           | 6-9-83            | Crown             | 243.7 a                                                                 | 94.5                   | 13.5 a             | 3.50 a                 | 25.1                     |
| E EL-228WP                | 0.25           | 6-9-83            | Crown             | 242.8 a                                                                 | 94.4                   | 13.2 a             | 3.43 a                 | 24.9                     |
| F EL-228WP<br>Sulfur      | 0.375<br>20.0  | 6-9-83<br>7-25-83 | Crown<br>Bdcst. > | 246.8 a                                                                 | 94.4                   | 13.1 a             | 3.45 a                 | 25.5                     |
| G EL-228WP<br>Sulfur      | 0.375<br>20.0  | 6-9-83<br>7-25-83 | Crown<br>Bdcst. > | 265.2 a                                                                 | 94.4                   | 13.5 a             | 3.67 a                 | 27.2                     |
| H EL-228WP                | 0.375          | 6-9-83            | Crown             | 249.7 a                                                                 | 94.8                   | 13.5 a             | 3.45 a                 | 25.7                     |
| J EL-228WP                | .75            | 6-9-83            | Crown             | 242.0 a                                                                 | 95.5                   | 13.3 a             | 3.33 a                 | 25.2                     |
| K EL-228EC<br>Sulfur      | 0.375<br>20.0  | 6-9-83<br>7-25-83 | Crown<br>Bdcst. > | 251.0 a                                                                 | 95.1                   | 13.2 a             | 3.42 a                 | 26.0                     |
| L Untreated               | ---            | ---               | ---               | 206.2 b                                                                 | 94.3                   | 11.8 b             | 2.53 b                 | 21.2                     |

1/Yield was obtained by harvesting the two center rows (5' x 40') from the center of each plot. Subsamples were obtained from each row (2 samples from each plot) for percent clean beet and sucrose determination.

\*Statistical notations: values in each column followed by the same letter are not significantly different from one another at 5% statistical (Duncan) evaluation.



TABLE 3 - EFFECT OF FOLIAR APPLIED FUNGICIDES ON POWDERY MILDEW CONTROL IN SUGARBEETS

302, 422, 81, 10, 83-2

Location: Westside Field StationIrrigation Method: FurrowSoil Type: Panoche clay loamPlot Size: 10' x 40', Reps 4Variety: SSE-1Planted: 4-1-83Fungicides Applied: 6-9-83Evaluated: See belowVolume: Crown 24.5gpa, Broadcast 26.0gpa

| Fungicide     | Lb ai/<br>Acre | Method | PERCENT MATURE LEAF AREA DISEASED ON DATES SHOWN <sup>1/</sup> |           |          |           |           |
|---------------|----------------|--------|----------------------------------------------------------------|-----------|----------|-----------|-----------|
|               |                |        | 7-8(29)*                                                       | 7-21(42)* | 8-3(55)* | 8-19(71)* | 8-29(81)* |
| A Tilt        | 0.25           | Bdcst. | 0                                                              | 35.1      | 51.9     | 15.4      | 66.0      |
| B Tilt        | 0.375          | Bdcst. | 0                                                              | 5.7       | 11.9     | 3.2       | 73.0      |
| C Tilt        | 0.375          | Crown  | 0                                                              | 55.9      | 94.4     | 32.7      | 73.0      |
| D XE-779 25WP | 0.375          | Bdcst. | 0                                                              | 27.0      | 52.2     | 28.4      | 81.5      |
| E XE-779 25WP | 0.375          | Crown  | 0                                                              | 0.7       | 0.9      | 1.7       | 8.4       |
| F Untreated   | ---            | ---    | 9.5                                                            | 61.8      | 96.1     | 8.2       | 49.0      |

<sup>1/</sup>The most recently matured leaf was used on 25 plants in each plot to determine the percent of mildew infestation.

\* The numbers within the parentheses represent the number of days following treatment that the evaluation was made.

Remarks: On the crown application, these fungicides were sprayed into the crown using a 1506 orifice; the broadcast application was applied using a 11006 orifice.



TABLE 4

TABLE 4 - EFFECT OF FOLIAR APPLIED FUNGICIDES ON SUGARBEET YIELD, POWDERY MILDEW CONTROL AND SUCROSE CONTENT

302, 422, 81, 10, 83-2

Location: Westside Field StationIrrigation Method: FurrowSoil Type: Panoche clay loamPlot Size: 10' x 40', Reps 4Variety: SSE-1Planted: 4-1-83Fungicides Applied: 6-9-83Harvested: 9-21-83Volume: Crown 24.5gpa, Broadcast 26.0gpa

| Fungicide     | Lb ai/<br>Acre | Method | SUGARBEET YIELD, POWDERY MILDEW CONTROL AND SUCROSE CONTROL DATA |                        |                    |                        |                          |
|---------------|----------------|--------|------------------------------------------------------------------|------------------------|--------------------|------------------------|--------------------------|
|               |                |        | Root Yield <sup>1/</sup><br>lbs/hvst.area                        | Percent<br>Clean Beets | Percent<br>Sucrose | Tons Sugar<br>Per Acre | Tons Clean<br>Beets/Acre |
|               |                |        | *                                                                |                        | *                  | *                      |                          |
| A Tilt        | 0.25           | Bdcst. | 118.3 ab                                                         | 94.5                   | 12.0 a             | 2.91 ab                | 24.3                     |
| B Tilt        | 0.375          | Bdcst. | 123.4 a                                                          | 93.8                   | 11.8 a             | 2.98 ab                | 25.2                     |
| C Tilt        | 0.375          | Crown  | 113.1 ab                                                         | 94.6                   | 12.4 ab            | 2.88 ab                | 23.3                     |
| D XE-779 25WP | 0.375          | Bdcst. | 114.9 ab                                                         | 94.5                   | 12.9 b             | 3.06 a                 | 23.6                     |
| E XE-779 25WP | 0.375          | Crown  | 119.6 ab                                                         | 93.6                   | 13.1 b             | 3.20 a                 | 24.4                     |
| F Untreated   | ---            | ---    | 108.4 b                                                          | 13.5                   | 11.8 a             | 2.62 b                 | 22.1                     |

<sup>1/</sup>Yield was obtained by harvesting three rows in each plot (7½' x 40'). Subsamples were obtained from each row (2 samples from each plot) for percent clean beet and sucrose determination.

\*Statistical notations: values in each column followed by the same letter are not significantly different from one another at 5% statistical (Duncan) evaluation.



TABLE 5 - EFFECT OF FOLIAR APPLIED SYSTEMIC FUNGICIDES ON POWDERY MILDEWCONTROL AND SUGARBEET YIELD

302, 425, 81, 10-41, 83-3

Location: Spreckels Farm 41, MendotaSoil Type: Chino clay loamBeet Variety: SSE-1Fungicides Applied: 7-11-83Irrigation Method: Sprinkler + FurrowPlot Size: 53' x 10', Reps 6Beets Planted: 4-27-83Harvested: 10-27-83

## POWDERY MILDEW CONTROL AND SUGARBEET YIELD EVALUATIONS

| Treatment                         | Lb ai/<br>Acre | Method  | Percent Mature<br>Leaf Area Diseased |                        | Root<br>Yield<br>Tons/A | Sucrose<br>Percent | Sucrose<br>Tons/A | Nitrate<br>DPM | Clean Beet<br>Percent |
|-----------------------------------|----------------|---------|--------------------------------------|------------------------|-------------------------|--------------------|-------------------|----------------|-----------------------|
|                                   |                |         | 9-6-83 <sup>2/</sup>                 | 10-19-83 <sup>1/</sup> |                         |                    |                   |                |                       |
| A Untreated                       | ---            | ---     | 28.5                                 | 75.2                   | 31.3                    | 13.08              | 4.0               | 62.7           | 95.0                  |
| B Bayleton                        | 0.37           | Crown   | 14.1                                 | 73.5                   | 31.6                    | 13.81              | 4.3               | 35.8           | 95.2                  |
| C Bayleton                        | 0.75           | Crown   | 5.8                                  | 62.0                   | 31.6                    | 12.96              | 4.1               | 32.3           | 95.8                  |
| D Bayleton<br>Sulfur not applied  | 0.37           | Crown > | 18.7                                 | 75.2                   | 32.3                    | 13.90              | 4.4               | 47.7           | 95.1                  |
| E EL-228-EC                       | 0.37           | Crown   | 0.2                                  | 18.1                   | 34.0                    | 13.10              | 4.4               | 80.0           | 95.5                  |
| F EL-228-WP                       | 0.37           | Bdcst.  | 3.3                                  | 77.1                   | 32.0                    | 12.01              | 3.8               | 54.6           | 95.2                  |
| G EL-228-EC                       | 0.75           | Crown   | 0.2                                  | 0                      | 35.1                    | 13.68              | 4.7               | 54.2           | 95.6                  |
| H EL-228-WP<br>Sulfur not applied | 0.37           | Crown > | 0                                    | 22.3                   | 34.3                    | 12.88              | 4.4               | 43.3           | 95.9                  |
| J DPX-H6573                       | 0.125          | Crown   | 13.3                                 | 93.2                   | 31.9                    | 13.88              | 4.4               | 35.0           | 95.0                  |
| Statistical Notation LSD 5%       |                |         |                                      |                        | 2.5                     | 1.10               | 0.4               | N.S.           | N.S.                  |

<sup>1/</sup> The most recently matured leaf was examined on 25 plants in each plot to determine the mildew infestation.<sup>2/</sup> Two weeks prior to 9-6-83 no evidence of powdery mildew was visible.



TABLE 6 - EFFECT OF FUNGICIDES, METHODS AND RATES OF APPLICATION ON POWDERYMILDEW CONTROL IN SUGARBEETS

302, 422, 81, 10, 82-2

Location: Westside Field StationSoil Type: Panoche clay loamPlanted: 4-21-82Fungicides Applied: 6-17-82Irrigation Method: FurrowPlot Size: 4 Rows (30") x 60', Reps 4Variety: SSE-1Harvested: 10-27, 28-1982

| Treatment     | Lb ai/<br>Acre | Method  | PERCENT MATURE LEAF AREA DISEASED |                               |                               |                              |                                | 2/<br>Mean |
|---------------|----------------|---------|-----------------------------------|-------------------------------|-------------------------------|------------------------------|--------------------------------|------------|
|               |                |         | (40) <sup>1/</sup><br>7-27-82     | (54) <sup>1/</sup><br>8-10-82 | (68) <sup>1/</sup><br>8-24-82 | (83) <sup>1/</sup><br>9-8-82 | (102) <sup>1/</sup><br>8-27-82 |            |
| A Untreated   | ---            | ---     | 10                                | 76                            | 96                            | 66                           | 19                             | 55         |
| B Sulfur      | 20.0           | Brdcst. | 9                                 | 58                            | 53                            | 37                           | 22                             | 29         |
| C Bayleton G  | 0.25           | Crown   | 1                                 | 40                            | 68                            | 62                           | 22                             | 35         |
| D Bayleton G  | 0.5            | Crown   | 0                                 | 4                             | 47                            | 60                           | 17                             | 19         |
| E Bayleton WP | 0.25           | Crown   | 2                                 | 28                            | 51                            | 62                           | 22                             | 28         |
| F Bayleton WP | 0.5            | Crown   | 0                                 | 7                             | 63                            | 72                           | 11                             | 25         |
| G CGA-64250   | 0.25           | Crown   | <1                                | 11                            | 62                            | 70                           | 15                             | 26         |
| H CGA-64250   | 0.5            | Crown   | <1                                | 2                             | 37                            | 65                           | 12                             | 17         |
| I CGA-64250   | 0.25           | Brdcst. | <1                                | 12                            | 66                            | 74                           | 18                             | 28         |
| J CGA-64250   | 0.5            | Brdcst. | 0                                 | <1                            | 27                            | 79                           | 28                             | 17         |
| K EL-228 G    | 0.25           | Crown   | <1                                | 14                            | 64                            | 64                           | 11                             | 26         |
| L EL-228 G    | 0.5            | Crown   | <1                                | 8                             | 43                            | 43                           | 13                             | 17         |
| M EL-228      | 0.25           | Crown   | 1                                 | 45                            | 82                            | 63                           | 16                             | 39         |
| N EL-228      | 0.5            | Crown   | <1                                | 2                             | 47                            | 71                           | 14                             | 20         |
| O EL-228      | 0.25           | Brdcst. | <1                                | 20                            | 74                            | 68                           | 16                             | 31         |
| P EL-228      | 0.5            | Brdcst. | <1                                | 6                             | 54                            | 59                           | 8                              | 21         |

<sup>1/</sup> Days after treatment<sup>2/</sup> Each rating weighted by the number of weeks to October 1, 1982.



TABLE 7 - EFFECT OF FOLIAR APPLIED FUNGICIDES FOR POWDERY MILDEW  
CONTROL ON SUGARBEET YIELD AND SUGAR CONTENT

302, 422, 81, 10, 82-2

Location: Westside Field Station  
 Soil Type: Panoche clay loam  
 Planted: 4-21-82  
 Fungicides Applied: 6-17-82

Irrigation Method: Furrow  
 Plot Size: 4 Rows (30") x 60', Reps 4  
 Variety: SSE-1  
 Harvested: 10-27, 28-1982

| Treatment     | Lb ai/<br>Acre | Method  | AVERAGE YIELD, SUCROSE PERCENT AND NITRATE CONTENT <sup>1/</sup> |                    |                    |                |
|---------------|----------------|---------|------------------------------------------------------------------|--------------------|--------------------|----------------|
|               |                |         | Root Yield<br>T/A                                                | Sucrose<br>Percent | Gross Sugar<br>T/A | Nitrate<br>PPM |
| A Untreated   | ---            | ---     | 35.3                                                             | 13.0               | 4.60               | 42.5           |
| B Sulfur      | 20.0           | Brdcst. | 36.0                                                             | 13.1               | 4.70               | 47.2           |
| C Bayleton G  | 0.25           | Crown   | 37.7                                                             | 13.1               | 4.93               | 54.0           |
| D Bayleton G  | 0.5            | Crown   | 37.7                                                             | 13.3               | 5.02               | 49.8           |
| E Bayleton WP | 0.25           | Crown   | 37.3                                                             | 13.0               | 4.86               | 58.0           |
| F Bayleton WP | 0.5            | Crown   | 37.8                                                             | 13.4               | 5.08               | 50.0           |
| G CGA-64250   | 0.25           | Crown   | 37.5                                                             | 13.4               | 5.01               | 46.5           |
| H CGA-64250   | 0.5            | Crown   | 38.6                                                             | 13.4               | 5.05               | 48.2           |
| I CGA-64250   | 0.25           | Brdcst. | 38.7                                                             | 13.3               | 5.13               | 47.5           |
| J CGA-64250   | 0.5            | Brdcst. | 38.7                                                             | 13.3               | 5.16               | 49.0           |
| K EL-228 G    | 0.25           | Crown   | 38.4                                                             | 13.0               | 4.99               | 60.0           |
| L EL-228 G    | 0.5            | Crown   | 38.2                                                             | 13.7               | 5.25               | 45.0           |
| M EL-228      | 0.25           | Crown   | 39.2                                                             | 13.0               | 5.12               | 50.5           |
| N EL-228      | 0.5            | Crown   | 38.9                                                             | 13.0               | 5.04               | 59.8           |
| O EL-228      | 0.25           | Brdcst. | 38.6                                                             | 13.2               | 5.10               | 50.8           |
| P EL-228      | 0.5            | Brdcst. | 38.8                                                             | 13.0               | 5.02               | 58.0           |
| Mean          |                |         | 38.0                                                             | 13.2               | 5.00               | 51.0           |
| LSD @.05      |                |         | NS                                                               | NS                 | NS                 | NS             |

1/Yield was obtained by harvesting two rows in each plot (5' x 55'). Subsamples were obtained from each row (2 samples from each plot) for percent clean beet and sucrose determination. Root yield calculated on the bases of clean beet.



TABLE 8 - EFFECT OF FUNGICIDES, METHODS AND RATES OF APPLICATION ON POWDERY

## MILDEW CONTROL IN SUGARBEETS

302, 422, 81, 10, 82-1

Location: Spreckels Farm 41, Mendota  
 Soil Type: Chino clay loam  
 Planted: 2-8-82  
 Fungicides Applied: 5-28-82

Irrigation Method: Sprinkler-Furrow  
 Plot Size: 4 rows (30") x 50', Reps 5  
 Variety: SSE-1  
 Harvested: 10-27, 28-1982

| Treatment                | Lb ai/<br>Acre | Method  | PERCENT MATURE LEAF AREA DISEASED |                               |                              |                               |                              | Mean    |
|--------------------------|----------------|---------|-----------------------------------|-------------------------------|------------------------------|-------------------------------|------------------------------|---------|
|                          |                |         | (42) <sup>1/</sup><br>7-9-82      | (54) <sup>1/</sup><br>7-21-82 | (66) <sup>1/</sup><br>8-3-82 | (82) <sup>1/</sup><br>8-19-82 | (97) <sup>1/</sup><br>9-2-82 |         |
| A Untreated              | ---            | ---     | 2                                 | 7                             | 16                           | 12                            | 40                           | + 11.37 |
| B Untreated<br>Bayleton* | 0.5            | ---     | 5                                 | 4                             | 10                           | 18                            | 2                            | 7.63    |
| C Bayleton WP<br>Nufilm  | 0.5<br>1%      | Crown   | 0                                 | <1                            | <1                           | 6                             | 7                            | 2.09    |
| D EL-228                 | 0.25           | Crown   | <1                                | <1                            | 3                            | 14                            | 30                           | 6.23    |
| E EL-228                 | 0.25           | Brdcst. | <1                                | <1                            | 6                            | 11                            | 25                           | 5.91    |
| F EL-228                 | 0.5            | Crown   | 0                                 | 0                             | <1                           | 3                             | 25                           | 3.02    |
| G EL-228                 | 0.5            | Brdcst. | 0                                 | <1                            | 7                            | 29                            | 22                           | 8.49    |
| H Sulfur<br>Nufilm       | 20.0<br>1%     | Brdcst. | 1                                 | 3                             | 5                            | 17                            | 8                            | 5.60    |
| J CGA-64250              | 0.25           | Crown   | 0                                 | <1                            | <1                           | 12                            | 37                           | 5.86    |
| K CGA-64250              | 0.25           | Brdcst. | <1                                | <1                            | 8                            | 24                            | 21                           | 8.07    |
| L CGA-64250              | 0.5            | Crown   | 0                                 | 0                             | <1                           | 13                            | 28                           | 4.93    |
| M CGA-64250              | 0.5            | Brdcst. | 0                                 | <1                            | 2                            | 20                            | 27                           | 6.44    |

\* Bayleton not applied because no disease symptoms were evident.

<sup>1/</sup> Days after treatment.

<sup>2/</sup> Each rating weighted by the number of weeks to harvest.



TABLE 9 - EFFECT OF FOLIAR APPLIED FUNGICIDES FOR POWDERY MILDEW  
CONTROL ON SUGARBEET YIELD AND SUGAR CONTENT

302, 422, 81, 10, 82-1

Location: Spreckels Farm 41, Mendota  
Soil Type: Chino clay loam  
Planted: 2-8-82  
Fungicides Applied: 5-28-82

Irrigation Method: Sprinkler-Furrow  
Plot Size: 4 rows (30") x 50', Reps 5  
Variety: SSE-1  
Harvested: 10-27, 28-1982

| Treatment                  | Lb ai/<br>Acre | Method  | AVERAGE YIELD, SUCROSE PERCENT AND NITRATE CONTENT* |                    |                    |                |
|----------------------------|----------------|---------|-----------------------------------------------------|--------------------|--------------------|----------------|
|                            |                |         | Root Yield<br>T/A                                   | Sucrose<br>Percent | Gross Sugar<br>T/A | Nitrate<br>PPM |
| A Untreated                | ---            | ---     | 28.5                                                | 14.5               | 4.13               | 14.2           |
| B Untreated<br>Bayleton 1/ | 0.5            | ---     | 27.9                                                | 15.0               | 4.19               | 11.2           |
| C Bayleton WP<br>Nufilm    | 0.5<br>1%      | Crown   | 30.6                                                | 15.2               | 4.63               | 11.6           |
| D EL-228                   | 0.25           | Crown   | 30.8                                                | 14.8               | 4.67               | 14.3           |
| E EL-228                   | 0.25           | Brdcst. | 27.3                                                | 14.6               | 3.99               | 14.1           |
| F EL-228                   | 0.5            | Crown   | 29.0                                                | 14.2               | 4.11               | 14.9           |
| G EL-228                   | 0.5            | Brdcst. | 29.2                                                | 14.5               | 4.22               | 15.4           |
| H Sulfur<br>Nufilm         | 20.0<br>1%     | Brdcst. | 30.7                                                | 14.7               | 4.52               | 11.3           |
| J CGA-64250                | 0.25           | Crown   | 28.0                                                | 14.7               | 4.10               | 12.6           |
| K CGA-64250                | 0.25           | Brdcst. | 29.0                                                | 14.5               | 4.15               | 12.4           |
| L CGA-64250                | 0.5            | Crown   | 28.0                                                | 14.4               | 4.03               | 17.1           |
| M CGA-64250                | 0.5            | Brdcst. | 28.6                                                | 14.6               | 4.23               | 13.7           |
| Mean                       |                |         | 29.0                                                | 14.6               | 4.24               | 13.6           |
| LSD @ .05                  |                |         | NS                                                  | NS                 | NS                 | NS             |

\* Yield was obtained by harvesting two rows in each plot (5' x 50'). Subsamples were obtained from each row (2 samples from each plot) for percent clean beet and sucrose determination. Root yield calculated on the bases of clean beet.

1/ Bayleton not applied because no disease symptoms were evident.



## IRRIGATION STUDIES

Sugarbeet growers find that their cost of production is continually increasing. To produce a profitable crop they must continually evaluate all inputs. The cost of water as well as the cost of energy and labor required to irrigate the crop is increasing. Water management such as frequency of irrigation, quantity of water applied, and irrigation cutoff date can influence the beet tonnage, sucrose content, quality, and ultimately the profitability of growing beets.

An experiment was conducted at the Westside Field Station under the leadership of Dr. Terry Howell, U.S.D.A-A.R.S.. Among the objectives were to study:

- \* The effects of irrigation frequency on the yield of beets.
- \* The effect of irrigation cutoff on yield.
- \* The evapotranspiration as effected by irrigation frequency.
- \* The accumulation of sugar during the growing season.

Irrigation water was applied at 1, 2, and 3 week intervals. Each time the crop was irrigated with sufficient amounts of water to refill the soil profile. The irrigation cutoffs were scheduled 3, 5, and 7 weeks prior to harvest.

The results obtained in the study will be published by Dr. Howell in other journals. From a preliminary summary report prepared by L. H. Ziska, Plant Physiologist, U.S.D.A-A.R.S., we can glean the following:

- \* No significant difference in sucrose yields were obtained due to irrigation frequency or cutoff date (see Table 1).
- \* Regardless of the frequency of irrigation, it is essential to replenish the soil profile on each date of water application.
- \* The permeability of certain soils to irrigation water is gradually reduced as the season progresses. Therefore, extending the



frequency of irrigation beyond 2 weeks on Panoche clay loam soil is not advisable because it could not be readily replenished.

- \* Cutoff dates of 2, 3, or 7 weeks prior to harvest did not adversely affect the yield.
- \* The combination of 3 week intervals in irrigation water application and 7 week cutoff date resulted in water extraction from greater depth.
- \* Closer monitoring of the water utilization (evapotranspiration) and better scheduling of irrigation can result in more efficient and reduced water application.

A second irrigation cutoff trial was conducted on Murietta Farms near Mendota on Oxalis silty clay soil. The beets were planted 10-14-82 and harvested 9-19-83. The field was irrigated approximately at two week intervals starting May 13. The irrigation cutoff dates and yield data are given in Table 2.

The results indicate that:

- \* On Oxalis silty clay soil significantly higher yields of beets and sucrose were obtained when the last irrigation was applied 8 weeks rather than 4 weeks prior to harvest.
- \* Significantly greater sucrose yield was obtained when the cutoff date was 6 weeks rather than 4 weeks before harvest.
- \* The clean beet and sucrose percentage increased with longer cutoff dates; however, the differences were not statistically significant.

#### CONCLUSIONS

The irrigation studies indicate that beet growers have great latitude in the frequency of irrigation as long as the depleted water can be replenished in the soil profile to the rooting depth. Growers can reduce the amount of water applied by manipulating the cutoff date. This needs to be closely coordinated with fieldmen of sugar companies when scheduling harvest.



TABLE 1 - EFFECT OF IRRIGATION FREQUENCY AND CUTOFF DATE ON SUGARBEET YIELD

Trial Location: Westside Field Station

Soil Type: Panoche clay loam

Beets Planted: April 15, 1983

Beet Variety: SS E-1

Fertilization: 100 N/A

Plot Size: 12 (30") rows x 85' - Reps 4

Harvested: October 6 and 7, 1983

YIELD COMPONENT AVERAGES

| Irrigation<br>Frequency | Net<br>Root          | Percent<br>Sucrose | Sucrose<br>Yield | Cutoff | Net<br>Root | Percent<br>Sucrose | Sucrose<br>Yield |
|-------------------------|----------------------|--------------------|------------------|--------|-------------|--------------------|------------------|
| Weeks                   | T/A                  | %                  | T/A              | Weeks  | T/A         | %                  | T/A              |
| 1                       | 32.6 a <sup>1/</sup> | 11.6 a             | 3.8 a            | 3      | 32.6 a      | 11.2 a             | 3.7 a            |
| 2                       | 32.6 a               | 11.3 a             | 3.9 a            | 5      | 32.0 a      | 11.4 a             | 3.6 a            |
| 3                       | 31.4 b               | 11.5 a             | 3.6 a            | 7      | 32.0 a      | 11.9 b             | 3.8 a            |

<sup>1/</sup>Different letters within the same column indicate treatment differences at the 5% level (Duncans Multiple Range Test).



TABLE 2

EFFECT OF IRRIGATION "CUT-OFF" INTERVAL PRIOR TO HARVEST ON SUGARBEET YIELDTrial Location: Jensen Ave.  $\frac{1}{2}$  mi. E. of San Diego, Murrieta FarmsSoil Type: Oxalis silty clayBeets Planted: 10-14-82Beet Variety: SS E-1Irrigation Schedule:

Last Irrigation: A - August 17, 1983

B - August 4, 1983

C - July 24, 1983

Harvested: September 19, 1983

|   | Cut-Off Dates   | Yield/<br>Hrvst. Row<br>* | Percent<br>Clean Beet | Percent<br>Sucrose<br>* | Tons/ A<br>Sucrose<br>* |
|---|-----------------|---------------------------|-----------------------|-------------------------|-------------------------|
| A | August 17, 1983 | 649.0 a                   | 91.5                  | 12.0 a                  | 3.87 a                  |
| B | August 4, 1983  | 657.7 a                   | 92.3                  | 12.7 a                  | 4.19 b                  |
| C | July 24, 1983   | 702.4 b                   | 93.4                  | 12.8 a                  | 4.56 b                  |

\*Statistical notations: values in each column followed by the same letter are not significantly different from one another at 5% statistical (Duncan) evaluation.



## Toward More Effective WEED CONTROL

Without knowledge of the weed infestation it isn't possible to intelligently plan an economical weed 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 231 commonly occurring weeds in different stages of their growth. The pictures in a sturdy, 3-ring binder, can be purchased from Agricultural and Natural Resources, 6701 San Pablo, Oakland, California 94608.

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 illustrated below, can be used to keep records of weed infestations. They are available from Cooperative Extension offices, from pest control advisors and distributors of herbicides.

## WEED INFESTATION RECORD

| FIELD LOCATION           |                     | CROP               |                                   | HERBICIDE USED         |               |                 |             |                        |                    |
|--------------------------|---------------------|--------------------|-----------------------------------|------------------------|---------------|-----------------|-------------|------------------------|--------------------|
| DATE PLANTED             |                     | DATE               |                                   | NOTES TAKEN            |               |                 |             |                        |                    |
|                          |                     |                    |                                   | PREVIOUS CROP          |               |                 |             |                        |                    |
| <b>BROADLEAF ANNUALS</b> | Anise               | Airplex            | Bassia                            | Black                  | Bristly       | Burweed         | Carpetweed  | Cat's Ear              | Cheeseweed         |
| Chickweed                | Clover              | Cocklebur          | Five Hook                         | Bindweed               | Oxtongue      | Dock            | Dodder      | Fal Hen                | Fiddleneck         |
| Filaree                  | Flaxleaved Fleabane | Ground cherry      | Groundsel                         | Hemlock                | Henbit        | Jimson Weed     | Knotweeds   | Lambsquarters          | Lettuce Wild       |
| London Rocket            | Mare's Tail         | Mayweed            | Milk Thistle                      | Miner's lettuce        | Morning Glory | Mustard         | Nettle      | Net leaved Goosefoot   | Nightshade         |
| Nuttalls Manolepis       | Phacelia            | Pigweed            | Pineapple Weed                    | Plantain               | Puncture Vine | Purslane        | Red Maids   | Russian Thistle        | Scarlet Pimpernel  |
| Shepherd's Purse         | Saw Thistle         | Spiny Clobur       | Spurge                            | Sunflower, Common      | Tarweed       | Telegraph plant | Toadflax    | Turkey Mullen          | Velvet Leaf        |
| Venice Mallow            | Veronica            | Willow Herb        | Yellow Starthistle                |                        |               |                 |             |                        |                    |
| <b>GRASSES ANNUAL</b>    | Annual Bluegrass    | Barley, Volunteer  | Barnyard-grass                    | Bromegrass             | Canarygrass   | Cupgrass        | Dallisgrass | Diffuse Lovegrass      | Feather Fingergass |
| Foxtails (Bristle-grass) | Jungle Rice         | Orcutt's Lovegrass | Rabbitfootgrass                   | Ripgut Brome           | Ryegrass      | Sandbur         | Sprangletop | Wild Barley (Foxtails) | Wild Oats          |
| Witchgrass               |                     |                    |                                   |                        |               |                 |             |                        |                    |
| <b>PERENNIALS</b>        | Alkali Sida         | Bermudagrass       | BINDWEED (Morning Glory)          | Cattail                | Chickory      | Heliotrope      | Hairy Cress | Johnsongrass           | Musledges Purple   |
| Musledges, Yellow        | Russian Knapweed    | Saltgrass          | SILVERLEAF NIGHTSHADE (Morsehett) | Swamp Smartweed (Kelp) | Taigaucha     | Tule            |             |                        |                    |

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January, 1984

650 Printed



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**UNIVERSITY OF CALIFORNIA**  
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