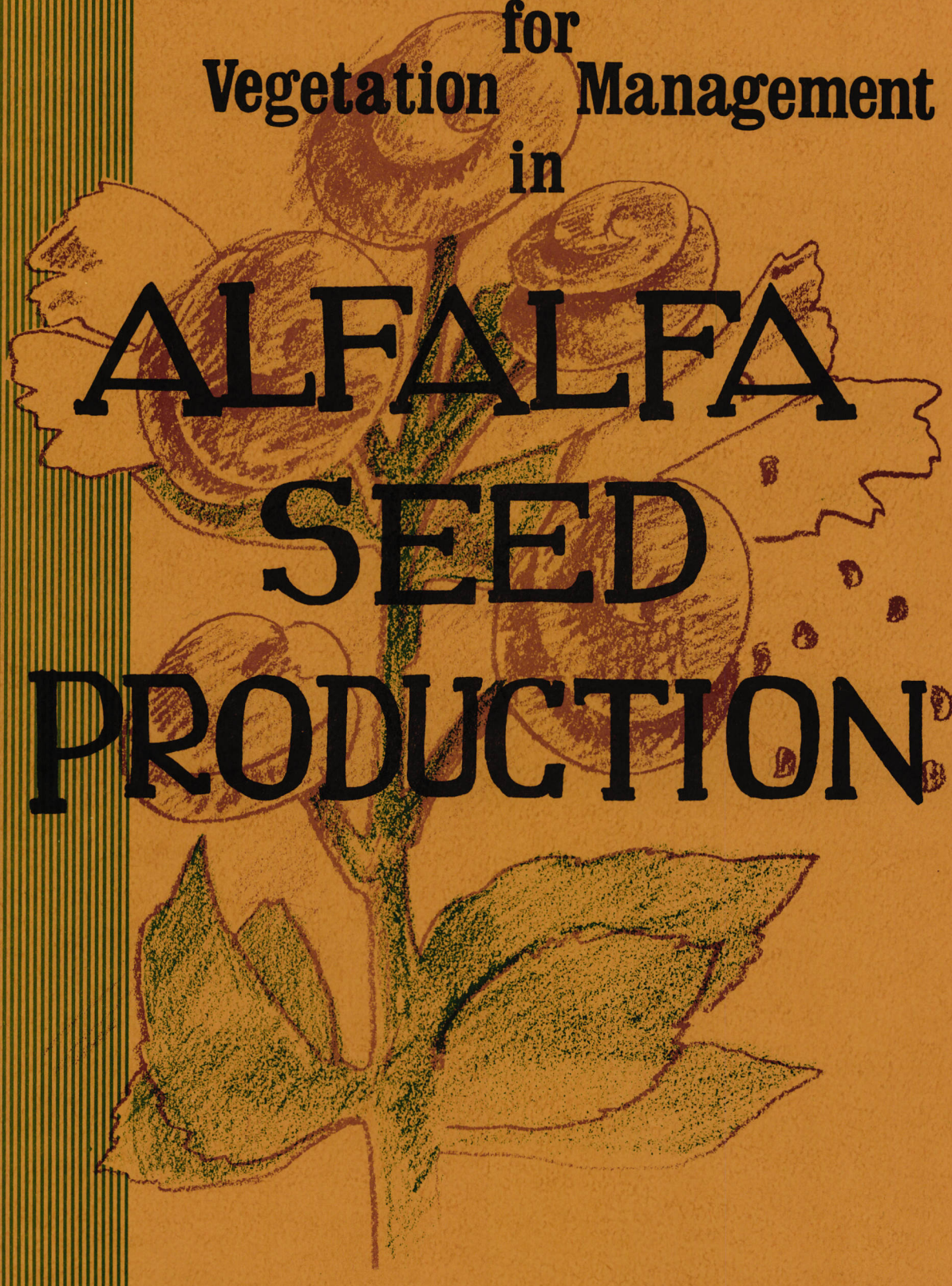
Runcina VOL. 16

Evaluation of Herbicides for Vegetation Management in ALFALFA SEED PRODUCTION



UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION FRESNO COUNTY

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

WARNING ON THE USE OF CHEMICALS

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

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

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Bill B. Fischer
Farm Advisor

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PREFACE

This progress report is a summary of applied research studies conducted in Fresno County. The first part of the report contains a general summary of past years' studies and field observations. A chart is included containing information about the susceptibility of weeds to herbicides registered for use in alfalfa seed fields. In a second chart a brief summary of the performance of herbicides is also included. The information presented in these two charts is tentative. Additional information may warrant changes.

The second part of the report is devoted to the presentation of information obtained in the trials conducted during the 1977 growing season. Additional information relating to the trials is available from the author of this report.

This is a progress report of applied research studies. It is not intended to serve as recommendations for the use of herbicides in alfalfa seed production. For weed control recommendations, please consult weed control guides published by the University of California. Always read and follow directions given on the label before using herbicides.

WHAT IS RUNCINA?

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

Runcina is the name of progress reports of applied weed control research studies conducted in Fresno County.

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VEGETATION MANAGEMENT IN THE PRODUCTION OF ALFALFA SEED

A Progress Report

Bill B. Fischer*



Alfalfa seed production in the central San Joaquin Valley is a highly specialized industry producing many varieties to meet the needs of hay growers locally, throughout the United States and in foreign countries.

Alfalfa hay growers in many areas of the world learned that certified seed grown in central California is of top quality, true to variety and free of weed seeds. To maintain this reputation and to produce alfalfa seed profitably, growers must endeavor to keep their fields free not only of noxious weeds but all competing, unwanted vegetation. To maintain the

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purity of the stand, following the first harvest, alfalfa germinating from seeds lost during harvest or from natural shattering of pods must be controlled also.

This is a demanding task requiring advanced planning and the utilization of mechanical and chemical tools in a unified program of vegetation management. Toward this objective extensive adaptive research studies have been conducted in Fresno County evaluating effective methods of weed control in alfalfa seed production.

These studies were generously supported by the California Alfalfa Seed Production Research Board and many growers in whose fields the applied research studies were conducted. The results of earlier studies have been published by the University of California Cooperative Extension in Fresno County and they were included in the proceedings of the Alfalfa Seed Production Symposium.

In this progress report a brief review of earlier studies and observations is presented and the studies conducted in 1977 are summarized. This progress report is prepared to inform members of the California Alfalfa Seed Production Research Board, cooperating growers and commercial companies of the results of our studies. It does not contain recommendations for the use of herbicides or methods of application. Regarding the use of herbicides in alfalfa seed production, please consult weed control guides and follow directions printed on the labels of recommended herbicides.

Unwanted Vegetation Control

Economical weed control in alfalfa seed production, as in the production of other crops, hinges on an effective system of vegetation management that utilizes all available knowledge and tools to produce a crop relatively

free of unwanted competing vegetation. Weeds can significantly increase the cost of seed production by:

a. increasing the need for repeated diskings and cultivations that can injure the alfalfa crowns,

b. necessitating the use of costly hand labor to clean out weeds from the planted row,

c. enhancing the buildup of insect populations therefore increasing the cost of insect control,

d. preventing approval of the field for certified seed production,

e. reducing the efficiency of harvest,

f. reducing the yield,

g. requiring additional seed cleaning and processing to remove weed seeds, which causes further loss of seed.

Although selective herbicides are used extensively, and they play a major role in the effective control of weeds in certified alfalfa seed production, they cannot be relied on to control all species of weeds. Examination of the chart on pg.14 listing the susceptibility of weeds to herbicides evaluated clearly demonstrates this fact. Therefore, sound agronomic practices have to be an integral part of an effective, economical weed control program. Practices such as:

Intelligent Field Selection

Through a sound cropping sequence (rotation) fields infested with perennial weeds, such as, whitehorsenettle, Russian knapweed, hoarycress, field bindweed, could be avoided. Fields infested with parasitic dodder should not be planted.

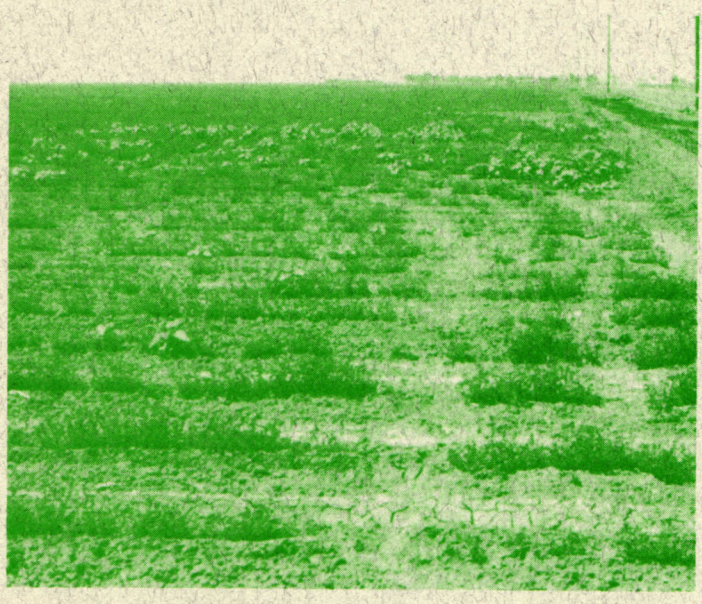
The perennials can be controlled before alfalfa is planted and dodder infested fields should be planted with crops that are not hosts to this parasite. Seed fields infested with dodder and other noxious weeds cannot be certified.

Proper Land Preparation

The importance of proper land and seed-bed preparation cannot be over-emphasized. Proper land preparation is essential for uniform distribution of irrigation water. A well prepared seed-bed promotes the rapid, uniform germination of alfalfa seeds and it enhances the effectiveness of herbicides.

Good Sanitation

Weeds allowed to grow and mature in and around the fields can encourage the buildup of insect populations. Weed species that are resistant to commonly used herbicides should be rogued to prevent their rapid increase through seed production. If the adage "--prevention is the best cure--" has validity, good sanitation could be a very profitable practice.



Wild sunflower plants allowed to mature and produce seed along the roadside the previous year created a serious weed problem in this newly planted alfalfa field. Practicing good sanitation would have prevented the problem.

Herbicide Selection

The use of selective herbicides can significantly decrease the cost of weed control. But only knowledge of the weed infestation can enable one to

select the most effective herbicide to use. Applying them without knowing the weed infestation can be wasteful and costly. Keeping records of weed infestation on cards such as the one stapled to the inside of the back cover, can be very beneficial.

Cultural Practices

Properly timed irrigations enhance the performance of herbicides. They are essential components of a good weed control program along with effective insect and disease control that promotes the health and longevity of the stand.

Vigorous Alfalfa Growth

Crop competition can greatly minimize and often prevent weed seed germination and their survival. Therefore, management practices that encourage the vigorous growth of the alfalfa are essential elements of an effective vegetation management system.

Mechanical Weed Control

Mechanical destruction is an effective, and at times it may be the most economical, method of controlling weeds. There are many tillage tools such as disks, rolling cultivators rototillers and cultivating shovels that will do a good job when properly used. All annual weeds are susceptible to them; not one has developed resistance to a metal blade whether on the end of a stick, a disk-blade or tiller. However, they do not provide lasting control and they have to be used repeatedly. The increasing cost of equipment, fuel and labor makes their use more and more expensive.

Complete weed control with mechanical tools, especially in the planted row in newly established alfalfa cannot be accomplished without costly hand hoeing.

Repeated cross diskings and cultivations used to control weeds and volunteer alfalfa in established fields may have an adverse effect on the health and longevity of the stand. It is difficult to assess how repeated injury by cultivators, and cuttings by disks of crowns influence the health of the plants and their yield.

The Role of Herbicides

There are a number of herbicides registered for use in alfalfa seed fields. Their effective use requires more advanced planning and a little more skill than the use of cultivators and hoes. Their proper use can provide longer lasting, more effective and less expensive control of the unwanted vegetation. Selective herbicides can be used:

Prior to Planting

Herbicides such as Balan, Eptam and Tolban can be used prior to planting of the alfalfa and incorporated into the soil to a depth of 2 to 2½ inches.

The use of these herbicides is especially desirable in fields that are infested with annual grasses and fiddleneck. Balan and Tolban effectively control knotweed, an annual somewhat difficult to control with the available postemergence herbicides.



The use of Balan, Eptam or Tolban preplant incorporated is essential in fields where a grass problem is anticipated.

Eptam was used in a 12" band on top of the bed and it effectively controlled the grasses.

Preemergence

Certain herbicides can be applied on the surface of the soil after planting. To leach them into the soil, where the weed seeds germinate, rainfall or sprinkler irrigation is essential.

In furrow irrigated fields, if rainfall did not occur prior to the emergence of the weeds, the use of preemergence herbicides has not been effective.

Postemergence

Following the emergence of the alfalfa and weeds, selective herbicides can be applied on their foliage to control the weeds without injuring the crop.

However, after the application of certain herbicides such as Kerb and Chemhoe, rainfall or sprinkler irrigation is essential to leach them into the root zone. They kill weeds through root uptake and have little foliar activity.

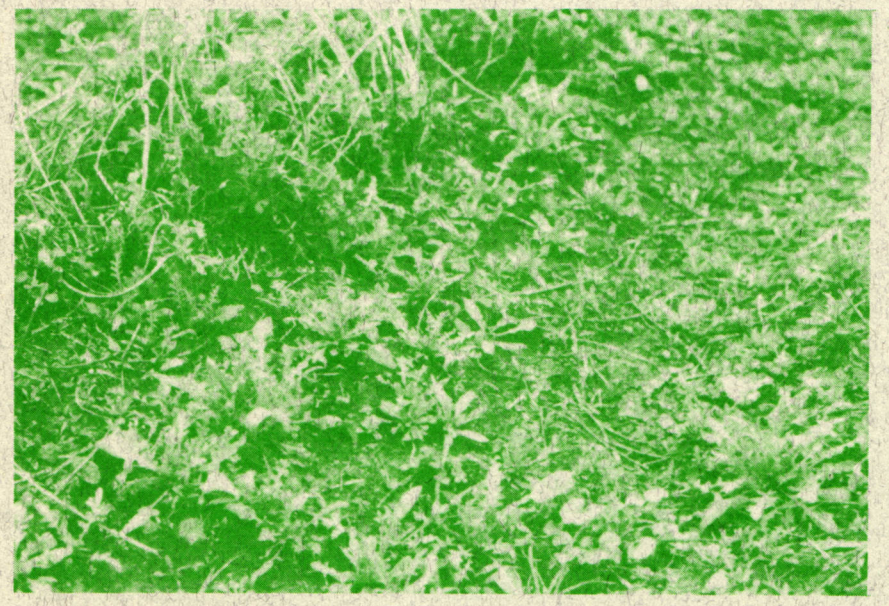


Postemergence herbicides such as 2,4-DB ester and dinitro selective should be applied when the weeds are in their seedling stage and growing vigorously, as pictured on the left. Many broadleaf weeds become tolerant to herbicides once they are beyond their seedling stage and/or when their stems start elongating.

Lay-by or Post-Thinning

Lay-by or post-thinning are terms used to describe applications made in established stands of newly planted or older stands. Generally, little or no additional cultivations are done following treatment. Certain herbicides such as Treflan is applied on the surface of the soil and incorporated with sectioned rolling cultivators. Eptam can be injected into the irrigation water.

In one year old or older stands Karmex and/or Furloe are often used alone or, if weeds are emerged at the time of treatment, in combination with contact herbicides such as Paraquat, dinitro general and weed oil.



Alfalfa seed field after the first harvest is infested with weeds and volunteer alfalfa.

Repeated cultivation is the only effective and practical method of cleaning out the field. Following cultivation Karmex or Treflan could be applied to prevent reinfestation.

The Performance of Herbicides

The activity and performance of herbicides are influenced by many factors, such as; soil type, moisture, temperature, vigor of the weeds and their maturity, timing of application, rate and accuracy of their application, weed species present and their susceptibility to the herbicide, the size and vigor of the alfalfa.

Some of these factors are within the control of the growers, some are beyond their control and still others are unpredictable and cannot be anticipated. When planning a weed control program some flexibility needs to be allowed for.

Alternatives must be weighed in case the field is not accessible at the proper time or air application cannot be made because of unfavorable weather conditions.

It is ironical that poor herbicide performance and sometime crop injury are caused by those enumerated factors that are within the control of the growers and applicators. Poor weed control and crop injury are most often caused by improper timing of the application relative to the weed growth. As an example, knotweed is susceptible to Buthoxone, Butyrac esters and dinitro selective in its seedling stage of growth but not after stem elongation.

Miscalculation of the rate of application often results in poor weed control and crop injury. The importance of proper calibration of the sprayer cannot be over-emphasized.

Volunteer Alfalfa Control

In certified alfalfa seed production following the first harvest, the volunteer alfalfa emerging from seeds lost during harvest and from natural shattering of pods, must be controlled to maintain the purity of the stand.

Cleaning up the field soon after harvest, incorporating the trash into the soil followed by application of Karmex, has prevented the establishment of volunteer alfalfa. Once the seedlings are established Karmex will not control them effectively.

In soils that crack severely upon drying alfalfa seedlings can emerge from below the herbicide treated layer of soil.

Shallow cultivation has been effectively used to prevent cracking without reducing the effectiveness of the herbicide.



Above is an alfalfa field properly cleaned up following harvest and treated with Karmex. Effective weed and volunteer alfalfa control was obtained.

Below - an alfalfa field treated with Karmex, but the soil cracked severely and volunteer alfalfa emerged from below the treated soil through the cracks. Shallow cultivation would have prevented the problem.

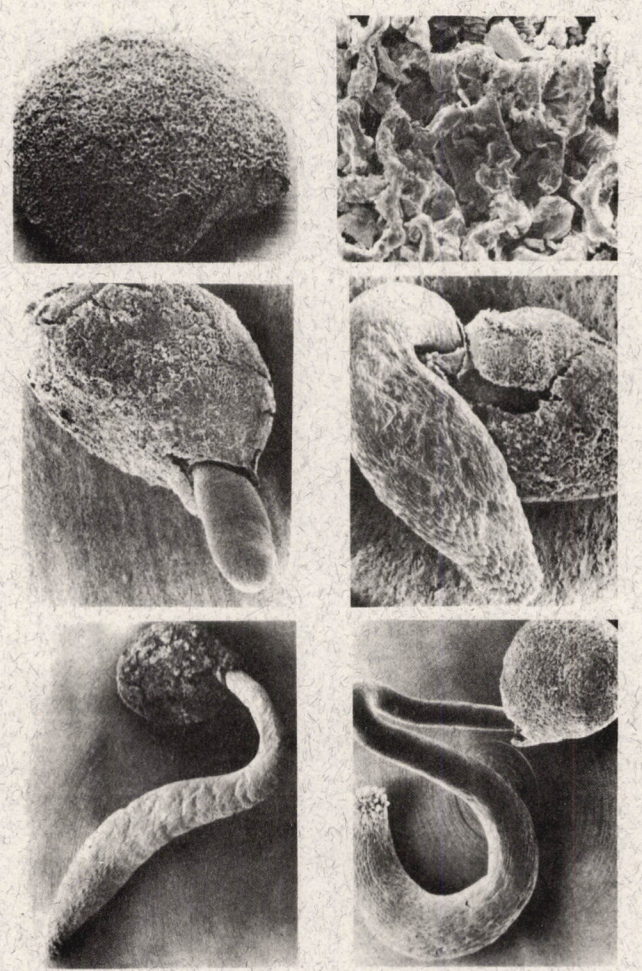


Dodder Control

No other annual weed causes as much concern to alfalfa seed growers as does parasitic dodder. Its presence in the field prevents certification. It is the most destructive weed and the most expensive to control.

Dodder is an obligate parasite. It obtains all its nutrients and moisture by penetrating the alfalfa plant with root-like structures called haustoria. To control dodder the alfalfa foliage to which it is attached has to be destroyed also.

Dodder, being an annual has to reproduce from seed every year. Therefore, prevention of seed production is an essential and effective method of control. Growers must make every effort to destroy it prior to seed production.



Dodder seed enlarged 50 times and the seed coat enlarged 1,200 times, in the upper left and right pictures. The other four pictures show germinating dodder seed at 6, 9, 12 and 24 hours. All enlarged scanning electron photomicrographs by James Hutchins and F.D. Hess.

The seeds of dodder can survive in the soil for many years; therefore, if alfalfa is planted in a field known to have contained dodder in the past, it should be judiciously monitored to detect and destroy the infestation as soon as observed. Heavily infested fields should be planted with non-host crops such as; cotton, wheat, barley, corn and sorghum.

Extensive experimentation has been pursued studying different methods of dodder control. A recent review of the literature by Ashton and Santana was published by the University of California, Division of Agricultural Sciences in Bulletin 1880, Aug. 1976.

Among the large number of herbicides evaluated only Dacthal, Furloe and Kerb provided a certain degree of control. Of these Dacthal was the most effective but it is not registered for use in alfalfa. The effectiveness of Furloe and Kerb has been erratic in Central California where dodder seeds germinate throughout the summer months.

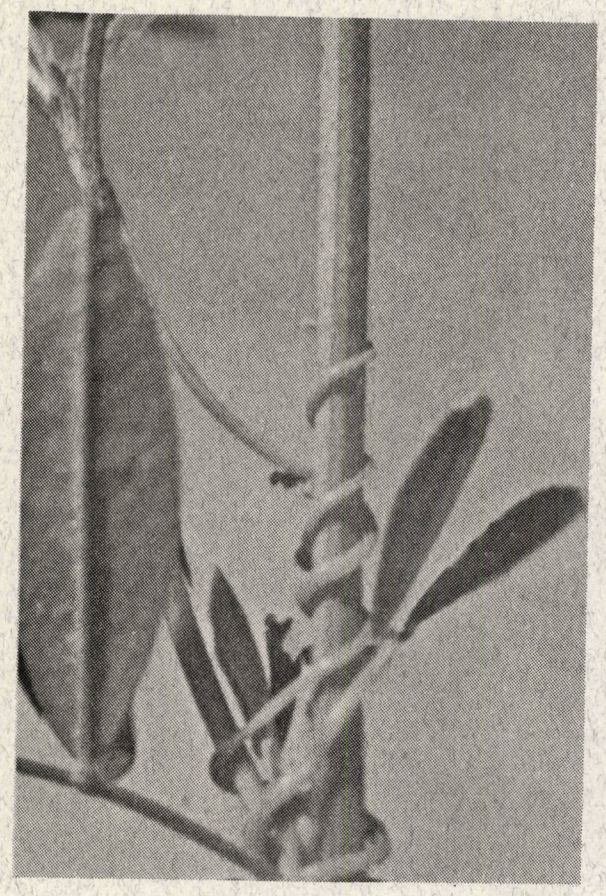
Dodder infestations generally occur in limited areas in the field, seldom exceeding 1 to 3% of the acreage. To control this limited and/or scattered infestation treating the entire acreage with a selective herbicide would be economically questionable unless other annual weeds would be controlled also. Furloe and Kerb could be used to treat small areas if the infestation could be delimited.

Contact herbicides such as dinitrogeneral, diesel fuel, weed oil and emulsions of weed oil plus dinitrogeneral and water has been used to effectively control dodder after it is attached to the alfalfa. Thorough coverage of the infested area is essential and the alfalfa foliage must be destroyed to prevent regeneration of the dodder.

Butane and propane burners can be used also to destroy the dodder and alfalfa foliage. Whether flaming or contact herbicides are used the

infested area may have to be treated two times, especially if the alfalfa growth is vigorous.

An experimental herbicide, H-26905, has been demonstrated to be effective for the control of attached dodder without injuring the alfalfa.



Attached dodder, shown on the left, cannot be controlled with presently available herbicides without destroying the foliage of the host alfalfa plant.

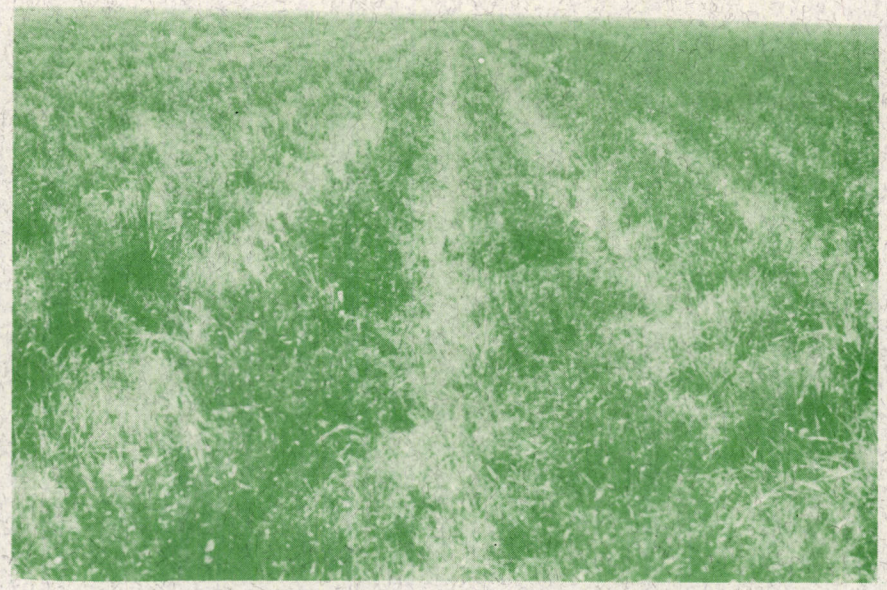
Dodder is an annual reproducing from seed every year. Fruit and flower cluster shown below. They should be destroyed before it reaches this stage of development.



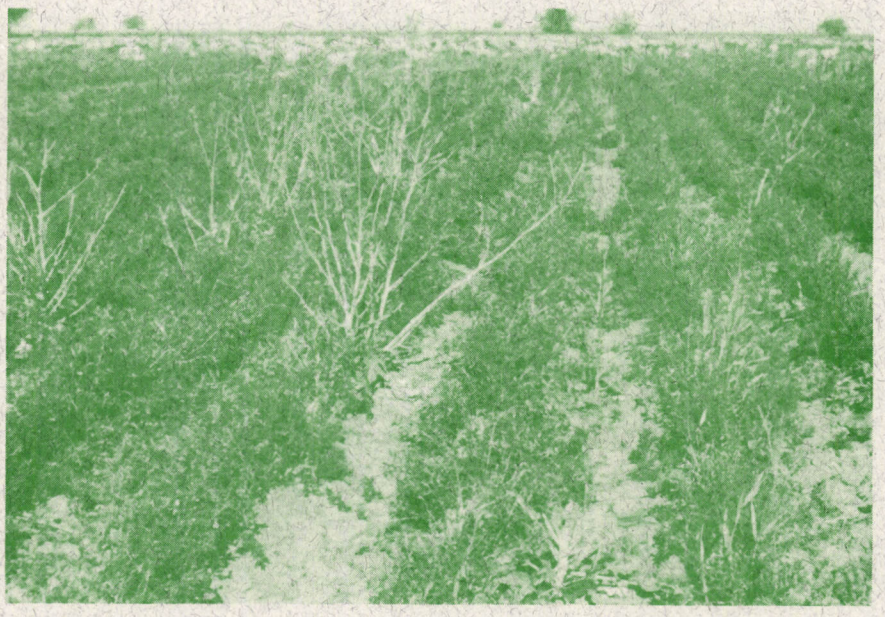
In Summary

Weed problems vary greatly from field to field and from season to season. The mechanical and chemical tools that are available to seed growers are numerous. Information has been developed regarding the effective use of selective herbicides.

The following two charts summarize the performance of herbicides and the susceptibility of commonly occurring weeds to herbicides evaluated in trials conducted in Fresno County. They can serve as guides in planning an effective weed control program to enable alfalfa seed growers to produce high quality seed, true to variety and free of weed seeds.



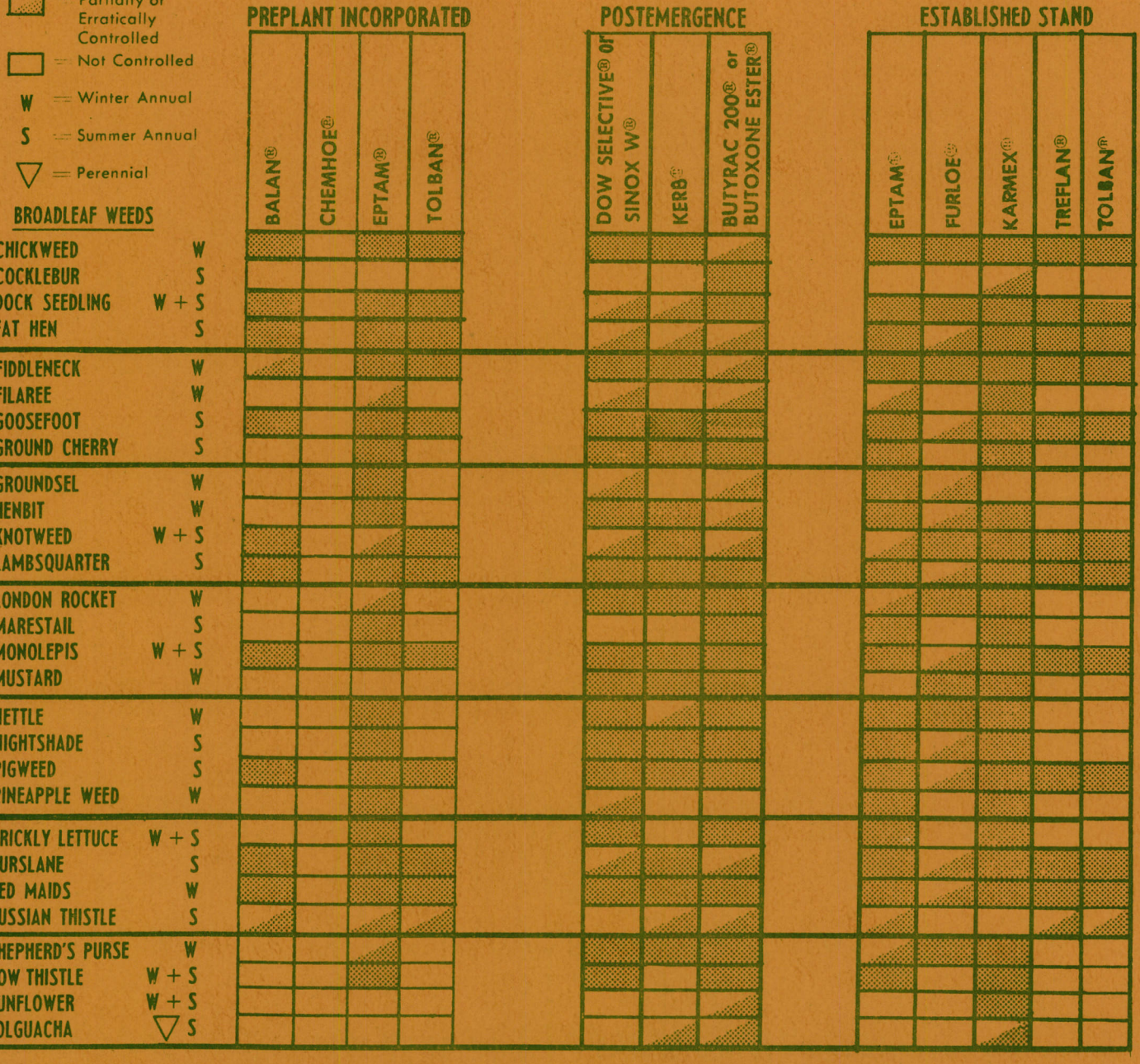
The importance of timely performance of cultural operations as well as the application of selective herbicides cannot be over-emphasized. Effective tools and knowledge are available therefore, there is no excuse for alfalfa fields such as the one pictured above. Even grazing sheep could refuse the stems of the tall weeds in the field in the lower photograph. Earlier grazing would have been preferable.



SUSCEPTIBILITY OF WEEDS TO HERBICIDES USED FOR THE SELECTIVE CONTROL OF WEEDS IN SEED ALFALFA PRODUCTION *

KEY

- ▩ = Effectively Controlled
- ▨ = Partially or Erratically Controlled
- □ = Not Controlled
- W = Winter Annual
- S = Summer Annual
- ▽ = Perennial



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

SUMMARY OF HERBICIDE PERFORMANCE IN SEED ALFALFA IN THE CENTRAL SAN JOAQUIN VALLEY

METHOD OF APPLICATION	HERBICIDE	Conditions That Resulted in Most Effective Control	Conditions That Resulted in Poor Control or Injury
PREPLANT INCORP-ORATED	Balan® or Tolban®	Shallow incorporated in well prepared seed bed. When temperature was favorable for rapid seedling growth. Only susceptible weeds were present.	Cool temperature, deep incorporation, volunteer cereals and other resistant weed species were present.
	Eptam®	Thorough incorporation early fall or in spring planted fields. Where nutsedge was present; where 4 to 8 weeks control was needed.	Winter application, cloddy seed bed and resistant weeds present. Where longer than 6 weeks of residual control was needed.
	Chemoe®	Where volunteer cereals and canary-grass were the only weeds present. Also, postemergence under sprinkler irrigation to control volunteer cereals.	Fields infested with broadleaf weeds. When used as a surface application and not irrigated within 24 hours. When unfavorable growing conditions prevailed, injury occurred.
POST-EMERGENCE	Dow Selective® or Sinox-W®	When alfalfa had two trifoliate leaves and weeds were not emerged or in their seedling stage and ½ inch of rainfall or sprinkler irrigation was applied following treatment.	When broadleaf weeds were beyond the seedling stage of growth. When grassy weeds were present.
	Butyrac 200® or Butoxone Ester®	When broadleaf weeds in their seedling stage were the only weeds present.	Broadleaf weeds beyond their seedling stage were present.
	Kerb®	When alfalfa had two trifoliate leaves and weeds were not emerged or in their seedling stage; rainfall or sprinkler irrigation was applied following treatment.	When alfalfa was in the seedleaf or unfoliate leaf stage of growth severe injury occurred. When weeds were beyond their seedling stage. When water was not applied soon after treatment.
ESTABLISHED STANDS	Karmex®	When applied on soil free of clods and volunteer alfalfa seed germination. Addition of dinitro general and weed oil improved weed control when groundsel was present.	Applied on trashy or cloddy soil. Applied after Feb. 1st on non-dormant varieties resulted in injury
	Eptam®	Applied in the irrigation water and only when thorough wetting of the bed top was obtained. Timely repeated application was made.	Poor water distribution and not wetting the bed top. Repeated application was not made.
	Treflan® or Tolban®	Thoroughly incorporated with rolling cultivators in fields free of established weeds. Summer annual grasses, pigweeds and lambsquarter, the only weeds present.	Not incorporated thoroughly or when resistant weed species predominated.
	Furloe®	Applied on wet soil immediately following irrigation provided dodder control if applied prior to attachment and repeated applications were made.	Applied on dry soil and/or repeated applications were not made. Dodder attached prior to treatment.

APPLIED RESEARCH STUDIES - 1977

A Progress Report

SNYOPSIS:

Ten applied research trials were conducted during the 1977 growing season. The most significant results were: Excellent post-emergence annual grass, including volunteer cereal control was obtained with Hoe-29152 and BAS-90210, two experimental compounds. These herbicides in combination with 2,4-DB ester or bromoxynil provided excellent control of annual broadleaf weeds as well as grasses. Both newly planted and older alfalfa exhibited good tolerance to these herbicides.

Nearly perfect common groundsel control was obtained in one year old or older alfalfa with Velpar. This herbicide also provided excellent control of a large spectrum of broadleaf weeds and grasses.

Karmex and Furloe were evaluated in combination with dinitro general and weed oil resulting in fairly good weed control and alfalfa tolerance.

The most frustrating and unproductive aspect of the 1977 studies were the dodder control trials. None of the trials contained sufficient infestation to allow reliable evaluation of the treatments.

How the Trials were Conducted

In all trials with the exception of one large scale dodder trial, the herbicides were applied with a CO_2 constant pressure sprayer. In the large scale dodder trial the herbicides were applied with an airplane.

All trials were replicated in a randomized complete block design. The herbicides used, rate per acre, dates of application, plot size, soil type, irrigation method and dates of evaluation are given in the tables that

summarize the results. Following weed control and alfalfa vigor ratings the weeds were removed by hand in some of the trials.

In the dodder control trials adequate infestation did not occur to reliably evaluate the effects of the treatments, therefore they are not presented in tabular form.

Evaluations were made by visual assessment and based on a 0 to 10 scale. A rating of "0" may denote no weed control, no alfalfa injury or as a vigor rating "0" means very poor alfalfa vigor. A rating of "10" indicates perfect weed control. Severe injury or, as a vigor rating, "10" means vigorously growing alfalfa.

Observations and Discussion

In Newly Planted Alfalfa

Four trials were conducted all postemergence to the alfalfa evaluating experimental compounds alone and in combinations for the control of annual grasses, volunteer cereals and broadleaf weeds. The results and observations can be summarized as follows:

HOE-29152 - provided excellent control of volunteer cereals and annual grasses with the exception of annual bluegrass. Broadleaf weeds were not controlled.

Hoe-29152 in combination with 2,4-DB ester or Brominal provided good control of volunteer barley as well as the broadleaf weeds.

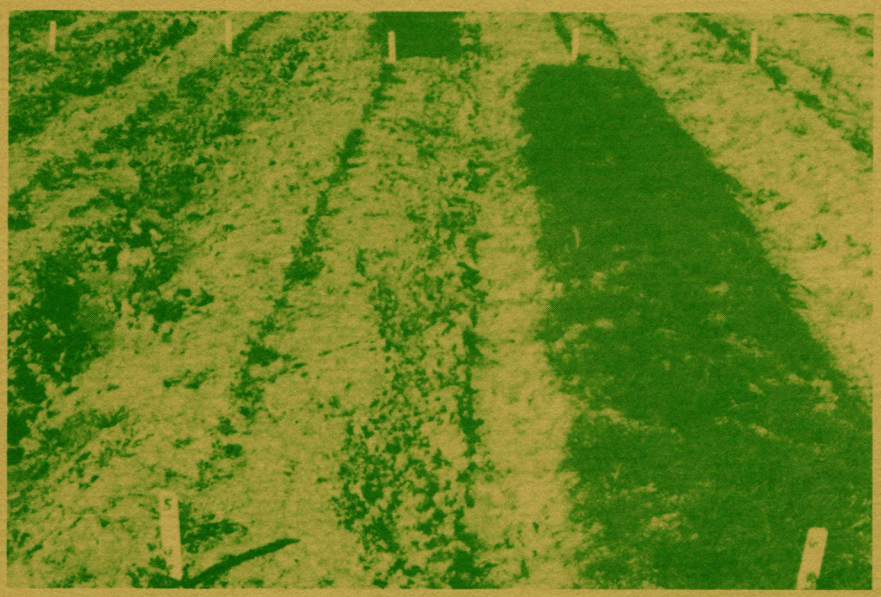
In the trials summarized in Tables 1, 2 and 3, the field was treated with2,4-DB ester except Treatment E and H. Therefore, the evaluations made on February 25 or later reflect the result of this commercial treatment.

In the trial summarized in Table 4 the alfalfa vigor was slightly reduced in the plots treated with Hoe-29152 in combination with Brominal or 2,4-DB ester, but this growth retardation was short lived.

BAS 90210 - provided good control of annual grasses but failed to control broadleaf weeds. 2.0 lb ai/A was as effective as 4.0 lb ai/A.

BAS-90210 in combination with 2,4-DB ester or Brominal provided effective control of broadleaf weeds except chickweed.

The field where the trials summarized in Tables 1, 2 and 3 were conducted was treated with 0.5 lb ai/A of 2,4-DB ester. In treatments made after the commercial application of 2,4-DB ester the grass control obtained with BAS 90210 was poor. See Tables 2 and 3.



The combination of Hoe-29152 with 2,4-DB ester provided excellent control of grasses and broadleaf weeds as shown on the leaf; approximately 10 days following treatment.

In the picture on the right the effectiveness of Hoe-29152 is demonstrated when used alone and in combination with Brominal. Extreme right row is untreated, next row was treated with Hoe 29152 at 1.0 lb ai/A plus 0.5 lb ai/A Brominal. Third row from the right was treated with Brominal alone and the extreme left row with Hoe-29152 alone.



Hoelon - Hoelon in combination with 2,4-DB ester provided effective control of annual ryegrass, rabbitsfootgrass but not annual bluegrass. Broadleaf weeds were controlled except chickweed.

Velpar effectively controlled the broadleaf weeds at 0.25 lb ai/A but it injured the young alfalfa and reduced the stand.

Velpar did not exhibit sufficient selectivity to pursue its evaluation in newly planted alfalfa.

In Established Alfalfa

Four trials were conducted in established alfalfa, one year old or older, to evaluate the effectiveness of several herbicides and combinations of herbicides to control annual broadleaf weeds and grasses. The tolerance of alfalfa to these herbicides was monitored. The results of the evaluations and observations can be outlined as follows:

Velpar gave excellent control of established broadleaf weeds when applied at 0.5 and 1.0 lb ai/A. At 0.25 lb ai/A it provided 75 to 80% broadleaf weed control, including common groundsel.

Grass control was poor at 0.25 and 0.5 lb ai/A rate but it was good in plots treated with 1.0 lb ai/A.

The established alfalfa exhibited good tolerance to Velpar. At 1.0 lb ai/A a slight reduction in the height, i.e., vigor, of the alfalfa was noted. See Table 5.

Velpar plus Karmex - combination provided excellent broadleaf weed control including the control of groundsel.

Velpar at 0.125 lb ai/A with 2.4 lb ai/A of Karmex provided excellent control of groundsel and other broadleaf weeds. The control was not better than was obtained with Velpar used alone at 0.25 lb ai/A. See Table 5.

Established grasses were not adequately controlled with 0.125 or 0.25 lb ai/A of Velpar in combination with 2.4 lb ai/A of Karmex.

Sencor plus Karmex combinations were included in the trial to evaluate their effectiveness in controlling common groundsel.

Sencor at 0.25 and 0.5 lb ai/A plus 2.4 lb ai/A of Karmex failed to control common groundsel but they effectively controlled London rocket and chickweed.

Sencor plus Karmex did not provide adequate control of the established grasses.

Goal - at 1.5 lb ai/A failed to provide good control of broadleaf weeds and grasses. At 3.0 lb ai/A it gave about 80% control of groundsel but poor control of London rocket and chickweed. The grass control at 3.0 lb ai/A was approximately 85%.

The alfalfa developed slight yellowing (chlorosis) and some leaf spotting (necrosis) was also evident. These symptoms were short lived but growth retardation of the alfalfa was observed for a longer period of time.

Karmex + Dow General with weed oil or wetting agent provided good broadleaf and annual grass control when applied while the weeds were in their seedling or rosette stage of growth. See Table 6.

Poor groundsel and grass control was obtained when the weeds were taller and the field was trashy. The reason for the poor control can be attributed to poor coverage of the basal parts of the weeds because of their size and trashiness of the field. See Table 5.

Slightly better weed control was obtained when the herbicides were applied in 73 gallons of water per acre when compared to 48 gallon per acre spray volume. Higher gallonage has been observed to provide significantly better weed control when the alfalfa and weed growth were beyond 4 inches in height.

Furloe + Dow General plus wetting agent at ½% of the spray volume provided good broadleaf control. The alfalfa regrowth was somewhat retarded. See Table 7.

Furloe at 4.0 lb ai/A in combination with 10 gallons of weed oil per acre plus ¼% of wetting agent in 73 gallons of water gave less effective control than the same rate of Furloe with 2.0 lb ai/A of Dow General.

Dow General + Weed Oil with wetting agent, at ½% of spray volume, provided fairly good broadleaf weed control when applied in 73 or 48 gallons per acre. It is important to note

that the effectiveness of this treatment will be influenced by the thoroughness of coverage. The taller the weeds and the alfalfa the higher volume of spray solution will be needed to obtain effective control.

Preplant Use of Herbicides

Although no preplant replicated trials were conducted but observations were made in many commercial fields where Balan, Eptam or Toblan were preplant incorporated.

Annual grasses were effectively controlled with all three herbicides but only Eptam provided acceptable control of volunteer barley and wild oats. None of them controlled black mustard and London rocket.

Eptam provided better control of shepherds purse than was observed in the Balan and Tolban treated fields. Eptam failed to control silver sheathed and common knotweed; Balan and Tolban effectively controlled them.

The longest residual control was obtained with Tolban and the shortest with Eptam.

In some fields early growth retardation of the seedling alfalfa was observed. This was attributable to deeper than 2 to 2½ inch incorporation. With warming temperatures and favorable growing conditions the alfalfa rapidly recovered and grew vigorously. Examination of the root revealed a lack of secondary root development in the top 2½ to 3 inch layer of soil.

The use of preplant herbicides are indispensable in newly planted fields where annual grasses, knotweed and fiddleneck infestations are anticipated.

Dodder Control Studies

Several dodder control trials were established but the infestation was too low to reliably evaluate the effectiveness of the treatments.

H-26905 (O-ethyl-O-(3 methyl-6-nitrophenyl)-N-sec-butyl phosphorothiamidate) was demonstrated to be very effective for the control of dodder after it became attached to the alfalfa. Studies demonstrating the effectiveness of H-26905 to control attached dodder and the tolerance of alfalfa to this herbicide was summarized in earlier progress reports.*

A trial was established to study the tolerance of alfalfa to multiple applications of H-26905. No evidence of injury was observed when applied at 1.0 or 2.0 lb ai/A three times at 4 to 5 week intervals. At 4.0 lb ai/A slight distortions of the growing points on the alfalfa plants were evident but these symptoms were short lived. See Table 8.

Unfortunately, very few dodder plants were present in the trial area to afford reliable dodder control evaluations. A similar trial was conducted in tomatoes where excellent dodder control was obtained with two applications of 1.0 or 2.0 lb ai/A of H-26905.* *

The continued development of H-26905 is not being pursued by Hercules Company. Hopefully another company will obtain it from its Japanese manufacturer for further development and marketing in the United States.

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*Runcina Vol.5 and Runcina Vol.12 Weed and Dodder Control Studies in Alfalfa Seed Production, University of California Cooperative Extension, Fresno County, 1975 and 1976.

**Runcina Vol.15 Vegetation Management in Processing Tomato Production, University of California Cooperative Extension, Fresno County, January 1978

Residue - Plant Back Study

Before herbicides are marketed for use in crop production it is essential to study their residual properties. This is especially important in an area such as the San Joaquin Valley where a large number of vegetable and agronomic crops are grown in rotation.

Established alfalfa was treated 21 January 1977 with herbicides listed in Table 9. Late September (after 7 cuttings) the alfalfa was plowed, disked and the area was listed to 30" beds. After sprinkler irrigation and additional working of the beds four crops (broccoli, sugar beets, lettuce and safflower) were planted; each crop was seeded in single rows on the 30" beds.

Stand counts of the emerged crops and evaluation of their vigor were made 11 November 1977. These ratings are summarized in Table 9. No significant differences in stand and in seedling vigor were found. The trial area became heavily infested with annual broadleaf weeds, therefore, additional ratings were not made.

During observations made January 1978 no growth retardation or any herbicidal symptoms were detectable on the crops and the weeds. Additional trials such as these are needed to study the residual properties of Velpar.

Table 1 Effect of Postemergence Herbicides on Weed Control and Alfalfa Vigor
C-52, 425, 94, 10, 77-5

Trial Location: Peck Ranch, Hwy 33, ½ mi N of almonds
Established: 26 Jan 77 -
Alfalfa Growth Stage: 1-3 trifoliate leaves

Soil Type: Panoche Loam
Plot Size: 1 bed(40") x 20' - 3 reps
Irrigation Method: Sprinkler
Evaluated: 2/9, 2/25 and 3/29/77

			Alfalfa Vigor and Weed Control Evaluations								
			2/9/77			2/25/77			3/29/77		
Treatment		lb ai/A	Alf. Injury	Broadleaf Control	Grass Control	Alf. Vigor	Broadleaf Control	Grass Control	Alf. Vigor	Broadleaf Control	Grass Control
I											
A	BAS 90210	2.0	0.6	3.3	8.6	8.0	8.7	10	10	8.5	9.6
B	BAS 90210	4.0	0.6	4.0	9.0	9.7	7.7	10	10	7.0	9.7
C	BAS 90210 + 2.4-DB ester	2.0 + 0.5	0.6	2.0	9.0	9.3	9.0	10	10	9.3	9.8
D	Hoe 29152	0.5	0	4.3	9.0	8.7	8.0	10	10	7.7	9.7
E	Hoe 29152	1.0	0.6	0.6	8.3	10	0	10	10	0	9.0
F	Hoe 29152	2.0	0.6	0.6	8.3	8.3	8.3	10	10	5.0	9.5
G	Hoe 29152 + 2,4-DB ester	0.5 + 0.5	2.0	6.3	10	9.0	8.0	9.7	10	9.0	9.2
H	Untreated	---	0	0	0	8.0	0.7	0	7.3	0.7	0

Remarks: All plots were sprayed commercially with 2,4-DB ester at 0.5lb ai/A on February 12, with the exception of treatment E and H.

1/Vigor and weed control ratings are based on a 0 to 10 scale. 0=very poor vigor, no weed control or no injury;10= vigorously growing plant or perfect weed control.

Weeds present: annual bluegrass, rabbitsfoot grass, chickweed, groundsel, knotweed, London rocket, red maids, sowthistle, shepherds purse.

Table 2 Effect of Postemergence Herbicides on Weed Control and Alfalfa Vigor
C-52, 425, 94, 10, 77-6

Trial Location: Peck Ranch, Hwy 33, ½ mi N of Almonds
Established: 10 Feb 77 - 3 to 7 trifoliate leaves
Alfalfa Stage of Growth: 3 to 7 trifoliate leaves
Evaluated: 25 Feb 77, 4 Mar 77, 29 Mar 77

Plot Size: 1 bed (40")x 20' - 3 reps
Irrigation Method: Furrow

	Herbicides	lb ai/A	Alfalfa Vigor and Weed Control Evaluations 2/25/77 Alfalfa Vigor	2/25/77 Brdlf Control	2/25/77 Grass Control	3/4/77 Alf. Vigor	3/4/77 Brdlf Control	3/4/77 Grass Control	3/29/77 Alf. Vigor	3/29/77 Brdlf Control	3/29/77 Grass Control	3/29/77 Weeds Present
J	BAS 90210 2, 4-DB ester	2.0 0.75	8.0	5.7	5.0	10.0	9.3	4.0	9.7	8.7	0.7	ABC
K	BAS 90210 Brominal	2.0 0.5	7.7	9.3	7.0	9.0	9.7	5.7	9.3	8.7	1.7	ABCR
L	Hoe 29152 Bio 88	0.5 0.5%	9.0	9.0	8.3	10.0	9.3	9.3	10.0	8.8	9.5	ACGLRS
M	Hoe 29152 Bio 88	1.0 0.5%	9.7	9.3	9.7	10.0	9.0	9.2	10.0	9.3	9.0	ACGR
N	Hoe 29152 Bio 88	2.0 0.5%	9.3	8.7	9.7	10.0	9.3	9.3	10.0	8.8	9.3	ACP
O	Hoe 29152 Brominal	0.5 0.5	8.6	10.0	9.0	9.7	9.8	9.5	10.0	9.8	9.3	AC
P	Hoe 29152 2,4-DB	0.5 0.75	8.7	8.3	8.7	10.0	9.0	9.2	10.0	9.0	9.5	ACGR
Q	BAS 90210 Bio 88	2.0 0.5	9.7	7.6	8.3	10.0	8.7	8.5	10.0	9.0	7.7	ABCK
H	Untreated	---	10.0	0	0	10.0	0	0	10.0	0	0	ABCGKLPRS

Remarks: All plots were sprayed commercially with 2,4-DB ester at 0.5 lb ai/A on February 12, except Treatment H.

1/Vigor and weed control ratings are based on a 0 to 10 scale. 0=very poor vigor, no weed control or no injury;10= vigorously growing plant or perfect weed control.

Weeds present: A=annual bluegrass B=rabbitsfoot grass C=chickweed G-groundsel K=knotweed L=London rocket R=red maids S=sowthistle P=shepherds purse

Table 3 Effect of Postemergence Herbicides on Weed Control and Alfalfa Vigor
C-52, 425, 94, 10, 77-7

Trial Location Peck Ranch, Hwy 33, ½ N of almonds
Established: 14 Feb 77
Alfalfa Growth Stage: 3 to 7 trifoliate leaves
Soil Type: Panoche Loam

Plot Size: 1 bed (40")x 20' - 3 reps
Irrigation Method:
Evaluated: 3/4/77 & 3/29/77

	Treatment	lb ai/A	Alfalfa Vigor and Weed Control Evaluations 3/4/77 Alf. Vigor	Broadleaf Control	Grass Control	3/29/77 Alfalfa Vigor	Broadleaf Control	Grass Control	Weeds Present
R	BAS 90210 2,4-DB ester	2.0 0.75	9.3	9.0	6.0	8.3	9.0	0.7	ABC
S	BAS 90210 2,4-DB ester	4.0 0.75	10.0	9.7	7.3	9.0	9.3	7.3	ABCG
T	BAS 90210 Endothal	2.0 0.5	9.3	8.3	5.7	9.3	9.3	4.2	ABCL
U	Hoe 29152 2,4-DB ester Bio 88	0.5 0.75 0.5%	10.0	9.0	9.2	10.0	9.3	6.0	ABC
V	Hoe 29152 2,4-DB ester	1.0 0.75	9.7	9.0	9.5	10.0	9.5	9.5	ACG
W	Hoe 29152 2,4-DB ester Bio 88	1.0 0.75 0.5%	10.0	9.3	9.7	9.3	9.3	9.5	ACGKR
Y	Hoelon 2,4-DB ester	1.0 0.75	10.0	8.7	9.0	10.0	9.2	9.2	ACR
Z	Hoelon 2,4-DB ester Bio 88	1.0 0.75 0.5%	10.0	9.3	9.5	10.0	9.2	9.2	ACGRS
H	Untreated	---	10.0	0	0	10.0	0	0	ABCGKLRS

Remarks: The field was sprayed commercially with 2,4-DB ester at 0.5 lb ai/A on Feb 12, except Treatment H.
Vigor and weed control ratings are based on a 0 to 10 scale. 0=very poor vigor or no weed control; 10=vigorously growing plant or perfect weed control. Injury, 0=no injury, 10=killed plant.

Weeds present: A=annual bluegrass B=rabbitsfoot grass C=chickweed G=groundsel K=knotweed L-London rocket P=shepherds purse R=red maids S=sowthistle

Table 4 Alfalfa Weed Control Trial-Postemergence
C-52, 425, 94, 10, 77-9

Trial Location: Westside Field Station
Soil Type: Panoche Loam
Alfalfa Planted: Dec 1977
Herbicides Applied: 28 Feb 1977 (Temp 65°F)

Plot/Size: 5'x10' - 4 reps
Irrigation Method: Border flood
Evaluated: 23 March 77, 16 Jun 77

	Herbicides	lb ai/A	Alfalfa Vigor, Injury and Weed Control Evaluations 1/ 23 March 1977 Barley Control	Broadleaf Control	Alfalfa Injury	Alfalfa Vigor	16 June 1977 Barley Control	Broadleaf Control	% Alfalfa Stand	Weeds Present
A	Hoe 29152 Bio 88	0.5 0.5%	4.8	0	0	10	5.7	0	100	BCFSL
B	Hoe 29152 Bio 88	1.0 0.5%	8.8	0	0	10	10.0	0	100	CFLS
C	Hoe 29152 Brominal Bio 88	0.5 0.5 0.5%	6.8	9.0	1.0	8.8	7.5	9.5	100	BC
D	Hoe 29152 Brominal Bio 88	1.0 0.5 0.5%	8.0	9.0	0.3	9.5	10.0	9.5	100	C
E	Hoe 29152 2,4DB ester Bio 88	0.5 0.75 0.5%	7.5	8.5	1.0	8.8	8.0	9.0	100	BCF
F	Velpar Bio 88	0.25 0.5%	1.0	8.4	4.8	6.3	2.0	9.0	60	BFS
G	Velpar Bio 88	0.5 0.5%	2.0	8.2	6.0	4.8	2.0	10.0	40	B
H	Untreated	---	0	0	0	0	0	0	100	BCFLS

1/ Evaluations based on a 0 to 10 scale. 0=no weed control, no alfalfa injury or very poor vigor. 10=perfect weed control, severe alfalfa injury or vigorously growing alfalfa.

2/ Weeds present were: B=volunteer alfalfa, C=chickweed, F=fiddleneck, L=lambsquarter, S=sowthistle. The alfalfa had 4 to 5 trifoliate leaves at the time of treatment. The broadleaf weeds were in their seedling stage and the barley had 4 to 6 leaves.

Table 5
Alfalfa Weed Control Trial - Established Stand-Evaluation
C-53, 425, 94, 10, 77-2

Trial Location: Westside Field Station-Field 10
Soil Type: Panoche Loam
Alfalfa Planted: Spring 1975
Evaluated: 30 March 1977

Herbicides Applied: 21 Jan 1977
Plot Size: 5'x35' - 4 reps
Irrigation Method: Border check

Herbicides	lb ai/A	Alfalfa Vigor and Weed Control Rating					
		Alfalfa Vigor	Groundsel	London Rocket	Chick-weed	Grasses	Overall Weed Cont
A Velpar Bio-88	0.25 .5%	9.8	8.3	7.5	7.5	2.0	7.0
B Velpar Bio-88	0.50 .5%	10.0	9.5	9.5	10.0	3.3	8.8
C Velpar Bio-88	1.0 .5%	9.0	10.0	10.0	10.0	9.0	9.5
D Karmex Velpar	2.4 0.125	9.3	8.0	10.0	10.0	1.8	8.0
E Karmex Velpar	2.4 0.25	9.8	9.0	10.0	10.0	7.0	8.5
F Karmex Sencor	2.4 0.25	9.5	0.5	9.8	10.0	4.0	5.0
G Karmex Sencor	2.4 0.5	9.5	0.8	10.0	9.0	5.0	6.0
H Goal	1.5	8.5	4.0	3.0	2.8	2.3	3.5
J Goal	3.0	8.3	8.3	5.0	5.8	8.5	7.0
K Karmex Dow General Weed Oil	2.4 2.0 10 gpa	9.3	1.5	9.0	7.5	2.3	5.3
L Karmex Dow General Bio 88	2.4 2.0 .5%	9.8	2.3	9.0	10.0	2.3	5.5
M Karmex Sencor Bio=88	2.4 0.5 .5%	9.8	0	10.0	10.0	4.3	4.8
N Untreated	---	9.5	0	0	0	0	0

Remarks: Herbicides applied in 1120cc of water per plot with a CO_2 scale.
0=no weed control or very poor vigor
10=perfect weed control or vigorously growing alfalfa.

Table 6 Alfala Weed Control Trial - Established Stand
C-53, 425, 94, 10, 77-1

Trial Location: Westside Field Station
Field 20
Alfalfa Planted: Spring 1976 - MOAPA 68
Soil Type: Panoche Loam
Evaluated: 29 Mar, 29 May 77

Herbicides Applied: 20 Jan 1977
Plot Size: 5'x20' - 4 reps
Irrigation Method: Basin flood

	Herbicides	lb ai/A	1/ Weed Control and Alfalfa Injury Evaluations 29 March 77 Groundsel	London Rocket	Grass Control	Alfalfa Injury	29 May 77 2/ Alfalfa Injury
A	Velpar Bio-88	0.25 0.5%	9.8	10	6.0	0	0
B	Velpar Bio-88	0.5 0.5%	10	10	7.0	0	0
C	Velpar Bio-88	1.0 0.5%	10	10	9.0	0	0
D	Karmex Sencor	2.4 0.5	0	9.5	6.2	0	0
E	Karmex Velpar	2.4 0.25	9.5	10	7.5	0	0
F	Goal	1.0	2.0	7.0	0	0	0
G	Goal	2.0	6.0	9.5	3.5	2.0	0
H	EL 171	0.25	8.5	9.5	7.5	2.0	0
J	EL 171	0.5	9.5	10	9.0	3.0	1.0
K	H-26905 Dow General Weed Oil	4.0 2.0 5 gpa	8.5	9.5	8.0	1.0	0
L	H-26905 Dow General Weed Oil	8.0 2.0 5 gpa	8.5	9.0	9.0	2.0	0
M	Velpar	.25	9.5	9.7	6.5	0	0
N	Untreated	---	0	0	0	0	0

1/ Evaluations based on a 0 to 10 scale. 0=no weed control or no injury; 10=perfect weed control or very severe injury.
2/ The 29 May evaluations were made on regrowth following cutting.

Remarks: The weed population in the trial area was sparse, therefore the ratings may not be very reliable. Herbicides applied with a CO_2 sprayer in 1120cc of water per plot.

Table 7 Alfalfa Weed Control Trial - Established Stand-Evaluation
C-53, 425, 94, 10, 77-3

Trial Location: Westside Field Station, Field 10
Soil Type: Panoche Loam
Alfalfa Planted: Spring 1976, MOAPA 69
Evaluated: 30 March 1977

Herbicides Applied: 27 Jan 1977
Plot Size: 10'x35' - 4 reps
Irrigation Method: Border Check

	Herbicide	lb ai/A	Water Volume Gallons/A	Alfalfa Vigor	Broadleaf Weed Control	Weeds Present 2/
			Alfalfa Vigor & Weed Control Evaluations 1/			
A	Furloe Dow General Bio-88	4.0 2.0 0.5%	73	8.8	9.0	GLP
B	Dow General Weed Oil Bio-88	2.0 10 gpa 0.5%	73	10.0	9.3	GLP
C	Furloe Weed Oil Bio-88	4.0 10 gpa 0.25%	73	8.8	7.0	GLP
D	Dow General Weed Oil Bio-88	2.0 10 gpa 0.5%	48	9.8	8.0	GLP
E	Karmex Dow General Bio-88	2.4 2.0 0.5%	48	10.0	9.8	GL
F	Karmex Dow General Bio-88	2.4 2.0 0.5%	73	9.5	9.8	G
G	Untreated	----		10.0	0	GLP

Remarks: Herbicides applied with a CO_2 constant pressure sprayer - 8008 orifices were used to apply 73 g. rate and 8004 orifices to apply the 48 g. rate.

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

2/ Weeds present: G=commond groundsel
L=london rocket
P=prickly lettuce

Weeds in the treated plots were retarded in growth not taller than the alfalfa whereas in the untreated plots they were much taller than the alfalfa.

Table 8 Alfalfa - Dodder Control Trial
C-52, 425, 94, 10, 77-11

Trial Location: Westside Field Station, Field 20
Soil Type: Panoche Loam
Alfalfa Variety: Moapa 69 - planted Spring 76
Plot Size: 40"x35' - 4 reps

Herbicides Applied: 30 March 1977
29 May 77, 13 June 77
Irrigation Method: Furrow

	Herbicides	lb ai/A	Alfalfa Injury Evaluations 1/ 29 May 77	13 Jun 77	27 Jun 77
A	H-26905	1.0 -- --	0	0	0
B	H-26905	2.0 -- --	0	0	0
C	H-26905	4.0 -- --	3	1	0
D	H-26905	1.0 + 1.0 --	0	0	0
E	H-26905	2.0 + 2.0 --	0	0	0
F	H-26905	1.0 + 1.0 + 1.0	0	0	0
G	H-26905	2.0 + 2.0 + 2.0	0	0	0
H	Untreated	----------	0	0	0
J	Princep H-26905	1.0 -- -- 2.0 -- --	3	1.5	0.5
K	Karmex H-26905	1.0 -- -- 2.0 -- --	0	0	0

1/ Injury rating based on a 0 to 10 scale - 0=no injury; 10=severe injury.

Remarks: Pronounced chlorosis of the alfalfa foliage evident in the Princep treated plots on 5/29 by 6/27 only occasional marginal chlorosis was evident on some of the leaflets.

The injury observed in the H-26905 4.0 lb ai/A treated plots was deformed terminal buds and slight growth retardation.

Herbicides applied with a CO_2 sprayer in 675cc of water per plot.

Dodder infestation too sparse, therefore no reliable evaluation could be made.

Table 9 The Residual Effect of Herbicides in a Plant - Back Study

Trial Location: Westside Field Station
Soil Type: Panoche Loam
Herbicides Applied in alfalfa: 21 Jan 77
Evaluated: 10 Nov 1977

Crops Planted: sugar beets, lettuce, broccoli, safflower
Irrigation Method: alfalfa - border check
plant back crops - sprinkler

	Herbicides	lb ai/A	Crop Stand and Vigor Evaluations[1/] Broccoli Stand	Broccoli Vigor	Sugar Beet Stand	Sugar Beet Vigor	Lettuce Stand	Lettuce Vigor	Safflower Stand	Safflower Vigor
A	Velpar Bio-88	0.25 .5%	6.8	9.3	4.5	8.6	23.5	9.6	20.5	10
B	Velpar Bio-88	0.50 .5%	5.0	8.1	8.0	8.1	34.3	8.5	12.8	10
C	Velpar Bio-88	1.0 .5%	6.0	9.0	6.8	8.8	37.8	9.1	23.0	10
D	Karmex Velpar	2.4 0.125	8.3	9.3	7.8	8.6	27.3	8.8	16.8	10
E	Karmex Velpar	2.4 0.25	8.0	9.3	5.0	8.6	31.5	9.1	20.3	9.8
F	Karmex Sencor	2.4 0.25	8.3	9.8	5.5	6.5	34.0	9.3	18.0	10
G	Karmex Sencor	2.4 0.5	10.8	10	7.0	8.0	30.0	9.5	18.5	10
H	Goal	1.5	8.5	9	3.8	9.5	35.8	8.3	20.0	10
J	Goal	3.0	8.8	10	5.5	7.3	33.8	9.3	19.0	10
K	Karmex Dow General Weed Oil	2.4 2.0 10 gpa	9.5	9.5	4.3	7.5	34.8	9.1	23.0	10
L	Karmex Dow General Bio-88	2.4 2.0 .5%	6.0	9.8	5.8	8.3	30.3	9.6	11.3	10
M	Karmex Sencor Bio-88	2.4 0.5 .5%	6.8	8.8	5.0	8.3	31.5	9.3	20.8	9.1
N	Untreated	---	6.3	9.1	5.5	7.5	29.3	8.1	16.8	9.1
			NS	NS	NS	NS	NS	NS	NS	NS

1/ Stand counts were made in 4'x6" areas in the center of each plot. Values are the average number of plants per 4' of row. Vigor ratings are based on a 0 to 10 scale; 0=very poor vigor, 10=vigorously growing seedlings.

Remarks: The alfalfa was plowed, disked and the area was listed to 30" beds and sprinkler irrigated. Prior to planting of the crops the beds were worked with rolling cultivators. The crops were planted and sprinkler irrigated. Only one rating was made because the area became heavily infested with weeds.

PROPRIETARY TRADE NAMES, COMMON NAMES AND SUPPLIERS
OF THE HERBICIDES MENTIONED IN THIS PROGRESS REPORT

TRADE NAME	COMMON NAME	SUPPLIER
Balan	benefin	Elanco
Brominal	bromoxynil	Amchem
Buctril	bromoxynil	Rhodia
Butoxone ester	2,4-DB ester	Rhodia
Butyrac ester	2,4-DB ester	Amchem
Chem-Hoe - IPC	propham	PPG
Dow General	dinoseb	Dow
Dow Selective	dinoseb (NH_4 salt)	Dow
Eptam	EPTC	Stauffer
Furloe CIPC	chlorpropham	PPG
Goal	oxyfluorfen	Rhom & Haas
Hoelon	diclofop	Hoechst
Karmex	diuron	DuPont
Kerb	pronamide	Rhom & Haas
Princep	simazine	Ciba-Geigy
Sencor	metribuzin	Chemagro
Sinox W	dinoseb (NH_4 salt)	FMC Corp
Tolban	profluralin	Ciba-Geigy
Treflan	trifluralin	Elanco
Velpar	(DPX 3674)	DuPont
BAS 90210	----------	BASF
EL-171	fluridone	Elanco
Hoe 29152	----------	Hoescht
H-26905	----------	Hercules

In this progress report the trade names are used because they are more familiar. They are capitalized and are protected by patents issued by the US Government.

WEED INFESTATION RECORD

FIELD LOCATION _____ CROP _____ HERBICIDE USED _____

DATE PLANTED _____ DATE NOTES TAKEN _____ PREVIOUS CROP _____

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

COMPLIMENTS OF



ELANCO PRODUCTS COMPANY

A DIVISION OF ELI LILLY AND COMPANY

TOWARD MORE EFFECTIVE WEED CONTROL

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

a. soon after crop emergence;

b. mid-season;

c. before harvest.

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

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

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

Bill B. Fischer, Fresno County Farm Advisor
University of California Agricultural Extension Service

TOWARD MORE EFFECTIVE WEED CONTROL

Without knowledge of the weed infestation it isn't possible to intelligently plan an economical weed control program.

Weed infestations recorded on weed infestation cards, such as the one below, will enable you to select a crop rotation system that can minimize your weed control costs. It can enable you to select the most effective tools whether mechanical or chemical. Cards such as this are available free from farm advisors and pest control advisors.

To help you identify weeds the Growers Weed Identification Handbook with colored photographs of 151 commonly found weeds in California may be helpful. The handbook can be purchased from the Publications Division of Agricultural Sciences of the University of California. Order forms are available from Cooperative Extension offices.

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750 Copies

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