Runcina VOL. 23

Weed Control Studies in

Alfalfa Seed Production



A PROGRESS REPORT

University of California · Cooperative Extension · Fresno County

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

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

WARNING ON THE USE OF CHEMICALS

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

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

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

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HEED THE WEED

I work so hard to make the flowers grow.
They wilt, turn pale, and die, but weeds
grow ever stronger.
I tug them out but
back they come
flourishing in the hot sun.

My hands are sweaty and dyed dark brown,
my back aches and my temples pound.
The muscles in my calves are screaming.
Each day that I grow weaker,
they strengthen and they multiply.

I'm grateful to the man who said,
"A weed is but an unloved flower."
It gets me off the hook in this
struggle for power.

Roberta Seibert

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

Runcina today is the title of applied research progress reports on weeding conducted in Fresno County. Each volume is devoted to a crop, a weed, a single herbicide, or a related group of herbicides. Runcina contains no recommendations for the use of herbicides.

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Sincerely yours,

BILL B. FISCHER,
Farm Advisor,
Fresno County

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WEED CONTROL STUDIES IN ALFALFA SEED PRODUCTION

A Progress Report

Bill B. Fischer and Larry M. Brown*

Profitable production of alfalfa seed cannot be accomplished without effective control of weeds. Alfalfa hay growers, as well as alfalfa sprout producers, demand alfalfa seed with high viability, true to variety and free of weed seeds. Such seed commands the highest price. Every farmer is aware of the competition between weeds and crops for available moisture, nutrients, and space. Alfalfa seed growers also know that the separation of weed seeds from alfalfa seed can entail additional economic losses. Therefore, economical production of alfalfa seed hinges on effective methods of weed control.

Numerous mechanical and chemical tools are available to alfalfa seed growers to successfully control all the unwanted vegetation that may infest the fields. However, weed control has to be an integral part of the total farming operation. In alfalfa seed production, every cultural operation can significantly influence the cost and effectiveness of weed control.

The system of husbandry that utilizes all available knowledge and tools to produce a crop relatively free of competing, unwanted vegetation is known as vegetation management. The focus is always on the crop, which the farmer should endeavor to make grow vigorously so that it will effectively compete with weeds. Two University of California publications, "Integrated Pest Management for Alfalfa Hay" and "Producing Alfalfa Seed in California," contain valuable information for alfalfa seed growers.

- -

*Farm Advisor and Research Assistant, respectively, U.C. Cooperative Extension, Fresno County, California.

To control unwanted, competing vegetation in alfalfa seed production, selective herbicides are used extensively. However, no one herbicide has been found to control all species of weeds that may be found infesting alfalfa fields, and good agronomic practices are essential components of an effective vegetation management program.

AGRONOMIC PRACTICES INFLUENCING WEED CONTROL

Field Selection

Intelligent field selection can greatly minimize weed competition and signigicantly reduce the cost of weed control.

Fields infested with perennial weeds such as field bindweed, whitehorsenettle, hoary cress, and Russian knapweed should not be planted with alfalfa for seed production.

Annual weeds such as parasitic field dodder are difficult and costly to control in alfalfa. Fields known to be infested with dodder should be planted with non-host crops such as cotton, corn, sorghum, wheat, barley, beans, etc. Fields infested with annual or biennial clovers should be avoided if possible because costly hand weeding is the only effective method for their removal.

Land and Seedbed Preparation

Proper land preparation is an essential component of an effective weed control program. It promotes the uniform distribution of irrigation water throughout the life of the stand.

Good seedbed preparation promotes the uniform and rapid germination of the alfalfa seed, hence the establishment of the stand. In a well prepared seedbed, free of large clods, selective herbicides will provide more effective weed control.

Sanitation

Good sanitation in and around alfalfa seed fields is an inexpensive, effective, preventive method of weed control. Weeds allowed to grow and mature in and around the fields can facilitate the buildup of insect populations detrimental to the alfalfa.

Weeds that are not controlled with available herbicides should be removed to prevent their reproduction and spread. The adage "one year's seeding, seven year's weeding" forewarns the costly consequences of allowing weeds to produce seeds.

Cultural Practices

Properly timed irrigations, adequate fertilization, and well-timed applications of insecticides and fungicides are seldom thought of as essential components of an effective weed control program. However, all practices that promote the vigorous growth of the alfalfa crop contribute to weed control. A competitive crop can greatly minimize and often prevent weed seed germination and survival. A vigorously growing crop will exhibit better tolerance to herbicides.

METHODS OF WEED CONTROL

Cultural

It is worth emphasizing that all cultural practices used in alfalfa seed production can influence the effectiveness of weed control.

Soils with low alkali and soluble salt content, and having good drainage, that promote the development of deep alfalfa tap roots can minimize weed growth. A solid stand offers better weed competition than a sparse or skimpy stand.

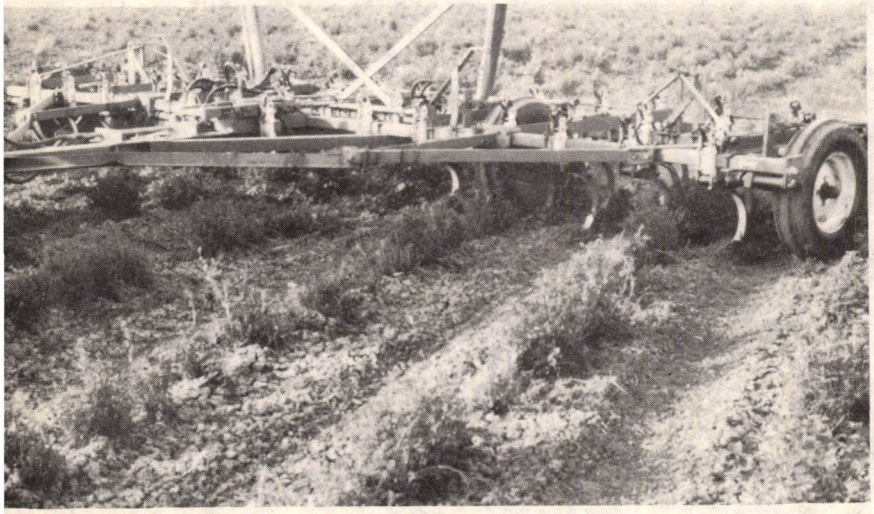
In the Central San Joaquin Valley, weed control can be obtained more effectively in fall planted fields than in spring planted fields.

Mechanical

Disks, rolling cultivators, harrows, and other tillage tools can be used for the destruction of unwanted vegetation. Properly adjusted, they can provide effective, though short-lived, weed control.

However, in newly planted alfalfa, complete weed control can rarely be accomplished with mechanical tools. Hand hoeing is often required, especially in fields where the alfalfa is planted in rows on beds. With the increasing cost of equipment, fuel, and labor, mechanical methods of weed control and hand hoeing are too expensive.

In established fields, cross diskings and cultivations to control weeds and volunteer alfalfa, may adversely effect the health and longevity of the stand.



Cultivations and cross diskings in established fields are effective methods of weed control. However, they injure the crown, predispose the alfalfa to invasion by disease organisms and reduce the stand. Their effectiveness is short-lived. In newly planted fields, costly hand weeding is required.



Selective Herbicides

Alfalfa seed growers have learned to rely on selective herbicides for effective, long-lasting weed control in their fields. There are many herbicides that can be used. However, though their proper selection and correct application can provide less expensive, longer-lasting, and more effective control, their intelligent use requires advanced planning and somewhat more skill than the use of hoes and cultivators.

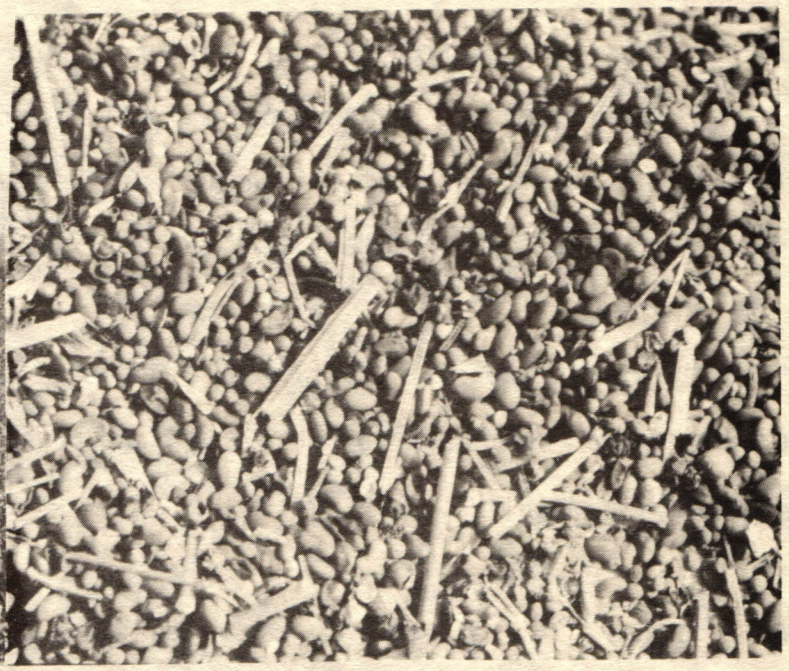
Selective herbicides in alfalfa seed production can be used preplant, preemergence, postemergence, post-thinning or lay-by, and post-harvest to control weeds as well as volunteer alfalfa.

A large number of applied research trials have been conducted in Fresno County to evaluate many herbicides. The susceptibility of weeds to some of these herbicides and their performance in the Central San Joaquin Valley are summarized in the two charts following Page 10.

Information presented in the two charts should not be interpreted as recommendations for the use of herbicides in alfalfa seed production. Some of the herbicides listed are not registered or labeled for use in alfalfa at the time of preparation of this progress report. Changes in the weed susceptibility chart and the herbicide performance summary may be required when additional information is developed.

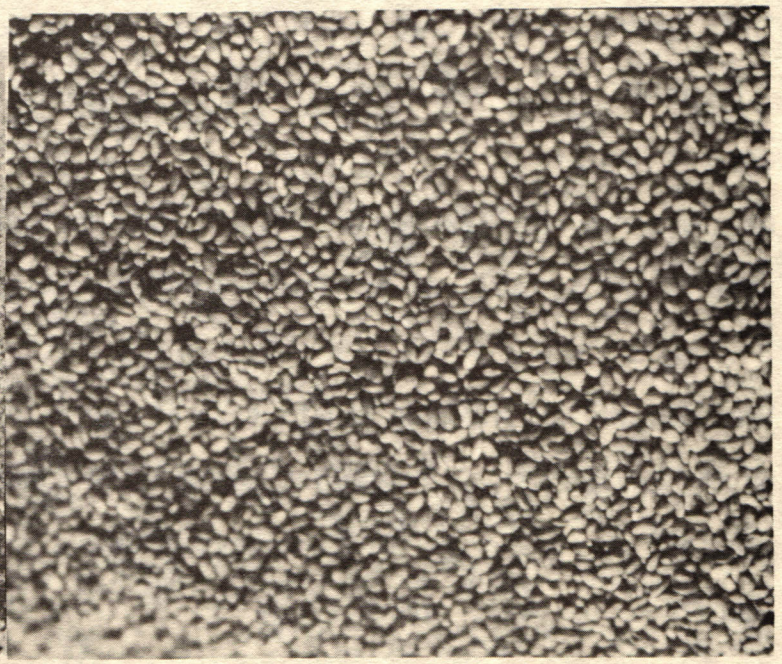
Use only those herbicides that are registered for use in alfalfa seed production by the Environmental Protection Agency (EPA) and the California Department of Food and Agriculture (CDFA). Always read the information and directions on the label and follow it carefully.





Weedy fields yield poor quality seed as shown above. Through competent vegetation management, weeds can be effectively controlled and excellent quality alfalfa seed, true to variety and having high germination percentage can be more economically obtained as illustrated in the pictures below.





Factors Influencing the Performance of Herbicides

There are many factors that can influence the performance and selectivity of herbicides, including:

A. Timing of the application relative to the growth of the weed and the alfalfa.

B. Soil type - sandy soils may require lower rates than clay soils.

C. Moisture - weeds stressed for moisture may not be effectively controlled with postemergence herbicides.

D. Temperature - air and soil temperature can influence both the effectiveness and selectivity of herbicides.

E. Vigor - seedling weeds growing vigorously are most susceptible to postemergence herbicides, and vigorously growing alfalfa exhibits the most tolerance to selective herbicides.

F. Weed species - knowledge of the weeds present and their distribution is essential for the proper selection of the most effective herbicide, herbicide combination, and/or sequence of herbicide applications.

G. Rate and accuracy - the rate of application and accuracy of calibration are extremely important factors influencing the performance and selectivity of herbicides. Only the applicator can make an herbicide effective and safe to use.

Growers can control some of these factors. Others are influenced by conditions that cannot be predicted or even anticipated. Therefore, a certain degree of flexibility is desirable when planning a weed control program. Under certain

conditions, alternative methods of control and/or the use of different herbicides may need to be considered. For example, unfavorable weather conditions may prevent accessibility for the proper application of certain herbicides by groundrig or by air.

Poor herbicide performance and crop injury are often caused by factors that the grower and applicator can manipulate. Poor weed control is often the result of improper selection of herbicides, improper timing of the application, and improper calibration of the equipment.

Control of Volunteer Alfalfa

To maintain the purity of the variety, volunteer alfalfa from seeds lost during harvest or from naturally shattered pods must be destroyed. Incorporation of the trash into the soil following harvest and the subsequent application of Karmex (diuron) has been used to control volunteer alfalfa. More recent studies have shown the combination of Velpar (hexazinone) plus Karmex to be very effective.

Once alfalfa seedlings are established and have two or three trifoliate leaves, only mechanical methods are available for weed control.

Control of Dodder

The most destructive and possibly the weed most dreaded by alfalfa seed growers is dodder. Its presence in the field can prevent certification, since its seeds are difficult and expensive to separate from alfalfa seed.

Dodder is an obligate parasite. It does not contain sufficient chlorophyl to enable it to survive without a suitable host plant. Soon after the seed germinates,

the seedling has to attach itself to its host by penetrating it with rootlike structures called "haustoria." It obtains all its required moisture and nutrients from its host. Once dodder becomes attached, it can be controlled only by destroying the vegetative part of the alfalfa.

Dodder is an annual and has to reproduce from seed every year. Therefore, destroying the weed prior to seed production is an essential, effective method of control. However, dodder seed can survive in the soil for many years. If alfalfa is planted in a field known to have been infested, it should be judiciously monitored to detect and destroy the infestation as soon as observed.

A large number of herbicides have been evaluated for the selective control of dodder in alfalfa. Furloe (chlorpropham) and Kerb (pronamide) are the only herbicides registered for use in alfalfa that provide a degree of control. Their effectiveness has been erratic in Central California, where dodder seeds germinate throughout the summer months.

Most often dodder infestations occur in limited areas, seldom exceeding ½ to 3 percent of the acreage. To control scattered infestations by treating the entire acreage with a selective herbicide would be uneconomical unless other weeds would be controlled as well as dodder.

The most effective and economical method of dodder control has been the use of contact herbicides and/or butane-propane burners. Thorough destruction of the infested alfalfa foliage is essential to prevent regeneration of the dodder.

When contact herbicides are used, the infested area may have to be treated twice to insure the total destruction of the dodder, especially if the alfalfa has lush foliage. However, a single application of a contact herbicide has been effective when sufficient gallonage was applied to thoroughly wet the entire alfalfa plant.

When butane or propane burners are used, two treatments are desirable. To be effective, a single treatment would require such a high temperature that it could injure or destroy the alfalfa crowns and thin the stand.

SUMMARY

In alfalfa seed production, weeds can cause considerable problems. However, through effective vegetation management, including the intelligent use of herbicides, growers can produce seed that is true to variety, high in germination percentage, and free of weed seeds.

Reliably reproducable data have been developed regarding the use of herbicides and the susceptibility of commonly occuring weeds to them. These data are summarized in the following two charts.

SUMMARY OF HERBICIDE PERFORMANCE EVALUATED IN SEED ALFALFA PRODUCTION 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 incorporatd 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 the broadleaf weeds were in their seedling stage of growth.	When broadleaf weeds were beyond the seedling stage of growth. When grassy weeds were present.
	Butyrac 200® or ButoxoneEster®	When broadleaf weeds in their seedling stage were the only weeds present.	Broadleaf weeds beyong 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.
	Brominal® Buctril®	When the Alfalfa had 2 to 3 trifoliate leaves and the broadleaf weeds were in their seedling stage. Applied in 60 gallons of water per acre and the alfalfa and broadleaf weeds were growing vigorously.	When grasses, chickweed and redmaids were prevalent. Weeds were beyond their seedling stage and air application in 10 gpa was used. When the temperature was above 80 °F temporary yellowing of the alfalfa was observed.
ESTABLISHED STANDS	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.
	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.
	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
	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.
	Velpar®	Alfalfa was established one year or longer. Applied during December and January when the alfalfa growth was short (4 to 6 inches). Rainfall occurred shortly after application and weeds were 2 to 4 inches tall.	Established grasses were the predominant weeds. Broadleaf weeds 8 to 10 inches tall or taller. Applied after the middle of February.

*This is not a recommendation for the use of herbicides. It is a progress report of observations made in applied research trials conducted in Fresno County.

SUSCEPTIBILITY OF WEEDS TO HERBICIDES EVALUATED FOR SELECTIVE CONTROL OF WEEDS IN SEED ALFALFA PRODUCTION

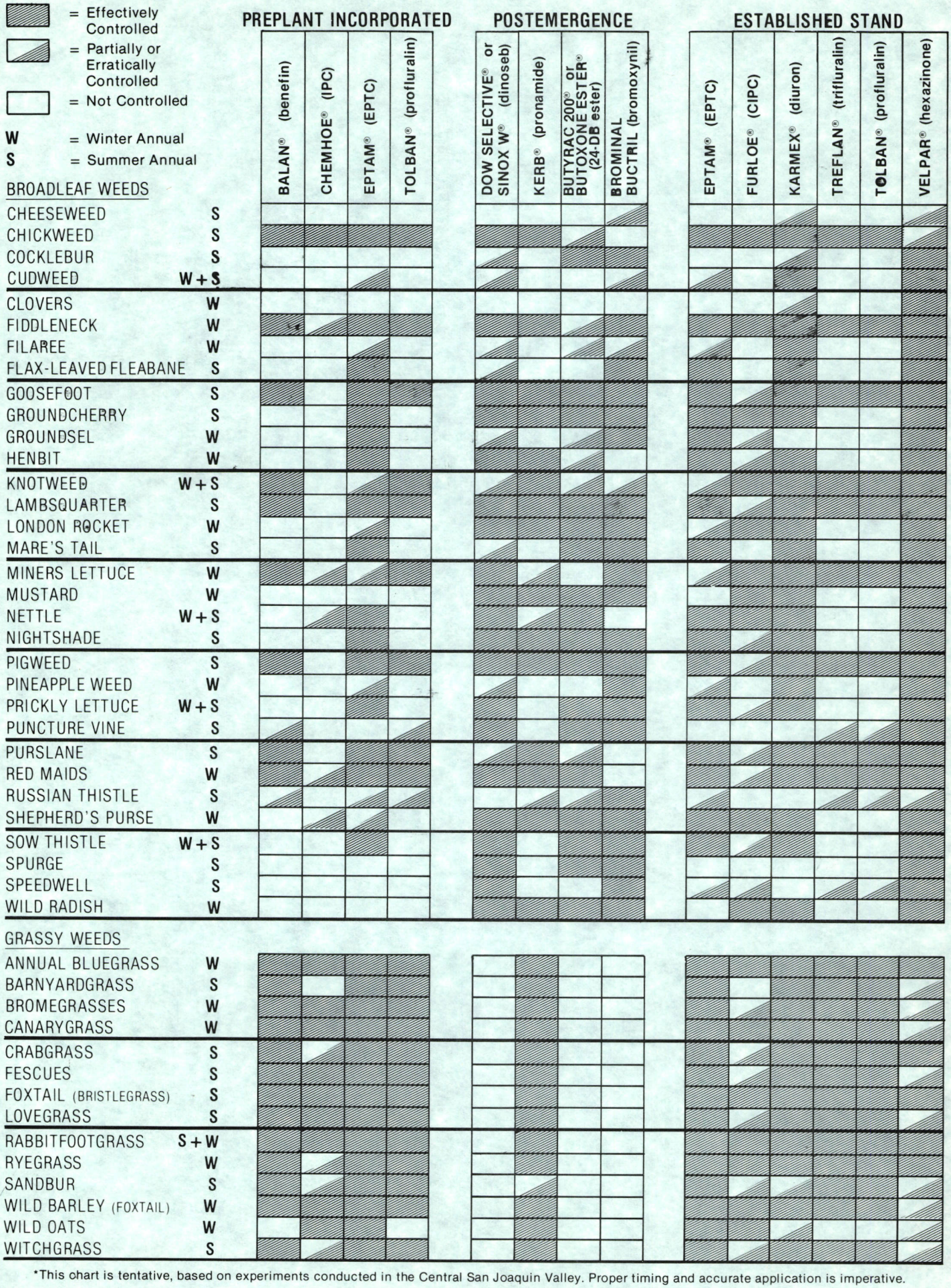
= Effectively Controlled

= Partially or Erratically Controlled

= Not Controlled

W = Winter Annual

S = Summer Annual



*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.

APPLIED RESEARCH STUDIES 1980-1981

A Progress Report

Synopsis

In established alfalfa one year old or older, the application of Velpar (hexazinone) during the winter months provided excellent selective control of broadleaf weeds, including common groundsel (Senacio vulgaris). Low rates of Velpar (0.25 and 0.5 lb ai/A) in combination with Karmex (diuron) provided better annual grass and volunteer alfalfa control than either herbicide used alone. Application of the herbicides with groundrigs resulted in more effective control than application with fixed-wing airplanes. Yellowing (chlorosis) of the alfalfa following the application of Velpar was short-lived. No differences in susceptibility to Velpar were detected in 35 different varieties of alfalfa with varying degrees of winter dormancy.

In newly planted alfalfa, postemergence applications of CGA-82725, Poast (BAS-9052, sethoxydim) and RO-138895 each provided effective volunteer cereal and grass control, with the exception of annual bluegrass (Poa annua). In combination with 2,4-DB ester, or Brominal (bromoxynil), or Dow Selective (dinoseb), these newly introduced herbicides provided good control of a large spectrum of broadleaf weeds and grasses.

More alfalfa injury was observed when postemergence herbicides were applied sequentially following preplant application of Eptam (EPTC) than of Balan (benefin), or Tolban (profluralin). However, the growth retardation and distortion of the young leaves was not observed beyond 4 to 6 weeks.

In herbicide persistance and plant-back studies, it was found that numerous crops could be safely planted 10 months following the application to alfalfa of Velpar

at 0.5 to 1.0 lb ai/A. However, at 2.0 lb ai/A, sufficient residual Velpar remains in Panoche clay loam soil to limit the growth of many crops commonly grown in rotation with alfalfa in the central San Joaquin Valley.

Procedures

Replicated trials were conducted at the West Side Field Station and in commercial fields with cooperating growers. Soil type, dates of herbicide application, alfalfa variety, plot size, herbicide used, and dates and methods of evaluation are given in the summary tables.

In the small-scale trials, herbicides were applied with CO_2 constant pressure sprayers. Each treatment was replicated three or four times in a randomized block design. In the large-scale trials, comparing the effectiveness of ground and air application, commercial equipment was used.

Control of weeds and volunteer alfalfa (when applicable) and alfalfa injury were evaluated periodically. In the trial evaluating the tolerance of 35 varieties of alfalfa to herbicides, yield data were obtained by hand-cutting the alfalfa in the center of each plot 1 to 1½ inches above the soil, and weighing. In another trial, yield data were obtained by mowing the alfalfa in the center of each plot in a 7' x 20' area, and gathering it for weighing. In both trials, subsamples were taken from the untreated plots and weeds were separated from alfalfa to obtain weed-free yield data.

RESULTS AND OBSERVATIONS ESTABLISHED STANDS ONE YEAR OR OLDER

Applied research studies conducted earlier* demonstrated that Velpar cannot be used as a selective herbicide in newly planted alfalfa. However, in established stands one year or older, it provided excellent control of broadleaf weeds without injuring the alfalfa at rates of 0.5 to 1.0 lb ai/A. The evaluation of Velpar, alone and in combination with Karmex, was continued in several areas of Fresno County on different soils and under varied methods of management.

The tolerance to Velpar of 35 varieties of alfalfa with varying degrees of winter dormancy was studied at the West Side Field Station. No differences in susceptibility to the herbicide were observed among the varieties, although more yellowing (chlorosis) of the alfalfa foliage was noted on the nondormant varieties. This was due to the fact that the nondormant varieties had more top growth at the time of treatment. The yellowing was short-lived, lasting approximately 14 days, and was rarely evident more than 3 weeks after treatment.

The results and observations made can be briefly outlined as follows:

A. Velpar at 0.5 lb ai/A provided excellent control of annual broadleaf weeds, including common groundsel and seedling cheeseweed.

B. The most effective control was obtained if Velpar was applied when broadleaf weeds were between the seedling and the two-to-six-leaf stage of growth.

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*Runcina Vol. 16, "Evaluation of Herbicides for Vegetation Management in Alfalfa Seed Production," U.C. Coop. Ext., Fresno County, CA, 2-10-78

C. Established grasses were not controlled adequately.

D. Rainfall or irrigation soon after application of Velpar resulted in more rapid herbicidal activity. However, a delay of 2 to 3 weeks in precipitation or irrigation did not reduce weed control.

E. Chickweed became established 8 to 10 weeks following treatment with Velpar. However, its growth was spindly and retarded.

F. Following application of Velpar, the alfalfa became yellow (chlorotic). If the alfalfa was 10 to 12 inches tall and the temperature was above 75°F at the time of treatment, some die-back (necrosis) was observed.

G. The alfalfa recovered within 2 to 3 weeks following treatment and no yellowing was evident beyond 4 weeks, except in one trial where 2.0 lb ai/A of Velpar was applied (see Tables 1-3).

H. To obtain good weed control and avoid alfalfa injury, Velpar had to be applied from late November through January. In the central San Joaquin Valley, low temperatures cause a die-back of winter growth on both dormant and nondormant varieties.

J. Valpar at 0.25 and 0.5 lb ai/A, in combination with Karmex at 1.2 and 2.4 lb ai/A, provided excellent broadleaf and grass control, as well as control of volunteer alfalfa.

K. The most effective volunteer alfalfa control was obtained when the Velpar plus Karmex application was made prior to germination of the alfalfa seed or before the seedling developed two trifoliate leaves.

L. Groundrig application of Velpar and Velpar plus Karmex provided better weed control than air application in 10 gallons of water per acre (see Table 7).

M. In trashy fields, where the straw had not been worked thoroughly into the soil following harvest, less effective control was obtained.



In trashy fields, and those with extensive weed infestation at the time of treatment, effective weed control with selective herbicides are impossible to obtain.



N. In fields where the alfalfa is planted on 20-to-40 inch rows, the best weed and volunteer alfalfa control was obtained when good

sanitation and cultivation followed harvest. Trash and straw had to be thoroughly incorporated into the soil and the field had to be furrowed and prepared for the following season prior to application of the herbicides. Subsequent cultivation reduced the effectiveness of control by exposing untreated soil.

O. Karmex in combination with Paraquat and a wetting agent, or in combination with Dow General (DNBP) plus weed oil, provided good broad spectrum weed control. However, late emerging common groundsel was not controlled.

P. Furloe-IPC (chlorpropham) in combination with Dow General or Paraquat plus a wetting agent provided less effective and shorter-lived weed control than was obtained with Velpar and Karmex (see Tables 1-4).

Q. Furloe failed to provide adequate volunteer alfalfa control (see Table 2).



The most effective control was obtained when the combination of Velpar plus Karmex were applied with a groundrig.

R. DPX-5648 effectively controlled all weeds, but severely injured the established alfalfa. Yellowing (chlorosis) persisted for 4 months following its application at 0.008 lb ai/A. The alfalfa regrowth following the first cutting on 4-6-81 showed yellowing symptoms only in plots treated with 0.032 lb ai/A (see Table 10).

A Word of Caution

Following seed harvest in the central San Joaquin Valley, many growers deep-chisel (16 to 20 inches) the furrows and irrigate the field with 14 to 20 inches of water to replenish the soil profile to rooting depth. In fields where this practice is followed, herbicides should be applied after irrigation to avoid leaching the herbicide from the surface 2 to 3 inches of soil where weed and volunteer alfalfa seeds germinate.

TOLERANCE OF THIRTY-FIVE VARIETIES OF ALFALFA TO HERBICIDES

A large number of varieties of alfalfa are grown for seed production in the central San Joaquin Valley. They differ markedly in their habits of dormancy and growth. The question of their relative tolerance to herbicides often arises. In a four-times replicated trial on Panoche clay loam soil, 35 varieties of alfalfa were treated with Velpar, Velpar plus Karmex, and Karmex plus Dow General.

The alfalfa varieties were planted in October 1976, and at the time of herbicide application, stand uniformity varied among the varieties. Therefore, stand and vigor evaluations were made prior to treatment (see Table 9A).

The varieties of alfalfa, their winter dormancies, and average stands are summarized in Table 9A. The results and observations made were:

A. Winter dormant varieties exhibited less yellowing (chlorosis) following Velpar application. This may be attributed to the fact that they had very short regrowth at the time of treatment.

B. Yellowing was short-lived on all varieties and 4 weeks following treatment was not visually detectable.

C. Nondormant varieties were more severely damaged by Egyptian alfalfa weevils and mildew than dormant varieties. This is reflected in the vigor evaluation summarized in Table 9A.

D. Treatment resulted in no statistically significant differences in yield (see Table 9B).

The winter growth pattern of alfalfa in Central California has been monitored during past years. These observations are summarized in the following graphs. It is evident that the alfalfa's winter growth dies back several times during the winter months. This die-back is caused by low (freezing) temperatures. In most years, growth continues slowly without die-back after the first of February.

These measurements validate earlier observations regarding the use of Karmex. Applied prior to February, Karmex did not cause injury to the alfalfa. However, later application often resulted in yellowing. In hay fields, the symptoms persisted through the first cutting, at times resulting in reduced yield. In seed fields, the yellowing and/or injury was not detectable beyond "clip-back" in April.

One may theorize that after the first of February, the soil temperature begins to warm, stimulating root development close to the soil surface. Application of Karmex and Velpar after February first may result in greater root and shoot uptake, hence more phytotoxicity.

CHART I

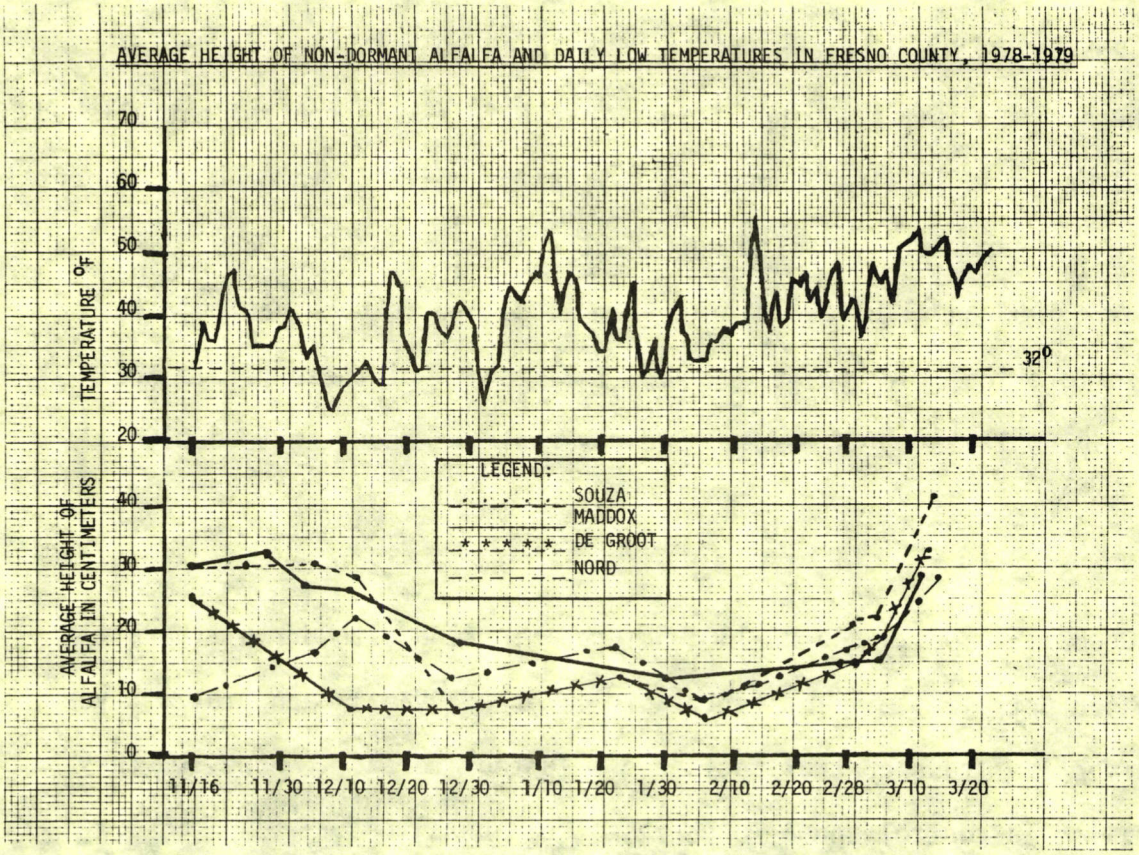
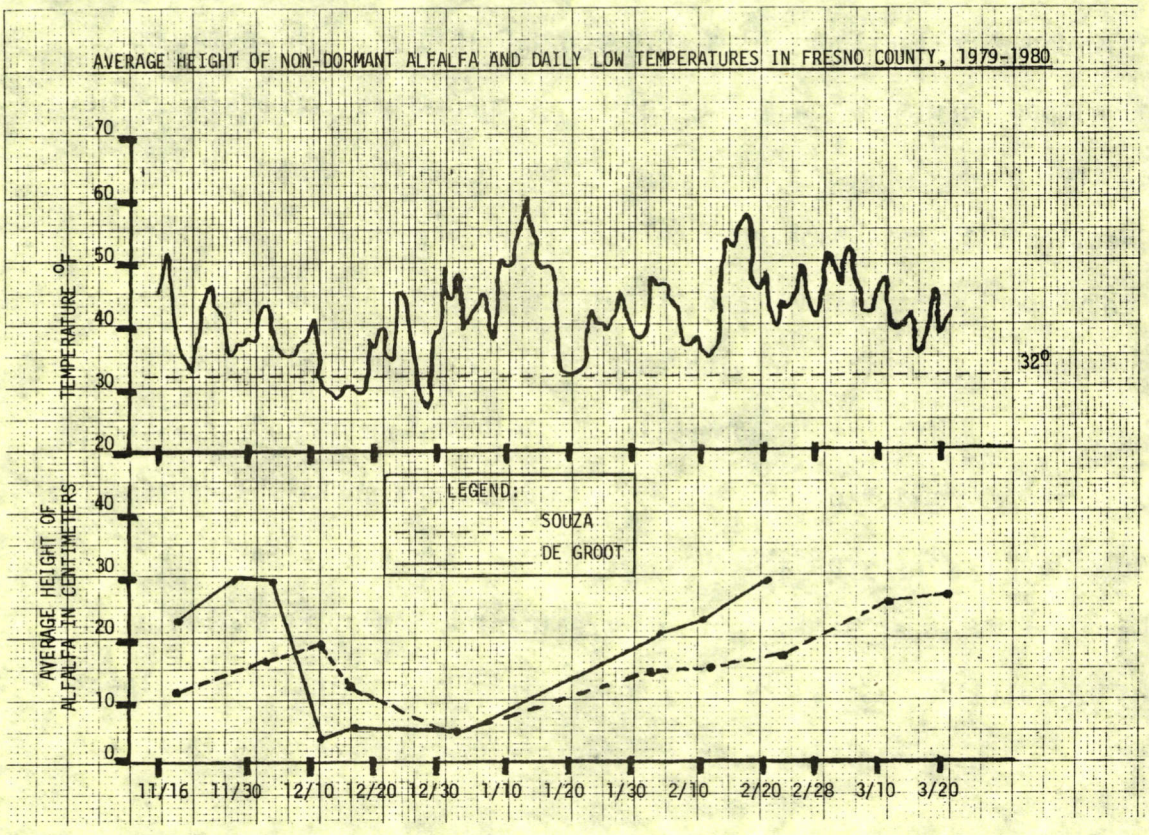


CHART II



POSTEMERGENCE WEED CONTROL IN NEWLY PLANTED ALFALFA

At present, there are no selective herbicides that effectively control established grasses in newly planted alfalfa. However, several recently introduced experimental herbicides look very promising, including CGA-82725, Poast and RO-138895. Trials were conducted in 1980 and 1981 evaluating them alone and in combination with 2,4-DB ester, or Brominal, or Dow Selective. The results of these trials are summarized in Tables 11-16. The results and observations made can be outlined as follows:

A. CGA-82725, Poast, and RO-138895 in combination with Surfel (paraffin based petroleum oil and fatty acid ester adjuvant) each provided very effective grass control including volunteer cereals. However, they failed to control annual bluegrass (Poa annua).

B. Each herbicide gave only marginal control at 0.25 lb ai/A. They provided excellent control at 0.5 and 1.0 lb ai/A. The symptoms developed very slowly and it required 4 to 6 weeks to obtain complete control.

C. Seedling alfalfa exhibited excellent tolerance in the seed leaf (cotyledon), unifoliate, and trifoliate stages of growth.

D. Brominal, in combination with each of the experimental grass herbicides, effectively controlled broadleaved weeds and grasses with the exception of chickweed, red maids, and annual bluegrass.

E. No evidence of phytotoxicity was observed when the temperature was 70°F or lower at the time of treatment. Temporary yellowing of the alfalfa was observed in some trials if Brominal was applied alone or in combination when the temperature was above 75 to 80°F.

F. 2,4-DB ester, in combination with CGA-82725, Poast, or RO-138895, effectively controlled broadleaf weeds susceptible to 2,4-DB ester (see susceptibility chart) and all grasses except annual bluegrass.

G. Grass control was slower in development and slightly reduced when each of the three experimental herbicides was used in combination with 2,4-DB ester (see Tables 11, 12, 13 and 16).

H. The most effective control of all broadleaf weeds and grasses was obtained in plots treated with Dow Selective plus CGA-82725, or Poast, or RO-138895 when weeds were in their seedling stages of growth.



The combinations of 2,4-DB ester or Brominal or Dow Selective with any one of the new grass herbicides provided excellent weed control as illustrated in these pictures.



J. The addition of Surfel to Dow Selective severaly injured the alfalfa seedlings and reduced the stand (see Table 16).

K. Goal (oxyfluorfen) provided good cheeseweed control at 0.5 and 1.0 lb ai/A, but it caused injury and temporary retardation of the alfalfa (see Tables 14A and 14B).

L. Goal in combination with Brominal gave better control of wild radish and other broadleaf weeds. The combination of Brominal and Poast plus Goal provided good broadleaf and grass control. However, these combinations caused more severe injury to the young alfalfa (3 to 6 inches tall)(see Tables 14A and 14B).

SEQUENTIAL APPLICATION OF HERBICIDES

No one herbicide provides effective control of all species of weeds that infest alfalfa, especially newly planted fields. Most often, combinations or sequential applications are needed to obtain desirable control.

To use combinations or sequential applications effectively and economically, it is essential to know the weed infestation, as well as the compatibility of herbicides. In earlier studies, it was clearly demonstrated that preplant application of Eptam (EPTC) followed by postemergence application of 2,4-DB ester can cause growth retardation of alfalfa and reduce the yield of the first cutting.

In a subsequent study, Eptam, Balan (benefin), and Tolban (profluralin) were incorporated preplant in separate plots. Following crop emergence, when the alfalfa seedlings had two trifoliate leaves, 2,4-DB ester, or Brominal or Dow Selective were applied alone and in combination with Poast. The results of this trial are summarized in Table 16. The results and observations made were:

A. The alfalfa was retarded in growth and the leaflets were distorted (folded and crinkled) in the Eptam treated plots.

B. Eptam provided better control of shepherd's purse than Balan and Tolban.

C. Sequential application of 2,4-DB ester caused greater injury and growth retardation in areas where Eptam was applied preplant than in the Balan and Tolban treated areas.

D. Sequential application of Brominal and Dow Selective caused slight growth retardation in the Eptam treated areas.

E. The addition of Surfel to the Dow Selective plus Poast combination resulted in severe alfalfa injury and stand reduction in all plots, whether treated preplant with Eptam, Balan, or Tolban. Similar injury was also observed in plots where no preplant herbicides were applied (see Table 16).

To obtain effective weed control in newly planted alfalfa, sequential applications of herbicides are needed in most fields. To avoid delayed growth or injury, it is essential to know the weed infestation and to plan a control strategy, taking into consideration the compatibility of herbicides and the effect of their sequential application on the crop.

HERBICIDE RESIDUE STUDIES

Herbicides are used in almost every crop grown in the San Joaquin Valley. Their persistance or residual properties must be known before their use can be recommended. In alfalfa seed production, it is essential to know whether the herbicide used on the previous crop has completely dissipated. Otherwise, small quantities of

herbicide that may be present in the soil can adversely effect the alfalfa seedlings. Conversely, one must know the residual properties of herbicides used in alfalfa to select crops to plant in rotation.

Herbicide persistence and plant-back studies were conducted at the West Side Field Station. Herbicides were applied only once and the area was cropped every 3 to 4 months. Five to six crops were used on each planting date. They were selected according to the date of planting, but they are all grown in the area in rotation with alfalfa. Earlier studies have been published by the University of California*. The 1980-81 trials are summarized in Tables 18-22. The results and observations made were as follows:

A. Several crops can be grown 8 to 10 months following the use of Velpar at 0.5 to 1.0 lb ai/A.

B. Sixteen months after the application of Velpar at 2.0 lb ai/A on Panoche clay loam soil with less than 1 percent organic matter, the growth of numerous crops was still adversely affected.

C. Sugar beets and broccoli appear to be more susceptible to residual Velpar than barley, safflower, and canteloupe.

D. Devrinol and its analog, R-23758, applied in crops preceeding alfalfa did not adversely affect the growth of alfalfa seedlings.

E. Nine to 10 months following their application, Nortron and its analog, NC-20484, applied at 1.5 and 1.0 lb ai/A respectively, did not adversely affect crops that are susceptible to these herbicides.

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* U.C. Div. of Agricultural Sciences, "Studies of Herbicide Persistence in a Panoche Clay Loam Soil," #75-SP/3010, and U.C. Agricultural Extension, "Studies of Herbicide Residues with Various Cultural Practices," #MA-35.

F. Poast adversely effected the growth of grasses planted soon after its application. However, in later plantings, all crops germinated and grew without any visual evidence of phytotoxicity.

G. Dual (metolachlor) and Furloe used in crops preceeding alfalfa did not adversely affect the growth of alfalfa seedlings.

CONCLUSION

Alfalfa seed and hay growers have available to them a number of selective herbicides. With their intelligent use, in a well-planned vegetation management system, they can control the weeds effectively and economically.

However, knowledge of the weed population or anticipated infestation is essential. Proper timing of herbicide application and accurate calibration of the spray equipment is very important to obtain effective control and good selectivity.

Additional studies should be conducted to evaluate newly introduced herbicides. The susceptibility of alfalfa varieties to Velpar need further scrutiny.

Brominal in newly planted alfalfa, and the combination of Velpar plus Karmex in established stands need to be further studied and pursued until their registration and labeling is obtained.

TABLE 1-A

Effect of Herbicides on Weed Control In Established Alfalfa
C-302, 94, 425, 10, 80-1

Trial Location: West Side Field Station
Soil Type: Panoche Loam
Alfalfa Variety: Moapa-69, planted 12-7-76
Herbicides Applied: 11-28-79
Alfalfa Height: 10 to 12 inches

Plot Size: 10' x 30' - 3 Reps
Irrigation Method: Basin Flood
Evaluated: 12-20-79, 2-8-80

		Weed Control And Alfalfa Injury Evaluation 1/						
		12-20-79			2-8-80			
Herbicide	lb ai/A	%Brdlf. Control	%Grass Control	Alfalfa Injury 2/	%Brdlf. Control	%Grass Control	Alfalfa Injury 3/	Weeds Present 4/
A Velpar 90W	0.25	100	90	5.0	100	80	0	A
B Velpar 90W	.5	100	100	6.3	100	100	0	---
C Velpar	1.0	100	97	8.0	100	100	0	---
D Velpar	2.0	100	100	8.0	100	100	0	---
E Velpar Karmex	0.25 1.20	98	100	6.3	100	100	0	---
F Velpar Karmex	0.5 1.20	100	93	7.0	100	100	0	---
G Furloe Dow General Weed Oil	4.0 2.0 10gpa	100	100	8.7	80	77	0	A, M, P, S, Sp
H Karmex Paraquat Bio 88	2.4 0.5 ½%	100	100	8.0	97	97	0	A
J Untreated	---	---	---	---	---	---	-	A, Lr, M, P, S, Sp

1/ Alfalfa Injury evaluation based on a 0 to 10 scale. 0= no injury, 10= very severe injury.
2/ Alfalfa Injury evaluations made on foliage treated at time of the trial establishment.
3/ Injury rating made on regrowth.
4/ Weeds present: A= annual bluegrass; Lr= London rocket; M= mare's tail; P= prickley lettuce; S= sowthistle; Sp= shepherd's purse

TABLE 1-B

EFFECT OF POSTEMERGENCE APPLIED HERBICIDES ON WEED CONTROL IN ESTABLISHED ALFALFA

302, 94, 425, 10, 80-1

Location: Westside Field Station, Field 11

Irrigation Method: Basin Flood

Soil Type: Panoche Loam

Plot Size: 10' x 30', Reps 3

Alfalfa Planted: 12-7-76

Herbicides Applied: 11-28-79, 12-8-80

Alfalfa Variety: Moapa 69

Evaluated: 4-8-81

Herbicides	Lb ai/ Acre	Weed Control Evaluations 1/ Grass Control	Broadleaf Control	Weeds Present
A Velpar 90W	0.25	5.0	6.7	Chw, O
B Velpar 90W	0.5	7.7	9.0	A, Chw, O
C Velpar 90W	1.0	10.0	10.0	
D Velpar 90W	2.0	10.0	10.0	
E Velpar 90W Karmex	0.25 1.20	8.7	8.3	Chw, O
F Velpar 90W Karmex	0.5 1.20	8.3	9.3	Chw, O
G Furloe Dow General Weed Oil	4.0 2.0 10 gpa	9.0	5.3	O, P
H Karmex Paraquat Bio 88	2.4 0.5 ½%	10.0	6.0	Chw, O
J Untreated	---	0	0	A, Br, Chw, Fb, K, Lr, O, S

Remarks: No evidence of injury or growth retardation of the alfalfa in any of the plots.

1/ Evaluations based on a scale of 0 to 10. 0 = no weed control, 10 = perfect weed control.

Weeds Present: A = Annual bluegrass, Br - Bromegrass, Chw = Chickweed, Fb = Foxtail barley, K = Knotweed, Lr = London rocket, O = Common groundsel, P = Prickley lettuce, S = Sowthistle

TABLE 2

The Effect of Herbicides on Weeds and Volunteer Alfalfa Control and Alfalfa Injury in Established Alfalfa

C-302, 425, 94, 10, 80-6

Location: Lassen Ave 1 mi S of Elkhorn, W side of road
Soil Type: Lethent silty clay
Herbicides Applied: 1-8-80

Plot Size: 4 rows(30") x 30'-3 reps.
Irrigation: Furrow
Evaluated: 3-28-80

Weed - Volunteer Alfalfa Control and Injury Evaluation

Herbicides	lb ai/A	% Weed Control	%Alf.Sdg. Control	Alfalfa Injury 1/	Weeds Present 2/
A Velpar	0.25	95	17	0	O, S, Wo
B Velpar	0.5	100	23	0	---
C Velpar	1.0	100	87	0	---
D Velpar	2.0	100	100	2.7	---
E Velpar Karmex	0.25 1.2	100	97	0	---
F Velpar Karmex	0.5 1.2	100	97	0	---
G Velpar Devrinol	0.5 2.0	100	60	0	---
H Furloe Paraquat X-77	4.0 0.5 ½%	87	43	0	O, P
J Karmex Paraquat X-77	2.4 0.5 ½%	100	93	0	---
K Untreated	---	0	0	0	Lr_3,Mu, O_3, Ry_2, S_2, Wo

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

2/ Weeds Present: Lr= London rocket; Mu= mustard; O= common; P= prickly lettuce; Ry= rye grass; S= sowthistle; Wo= wild oats. Subscript indicate the number of replications in which the weed was observed.

TABLE 3

THE EFFECT OF HERBICIDES ON WEED AND VOLUNTEER ALFALFA CONTROL IN ESTABLISHED ALFALFA

C-302, 94, 425, 10, 80-2

Location: West Side Field Station, Field 41
Soil Type: Panoche Loam
Alfalfa Variety: Moapa 69, planted 1976
Herbicides Applied: 12-13-79

Plot Size: 4 rows x 30' - 4 reps.
Irrigation: Furrow
Evaluated: 2-8-80

		Weed - Volunteer Alfalfa Control and Injury Evaluation			
Herbicides	lb ai/A	%Brdlf. Control	%Alf.Sdlg. Control	Alfalfa Injury 1/	Weeds Present 2/
A Velpar	0.25	83	83	0	O_4, Sp
B Velpar	0.50	91	100	0	O_3
C Velpar	1.0	98	100	0	0
D Velpar	2.0	100	100	0	---
E Velpar + Karmex	0.25 + 1.20	88	98	0	O_3
F Velpar + Karmex	0.5 + 1.20	93	93	0	O_3
G Karmex	2.4	65	88	0	O_2
H Velpar + Treflan	0.5 + 1.5	80	90	0	O_4
J Velpar + Treflan	1.0 + 1.5	95	100	0	0
K Untreated	---	---	0	0	Lr_4, O_4, Sp_4

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

2/ Weeds present: 0= common groundsel; Sp= shepherd's purse; Lr= London rocket. Subscript indicate the number of replications in which the weed was observed.

TABLE 4

Effect Of Herbicides On Weed Control In Established Alfalfa

C-302, 425, 94, 10, 80-3

Trial Location: Hwy 33, 1.5 mi N of Three Rocks
Soil Type: Panoche Loam
Alfalfa Variety: Moapa, 4th year
Herbicides Applied: 12-18-79

Volume of Water: 52gpa
Irrigation Method: Sprinkler
Plot Size: 10' x 30' - 4 Reps.
Alfalfa Height: 8 to 9 inches
Evaluated: 2-27-80

Weed Control and Alfalfa Injury Evaluation [1/]

Herbicide	lb ai/A	% Weed Control	Weeds Present [2/]	Alfalfa Injury
A Velpar	0.25	65	A_2, Ch, Chw_3, Fb_1, O_4	0
B Velpar	0.5	75	A_2, Chw_4, Fb_1, O_3, S_3, Sp_1	0
C Velpar	1.0	91	A_1, Chw_1, Fb_1, O_2, Sp_1	0
D Velpar Karmex	0.25 1.2	70	A, Ch, Fb, O_4, S_3	0
E Velpar Karmex	0.5 2.4	81	Ch, Fb, O_4	0
F Karmex Paraquat X-77	2.4 0.5 ½%	85	Ch, O_4	0
G Karmex DinitroGen Weed Oil	2.4 2.0 10 gal	70	Ch, Fb, O_4	0
H Furloe DinitroGen Weed Oil	4.0 2.0 10 gal	73	O_4	0
J Furloe Paraquat X-77	4.0 0.5 ½%	84	Ch, Chw, O_3, P_2, Sp_2	0
K Untreated	---	0	A_3, Ch_4, Chw_4, Lr_4, O_4, P_4, S_4, Sp_4	0

1/ Alfalfa injury evaluations are based on a 0 to 10 scale. 0= no injury, 10= very severe injury.

2/ Weeds present: A= annual bluegrass, Ch= cheeseweed, Chw= chickweed, Fb= foxtail barley, O= common groundsel, Lr= London rocket, P= prickley lettuce, S= sowthistle, Sp= shepherd's purse. Subscript following weed designation indicates in how many replications it was identified.

Remarks: The weeds were well established, some in early bloom at time of treatment. Overall appearance was better than the evaluation indicates.

TABLE 5

THE EFFECT OF HERBICIDES ON WEED AND VOLUNTEER ALFALFA CONTROL IN ESTABLISHED ALFALFA

C-302, 425, 94, 10, 80-5

Location: Hwy 33 at Half Way Store, W side of road
Soil Type: Panoche Silty Clay
Herbicides Applied: 12-18-79
Plot Size: 4 rows x 30'
Irrigation: Sprinkler
Evaluated: 3-24-80

Herbicides	lb ai/A	Weed - Volunteer Alfalfa and Injury Evaluation % Weed Control	%Alf.Sdg. Control	Alfalfa Injury 1/	Weeds Present 2/
A Velpar	.25	85	85	0	Lr, O_3, P, S_2
B Velpar	.5	96	88	0	Lr_2, S
C Velpar	1.0	100	89	0	---
D Velpar Karmex	.25 1.2	93	94	0	Lr, O_2, S_2
E Velpar Karmex	.5 1.2	99	91	0	P, S
F Paraquat Karmex WA	.5 2.4 ½%	93	91	0	Lr, O, S_3
G Untreated	---	0	0	0	Lr_4, O_4, P, S_4, Y_4

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

2/ Weeds present: Lr= London rocket; O= common groundsel; P= prickly lettuce; S= sowthistle; Y= pineapple weed. Subscript indicate number of replications in which the weed was observed.

TABLE 6

THE EFFECT OF HERBICIDES ON WEED AND VOLUNTEER ALFALFA CONTROL IN ESTABLISHED ALFALFA

C-302, 425, 94, 10, 80-7

Location: Adams and Lyon Aves., SE corner
Soil Type: Panoche clay loam
Herbicides Applied: 1-8-80
Evaluated: 2-27-80
Plot Size: 4 rows x 30" - 3 reps.
Irrigation: Sprinkler

Weed - Volunteer Alfalfa and Injury Evaluation

Herbicides	lb ai/A	%Weed Control	%Alf.Sdg. Control	Alfalfa Injury 1/	Weeds Present 2/
A Velpar	0.25	98	40	0	---
B Velpar	0.5	100	86	0	---
C Velpar	1.0	100	90	0	---
D Karmex Velpar	1.2 0.25	100	100	0	---
E Karmex Velpar	1.2 0.5	100	100	0	---
F Untreated	---	0	0	0	B, Ch, Lr, O, S, Sp

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

2/ Weeds Present: B= barnyard grass; Ch= cheese weed; Lr= London rocket; O= common groundsel; S= sowthistle; Sp= shepherd's purse.

TABLE 7

EFFECT OF AIR AND GROUND APPLICATION OF HERBICIDES ON WEED CONTROL IN ESTABLISHED ALFALFA
302, 425, 94, 10, 81-2

Location: SW¼ Sec. 14, R 17, T15, B. Lara Farm

Plot Size: 112' x ¼ mile, Reps 2

Soil Type: Panoche clay loam

Volume of Water: Air Application - 10 gpa
Ground Application - 75 gpa

Alfalfa Planted: 11-1978

Alfalfa: 3" to 6" tall

Alfalfa Variety: DeKalb-185

Herbicides Applied: 1-12-81

Herbicides	Lb ai/A	Method of Application	Percent Weed Control Average 2 Replications 2-16-81	3-11-81
A Velpar L	0.75	Air	90	90
B Velpar SP	0.75	Air	95	90
C Velpar SP	0.75	Ground	100	100
D Velpar L Karmex	0.25 1.2	Air	90	90
E Velpar L Karmex	0.5 1.2	Air	95	95
F Karmex Sinox Weed Oil	2.4 2.0 10gpa	Air	85	85
G Untreated	---	---	0	0

Remarks: Weeds present at time of herbicide application: Common groundsel, Shepherd's purse, London rocket, Sowthistle, Chickweed, Grasses, Lambsquarter - all from seedling to bloom except Lambsquarter and Sowthistle.

TABLE 8

EFFECT OF POSTEMERGENCE APPLIED HERBICIDES ON WEED CONTROL AND YIELD IN AN ESTABLISHED ALFALFA STAND

203, 425, 94, 10, 81-9

Location: NW corner of Shaw & Chestnut, CSUF

Irrigation: Basin Flood

Soil Type: Hanford Sandy Loam

Plot Size: 20' x 300', Reps 5

Variety: 819, Planted 10-79

Alfalfa Height: 4 to 6 inches

Herbicides Applied: 1-26-81 in 49.5 Gal. water/A

Weed Control Evaluated: 2-28-81 and 3-24-81

Harvested: 4-2-81

Harvested Area: 3' x 20'

Herbicide	Lb ai/A	Weed Control Evaluation and Yield Data: Percent Weed Control 2-28-81	Percent Weed Control 3-24-81	Yield/ Hvstd.Area	Percent of Untreated
A Velpar	1.0	100	100	13.1	105
B Velpar	0.5	100	95*	13.8	111
C Velpar Karmex	0.25 1.2	100	98*	13.2	106
D Velpar Karmex	0.5 1.2	100	100	12.1	97
E Karmex Dinitro General Bio 88	1.6 2.0 ½%	90	85*	10.6	86
F Karmex Dinitro General Paraquat	1.6 2.0 0.5	95	85**	12.9	103
G Untreated (Weedy)	---	0	0	16.0	129
H Untreated (Weed-Free)	---	0	0	12.4	100

Note: To obtain yield in tons of green weight per acre, multiply values by 0.363

*Weed primarily Chickweed - spindly and retarded

**Common groundsel

EFFECT OF HERBICIDES ON HEIGHT AND VIGOR OF 35 VARIETIES OF ALFALFA

302, 425, 94, 10, 81

Location: West Side Field Station
Soil Type: Panoche clay loam
Alfalfa Planted: 12-7-76
Herbicides Applied: 12-5-80

Irrigation Method: Basin Flood
Plot Size: 5' x 3', Reps 4
Evaluations:
Percent stand prior to treatment: 12-5-80
Height measurements: 2-24-81
Vigor prior to cutting: 4-6-81

VARIETY	Dormancy[1]	Evaluations Average of 4 Replications: % Stand[2] Prior to Treatment	Alfalfa Height in Inches: Velpar[3]	Karmex 1.2 Velpar 0.5	Karmex 1.2 Dow Gen. 2.0	Untreated	Alfalfa Vigor[4] Prior to Cutting
1. UC-108	ND	76.2	15.5	14.5	15.0	18.5	7.0
2. WL-318	SD	66.2	12.0	14.0	13.0	13.0	9.2
3. A-55	D	51.2	12.5	12.5	15.0	14.8	8.0
4. UC-110	VND	76.2	17.5	16.5	17.0	18.5	6.8
5. OX	D	81.2	11.5	11.5	12.5	13.0	8.5
6. Corverde 95 Br.	VND	77.5	13.5	16.5	17.0	17.0	6.7
7. AS-13R	ND	87.5	16.5	14.5	15.0	16.5	7.0
8. WL-512	ND	73.7	13.5	18.0	17.5	16.5	8.2
9. DK Br. 167	SD	77.5	12.0	12.0	12.0	14.5	8.5
10. Matador	ND	80.0	16.5	16.5	15.5	17.0	6.7
11. Moapa 69	ND	75.0	14.0	13.0	13.0	15.0	5.7
12. B-210	ND	67.5	15.5	15.5	16.0	13.5	7.2
13. UC-111	VND	76.2	18.0	21.0	15.5	16.5	6.7
14. A-21R	ND	76.2	17.0	17.0	18.0	15.5	5.7
15. PX-745	ID	82.5	12.0	15.5	15.0	13.0	9.0
16. CUF-101	VND	78.7	19.0	17.0	16.5	19.5	7.5
17. Hayden PX PRRR	VND	78.7	19.0	19.0	20.0	20.0	6.5
18. Lahontan	SD	88.7	9.0	9.5	11.5	8.5	8.7
19. Amador	ID	75.0	13.0	12.5	13.0	13.0	8.0
20. Condura 73 Br.	ID	85.0	16.0	13.5	17.0	14.5	8.7
21. UC Cargo	VND	75.0	16.5	16.0	16.0	15.5	7.0
22. DK Br. 185-R		77.5	14.0	13.5	12.5	15.0	7.6
23. UC-103	VND	75.0	14.5	16.5	16.0	19.0	7.0
24. WL CA 423-26	ND	81.2	16.5	15.0	15.0	15.0	7.2
25. WL 70T4-2	ND	75.0	14.0	12.0	14.0	15.5	8.5
26. SW32 AN4 P3 1976	ND	81.2	14.5	12.0	12.5	14.5	6.5
27. Nevada Syn YY	ID	75.0	15.5	15.0	16.5	15.0	8.2
28. CW-0131-23	D	66.2	5.5	8.0	10.5	11.0	9.0
29. CW-22-03	ND	81.2	14.5	13.5	13.0	13.5	7.2
30. CW-116	SD	88.7	12.5	13.0	15.0	14.0	8.2
31. UC-76E	VND	81.2	15.5	16.0	17.0	13.5	6.7
32. UC-104	VND	73.7	15.0	14.0	17.0	14.5	6.0
33. Ardiente	ND	78.7	17.0	18.0	19.0	19.5	6.0
34. WL-219	D	65.0	12.0	12.5	10.0	12.5	9.0
35. Pioneer Br. 572	VND	77.5	15.5	15.5	15.0	12.5	6.5

1/D=Dormant, ID=Intermediate dormancy, ND=Non-dormant, SD=Slightly dormant, VND=Very non-dormant
2/Alfalfa was planted four years before applications of herbicides - values are the average estimated stand
3/Rates of herbicides are active ingredients in pounds per acre
4/Vigor rating based on a 0 to 10 scale where 10 denotes vigorously growing alfalfa. Egyptian weevil and mildew damage were more pronounced in the non-dormant varieties. This is reflected in the ratings. No difference in vigor ratings were evident in any variety due to herbicide treatment

TABLE 9-B

EFFECT OF POSTEMERGENCE APPLIED HERBICIDES ON THE YIELD OF 35 VARIETIES OF ALFALFA

302, 425, 94, 10, 81

Location: West Side Field Station
Soil Type: Panoche clay loam
Alfalfa Planted: 12-7-76
Herbicides Applied: 12-5-80

Irrigation Method: Basin flood
Plot Size: 5' x 3', Reps 4
Harvested: 4-6-81
Harvested Area: 3' x 2.3'

		Alfalfa Yield in Pounds Per Harvested Area - Average 4 Replications[1]				
			Karmex 1.2 DNBP 2.0 X-77 ½%	Velpar 0.5 Karmex 1.25	Untreated[4]	
VARIETY	Dormancy[2]	Velpar 1.0[3]			Weed Free	Weedy
1. UC-108	ND	2.8	2.5	2.3	2.0	(2.7)
2. WL-318	SD	2.4	2.9	2.1	2.2	(2.9)
3. A-55	D	2.5	2.4	2.3	2.3	(3.0)
4. UC-110	VND	2.3	2.4	2.3	2.0	(2.7)
5. OX	D	2.4	2.3	2.7	2.4	(3.1)
6. Corverde 95 Br.	VND	2.4	2.3	2.3	1.8	(2.4)
7. AS-13R	ND	2.4	2.6	2.8	2.0	(2.7)
8. WL-512	ND	2.5	2.1	2.3	2.1	(2.8)
9. DK Br. 167	SD	2.2	2.7	2.4	2.0	(2.7)
10. Matador	ND	2.3	2.6	2.2	2.0	(2.7)
11. Moapa 69	ND	2.4	2.1	1.9	1.8	(2.4)
12. B-210	ND	2.4	2.3	2.1	2.0	(2.7)
13. UC-111	VND	2.2	2.3	2.0	1.9	(2.5)
14. A-21R	ND	2.0	1.8	2.2	1.8	(2.4)
15. PX-745	ID	2.4	2.4	2.6	2.1	(2.8)
16. CUF-101	VND	2.4	2.4	2.3	2.4	(3.1)
17. Hayden PX PRRR	VND	2.9	2.4	2.4	2.2	(2.9)
18. Lahontan	SD	1.7	1.7	1.6	1.8	(2.4)
19. Amador	ID	2.3	2.3	2.1	1.8	(2.4)
20. Condura 73 Br.	ID	2.8	2.6	2.5	2.3	(3.0)
21. UC Cargo	VND	2.3	2.3	2.4	2.2	(2.9)
22. DK Br. 185-R		2.2	2.3	1.9	1.7	(2.2)
23. UC-103	VND	2.3	2.1	2.4	2.1	(2.8)
24. WL CA 423-26	ND	2.3	2.5	2.1	2.0	(2.7)
25. WL 70T4-2	ND	2.8	2.1	2.2	2.3	(3.0)
26. SW32 AN4 P3 1976	ND	1.9	1.9	2.1	1.8	(2.4)
27. Nevada Syn YY	ID	2.0	2.3	2.6	2.0	(2.7)
28. CW-0131-23	D	1.7	1.8	2.0	1.4	(1.9)
29. CW-22-03	ND	2.5	2.7	2.4	1.6	(2.1)
30. CW-116	SD	2.4	2.6	2.4	2.2	(2.9)
31. UC-76E	VND	2.6	2.5	2.4	2.2	(2.9)
32. UC-104	VND	2.1	2.3	2.3	2.0	(2.7)
33. Ardiente	ND	2.4	2.3	2.1	2.1	(2.8)
34. WL-219	D	2.2	2.1	2.1	2.0	(2.7)
35. Pioneer Br. 572	VND	2.4	2.4	2.4	2.1	(2.8)

1/The alfalfa was cut by hand 1½ inches above the soil surface and weighed. Values are pounds of green - undried
2/D=Dormant, ID=Intermediate dormancy, ND=Non-dormant, SD=Slightly dormant, VND=Very non-dormant
3/Rate in pounds of active ingredients per acre (DNBP=Dinitro General)
4/Values in parentheses equal total yield - alfalfa plus weeds

TABLE 10

EVALUATION OF DPX-5648 ON WEED CONTROL AND SELECTIVITY IN ESTABLISHED ALFALFA

302, 425, 94, 10, 81-8

Location: West Side Field Station

Soil Type: Panoche clay loam

Alfalfa Planted: 12-7-76

Alfalfa Variety: Moapa-69

Irrigation Method: Basin Flood

Plot Size: 5' x 20' - Reps 3

Herbicides Applied: 1-15-81

Evaluated: See below

		WEED CONTROL AND ALFALFA INJURY EVALUATIONS					
		1-27-81		2-6-81		4-6-81	
Herbicide	Lb ai/A	% Weed Control	Alfalfa Injury	% Weed Control	Alfalfa Injury	% Weed Control	Alfalfa Injury
A DPX-5648	0.008*	73	6.3	100	5.4	100	2.0
B DPX-5648	0.016	73	6.3	100	5.0	100	3.0
C DPX-5648	0.032	80	7.6	100	6.0	100	4.0
D Untreated	---	0	0	0	0	0	0

* BIO-88 at ½% of spray volume added to all treatments.

Remarks: Injury evaluation based on 0 to 10 scale. 0 = no injury, 10 = very severe injury. Injury was expressed by retarded growth and chlorosis.

TABLE 11

EFFECT OF POSTEMERGENCE APPLIED HERBICIDES ON WEED CONTROL IN NEWLY PLANTED ALFALFA

302, 425, 94, 10, 81-6

Location: West Side Field Station
Soil Type: Panoche Loam
Alfalfa Variety: Moapa 69
Alfalfa Planted: 12-1980

Irrigation Method: Sprinkler
Plot Size: 5' x 10'
Evaluated: 1-27-81, 2-6-81, 3-6-81
Herbicides Applied: 1-15-81

		Weed Control and Alfalfa Vigor Evaluations - Average of Three Replications [1]								
		1-27-81		2-6-81		3-6-81				
Herbicides	Lb ai/ Acre	Grass Control	Brdlf. Control	Grass Control	Brdlf. Control	Grass Control	Chickweed Control	Brdlf. Control	Alfalfa Vigor	Weeds [2] Present
A Brominal	0.5	3.3	8.0	8.6	8.0	7.6	0	8.0	9.7	Chw, Lr, Sp
Poast	0.5									
B Brominal	0.5	7.0	8.3	9.0	9.0	10.0	0	7.3	10.0	Chw, Lr, Sp
RO-138895	1.0									
C 2,4-DB ester	0.75	3.6	0	5.0	8.3	8.6	0	4.0	10.0	Chw, Lr, O, Sp
Poast	0.5									
D 2,4-DB ester	0.75	4.6	0.6	6.0	9.0	10.0	0	1.0	10.0	Chw, Lr, O, Sp
RO-138895	1.0									
E Untreated	---	0	0	0	0	0	0	0	8.0	Chw, Lr, O, Sp

Remarks: The seedling alfalfa was in the unifoliate to one trifoliate stage of growth when the herbicides were applied.

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

2/ Weeds present: Chw =Chickweed, Lr = London rocket, O = Common groundsel, Sp = Shepherd's purse

TABLE 12

Effect of Postemergence Herbicides on Weed Control in Newly Planted Alfalfa
C-302, 425, 94, 10, 80-8

Trial Location: Chestnut and Peach Aves.
Soil Type: Hanford sandy loam
Alfalfa Variety: 819
Herbicides Applied: 11-1-79

Plot Size: 5' x 20' - 3 Reps.
Irrigation Method: Sprinkler
Evaluated: 12-11-79

WEED CONTROL AND ALFALFA INJURY EVALUATIONS 1/

Herbicide	lb ai/A	% Brdlf. Control	%Grass Control	Weeds Present 2/	Alfalfa Injury
A Brominal	0.5	90	0	A, Chw, Ch, R Wo	0
B Brominal Poast	0.5 0.5	90	80	A, Ch, Chw, R	0
C 2, 4-DB ester Poast	0.75 0.5	55	80	A, Chw, Fd, P	1.5
D Dow Selective Amm. Sulfate	1.0 1.0	98	0	A, Fd, Chw, Wo	1.0
E Dow Selective Poast	1.0 0.5	95	80	A, Fd, Chw	1.0
F Untreated	---	0	0	A, Fd, Ch, Chw, P, R, Wo	0

1/ Alfalfa injury evaluations are based on a 0 to 10 scale. 0= no injury, 10= very severe injury.

2/ Weeds Present: A= annual bluegrass, Ch= cheeseweed, Chw= chickweed, Fd= fiddleneck, P= pineappleweed, R= red maids, Wo= wild oats.

TABLE 13

EFFECT OF POSTEMERGENCE APPLIED HERBICIDES ON WEED CONTROL IN NEWLY PLANTED ALFALFA

302, 425, 94, 10, 81-4

Location: S.E. corner Madera & Elkhorn, Schramm Ranch

Irrigation Method: Furrow

Soil Type: Merced clay

Plot Size: 5' x 30', Reps 3

Alfalfa Planted: 10-1980

Evaluated: 1-27-81, 2-6-81, 2-24-81 3-11-81, 3-16-81

Herbicides Applied: 1-14-81

Herbicides	Lb ai/A	Grass Control and Alfalfa Vigor Evaluations - Average of 3 Replications 1/ 1-27-81	2-6-81	2-24-81	3-11-81	3-16-81	Alfalfa Vigor
A Poast Surfel	0.5 1 qt.	6.0	8.0	8.8	10.0	9.9	10.0
B Poast Surfel	1.0 1 qt.	7.3	8.0	9.5	10.0	10.0	10.0
C RO-138895 Bio-88	1.0 25%	5.0	7.0	9.3	10.0	10.0	10.0
D RO-138895 Bio-88	2.0 25%	7.6	8.0	9.7	10.0	10.0	10.0
E Brominal Poast	0.5 0.5	2.0	5.3	7.0	7.6	8.8	10.0
F Brominal RO-138895	0.5 1.0	3.6	7.0	9.3	10.0	10.0	10.0
G Brominal Poast Surfel	0.5 0.5 1 qt.	4.6	8.6	7.6	9.0	9.5	10.0
H 2,4-DB ester Poast	0.75 0.5	2.0	5.0	7.3	7.3	8.6	10.0
J 2,4-DB ester RO-138895	0.75 1.0	3.3	8.6	9.2	10.0	10.0	10.0
K 2,4-DB ester Poast Surfel	0.75 0.5 1 qt.	4.0	7.0	8.6	9.3	9.8	10.0
L Untreated	---	0	0	0	0	0	8.0

Remarks: The alfalfa seedlings had 4 to 5 trifoliate leaves at the time of herbicide application. Weeds present were primarily volunteer barley and rabbitsfootgrass-both well tillered. The broadleaf infestation was very sparse.

1/ Ratings are based on a 0 to 10 scale. 0 = no weed control or very poor vigor. 10 = perfect weed control and, as a vigor rating, vigorously growing alfalfa.

TABLE 14-A

EVALUATION OF POSTEMERGENCE APPLIED HERBICIDES ON NEWLY PLANTED ALFALFA

302, 425, 94, 10, 81-3

Location: S.W. Corner Colorado & Lassen
Soil Type: Merced Clay
Herbicides Applied: 1-14-81
Alfalfa Growth: 3 to 6" tall

Irrigation Method: Furrow
Plot Size: 12" x 20', Reps 4
Evaluated: 1-20-81, 2-6-81

		Weed Control and Alfalfa Injury Evaluation 1/											
		1-20-81						2-6-81					
Herbicides	lb ai/A	Cheese Weed	Grass	Fiddle Neck	Wild Radish	London Rocket	Alfalfa Injury	Cheese Weed	Grass	Fiddle Neck	Wild Radish	London Rocket	Alfalfa Vigor
A Brominal	0.5	1.2	0.5	7.6	8.0	7.3	1.0	5.3	3.0	8.8	10.0	9.5	7.5
B Goal WP	0.5	4.7	0.5	4.3	3.0	5.0	2.5	7.0	0	6.3	5.3	7.0	6.5
C Goal WP	1.0	7.5	1.7	5.3	4.5	7.3	3.2	9.5	4.0	8.8	9.3	9.5	5.0
D Brominal Goal WP	0.5 0.25	5.7	1.7	8.0	9.0	8.0	4.2	9.0	2.5	10.0	10.0	9.8	4.5
E Brominal Goal	0.5 0.5	7.7	3.0	8.5	8.5	8.5	6.2	9.0	3.3	10.0	9.8	10.0	4.3
F Brominal Goal WP Poast	0.5 0.25 0.5	6.0	2.6	8.7	6.0	8.5	4.7	8.5	9.5	10.0	8.7	10.0	5.3
G 2,4-DB ester	0.75	4.2	0.3	5.6	7.0	4.5	3.0	4.5	0	4.3	7.0	5.0	6.5
H Untreated	---	0	0	0	0	0	0.25	0	0	0	0	0	8.0

Remarks: Grasses were: Ryegrass, Wild oats and Rabbitsfootgrass

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

TABLE 14-B

EVALUATION OF POSTEMERGENCE APPLIED HERBICIDES ON NEWLY PLANTED ALFALFA

302, 425, 94, 10, 81-3

Location: S.W. Corner Colorado & Lassen Aves. Gragnani Bros.

Irrigation Method: Furrow

Soil Type: Merced Clay

Plot Size: 12" x 20', Reps 4

Herbicides Applied: 1-14-81 - (Alfalfa 3" to 6" tall)

Evaluated: 3-6-81

Herbicides	Lb ai/ Acre	Weed Control and Alfalfa Vigor Evaluation [1] Broadleaf [2]	Grass [3]	Cheeseweed	Alfalfa Vigor	Weeds Present [2]
A Brominal	0.5	9.7	0	1.2	10.0	Lr
B Goal WP	0.5	4.7	0	5.5	9.0	Fn, La, Lr, Mu
C Goal WP	1.0	7.7	0	9.5	8.7	Fn, Lr, Mu
D Brominal Goal WP	0.5 0.25	9.5	1.2	7.7	8.5	Fn, Lr
E Brominal Goal WP Poast	0.5 0.25 0.5	9.5	9.5	5.5	9.2	Lr, Mu
F Brominal Goal WP	0.5 0.5	9.5	0	8.7	8.2	Lr, Mu
G 2,4-DB ester	0.75	7.5	1.5	5.0	9.2	Fn, O
H Untreated	---	0	0	0	10.0	Fn, Lr, Mu, O

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

2/ Broadleaf weeds present: Fn = Fiddleneck; La = Lambsquarter; Lr = London rocket; Mu = Mustard; O = Common groundsel

3/ Grasses present: Ryegrass, Wild oats and Rabbitsfootgrass

TABLE 15

ALFALFA WEED CONTROL - POSTEMERGENCE

302, 425, 94, 10, 81-10

Location: West Side Field Station

Irrigation Method: Sprinkler

Soil Type: Panoche Loam

Plot Size: 5' x 30', Reps 3

Alfalfa Variety: Moapa 69

Herbicides Applied: 2-23-81

Alfalfa Planted: December, 1980

Evaluated: 3-18-81

Herbicides	Lb ai/ Acre	Weed Control and Alfalfa Vigor Evaluation[1/]			
		Broadleaf Control	Barley Control	Alfalfa Vigor	Weeds Present[2/]
A CGA-82725 Surfel	0.5 1 qt.	0	7.0	8.6	Chw, Lr, Sp
B CGA-82725	0.5	0	2.0	8.3	Chw, Lr, Sp
C Bromoxynil RO-138895	0.5 0.5	8.6	8.0	9.0	Chw, Lr
D Bromoxynil RO-138895 Surfel	0.5 0.5 1 qt.	8.3	9.0	9.3	Chw, Lr
E Bromoxynil Poast Surfel	0.5 0.5 1 qt.	8.6	8.6	8.3	Chw
F Bromoxynil Poast	0.5 0.5	8.6	8.3	9.0	Chw
G Bromoxynil CGA-82725	0.5 0.5	7.6	7.0	9.0	Chw, Lr, Sp
H Bromoxynil CGA-82725 Surfel	0.5 0.5 1 qt.	8.3	9.0	8.3	Chw
J Untreated	---	0	0	4.6	Chw, Lr, Sp

1/Evaluation based on a 0 to 10 scale. 0 = No control or very poor vigor, 10 = perfect control or vigorously growing alfalfa

2/Weeds: Chw - Chickweed, Lr - London rocket, Sp - Shepherd's purse

TABLE 16

EFFECT OF SEQUENTIAL APPLICATION OF HERBICIDES ON ALFALFA VIGOR IN NEWLY PLANTED ALFALFA

302, 425, 94, 10, 81-11

Trial Location: West Side Field Station

Soil Type: Panoche clay loam

Alfalfa Variety: Moapa 69

Alfalfa Planted: 4-16-81

Herbicides Applied: Preplant, 4-15-81
Postemergence, 5-12-81

Irrigation Method: Sprinkler to establish, then Basin flood

Plot Size: 5' x 50' - Reps 4

Temperature on 5-12-81: 80°F

Preplant Herbicides: Eptam, 3.0 lb ai/A)incorporated with
Tolban, 0.75 lb ai/A)disks to a depth of 2 inches

		Percent Alfalfa Vigor and Weed Control Evaluations - Average of Four Replications							
		5-22-81 1/			6-2-81 2/			6-6-81 3/	
Postemergence Herbicide	Lb ai/ Acre	Eptam Preplant	Tolban Preplant	No Herb. Preplant	Eptam Preplant	Tolban Preplant	No Herb. Preplant	Weed Control Brdlf.	Grasses
A Brominal	0.5	80	85	85	90	95	95	100	0
B 2,4-DB ester	0.75	65	95	95	85	98	100	100	0
C Sinox W	1.0	80	90	90	98	100	100	87	0
D Poast	0.5	80	85	85	90	95	95	97	100
Brominal	0.5								
E Brominal	0.5	80	85	85	95	95	98	97	100
RO-138895	0.5								
F Brominal	0.5	80	85	85	95	98	98	97	100
CGA-82725	0.5								
G Brominal	0.5	75	80	80	90	95	95	100	100
Poast	0.5								
Surfel	1 qt.								
H Sinox W	1.0	40	40	40	60	70	70	47	67
Poast	0.5								
Surfel	1 qt.								
J 2,4-DB ester	0.75	60	80	80	80	90	95	100	100
Poast	0.5								
Surfel	1 qt.								
K Poast	0.5	80	100	100	98	100	100	0	100
Surfel	1 qt.								
L RO-138895	0.5	80	100	100	98	100	100	5	100
Surfel	1 qt.								
M CGA-82725	0.5	80	100	100	98	100	100	5	100
Surfel	1 qt.								
N Untreated	---	85	100	100	98	100	100	0	0

Remarks: No significant differences in stand (alfalfa per square foot) were found on 5-12-81 prior to the application of the postemergence herbicides. However, distorted (folded and crinkled) leaflets were observed in the Eptam treated areas.

1/ The alfalfa was chlorotic in all plots treated with Brominal.

2/ The trial was irrigated 6-1-81. The alfalfa was green and growing vigorously - no differences in the color of the alfalfa were evident. The height of the alfalfa was two to three inches shorter in plots treated with Brominal than those treated with the other herbicides.

3/ Weed control ratings were made in areas not treated with preplant herbicides. In the Eptam and Tolban treated areas perfect weed control was obtained. Weeds present were: pigweed, lambsquarter, knotweed and barnyardgrass.

TABLE 17

Evaluation of Residual Properties of Herbicides Used In Alfalfa Seed Production In A Plant-Back Study

Trial Location: West Side Field Station
Soil Type: Panoche Loam
Herbicides Applied: 12-13-79
Alfalfa Variety: Moapa - planted 1976

Plot Size: 4 rows (40") x 30'
Crops Planted: 10-23-80
Evaluated: 12-13-80
Alfalfa Plowed: 9-19-79

Herbicides	lb ia/A	Average Number of Plants Per Foot of Row 1/ Barley	Safflower	Sugar Beets	Bdlf.Weeds 2/
A Velpar	0.25	10.3	5.8	7.5	19.5
B Velpar	0.5	8.1	6.6	7.2	13.9
C Velpar	1.0	9.6	7.1	6.1	9.1
D Velpar	2.0	7.9	8.1	6.1	11.1
E Velpar + Karmex	0.25 + 1.2	11.3	5.5	3.7	14.1
F Velpar + Karmex	0.5 + 1.2	6.4	6.7	7.3	13.1
G Karmex	2.4	8.8	6.2	5.8	18.5
H Velpar + Treflan	0.5 + 1.5	10.5	6.4	5.3	21.2
J Velpar + Treflan	1.0 + 1.5	10.5	5.8	4.4	10.6
K Untreated	---	8.4	5.1	4.2	23.5
Statistical Notation		NS	NS	NS	NS

1/ Counts made in 6" x 4' areas in each plot and in each crop. Values represent the average of all counts.

2/ Weeds present: sowthistle, London rocket, common groundsel, lambsquarter and prickley lettuce.

HERBICIDE PERSISTENCE STUDY

501, 453, 10, 80-1

Table 18

Trial Location: West Side Field Station, Field 20
Soil Type: Panoche clay loam
Plot Size: 15' x 30', Reps 4
Variety: See below

Irrigation Method: Furrow
Herbicides Applied: 4-15-80
Planted: 7-11-80
Evaluated: 8-11-80

		Crop Vigor and Weed Control Evaluations						Average of Four Replications 1/		
Herbicide	Lb ai/A	Cotton	Sorghum	Melon	Sugar Beet	Tomatoes	Millet	Broadleaf Control	Grass Control	Bdlf. Weeds Present
A DPX 4189	.04	2.2	2.0	4.0	0	0.5	3.7	10.0	9.1	---
B DPX 4189	.16	1.7	1.0	2.0	0	0.2	3.0	10.0	9.7	---
C Velpar WP	.5	2.3	5.0	0	0	0	0.7	7.5	7.5	I, La, Pl
D Velpar WP	2.0	0	0	0	0	0	0	9.7	9.7	I
E Velpar EC	.5	3.5	4.0	1.2	0	0	1.0	6.7	8.2	I, La, Ni, Pl
F Velpar EC	2.0	0	0	0	0	0	0	9.8	10.0	I
G NC 20484	1.0	9.3	9.0	3.7	9.7	6.5	7.2	1.5	3.0	I, La, Ni, Pl
H NC 20484	4.0	9.0	4.2	1.2	4.2	1.2	0.2	7.5	8.0	I, La, Ni, Pl
J Nortron	1.5	8.5	8.7	4.5	9.2	7.2	6.0	3.5	4.0	I, La, Ni, Pl
K Nortron	6.0	9.2	6.2	1.5	3.0	2.5	6.5	7.5	8.2	I, Ni, Pl
L BAS 9052	1.0	9.2	9.5	9.7	7.5	7.2	9.7	4.5	5.0	I, La, Pl, S
M BAS 9052	4.0	10.0	9.7	10.0	7.0	9.7	9.5	4.2	4.0	I, La, Ni, Pl, S
N Dual	2.0	8.2	7.2	9.0	8.0	7.5	0.5	3.2	7.5	I, La, Pl, T
P Dual	8.0	3.2	3.2	4.5	9.5	5.7	0	6.0	9.5	I, La, Pl
Q Furloe 124	4.0	10.0	10.0	9.7	5.7	9.7	9.2	3.5	3.5	Ni, Pl
R Furloe 124	16.0	10.0	9.7	9.5	8.2	9.5	9.2	2.0	1.0	I, La, Ni, Pl
S Devrinol Flo	1.0	9.7	10.0	10.0	7.5	9.2	4.0	7.7	7.5	I, La, Ni, Pl
T Devrinol Flo	4.0	9.0	7.7	8.7	7.2	9.5	2.3	9.1	9.1	I, Ni, Pl
U R-23758	1.0	6.0	3.2	7.2	3.0	7.0	2.0	8.7	9.2	Ni, Pl
V R-23758	4.0	9.0	3.0	6.5	1.5	8.5	0.7	9.0	9.5	Ni
W Sencor	2.0	1.5	2.3	0	0	8.7	3.0	7.7	7.5	I, La, Pl
X Untreated	---	9.5	9.7	8.5	9.5	8.7	9.5	3.0	3.0	I, La, Ni, Pl, S

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

Remarks: Weeds present: I = Pigweed, La = Lambsquarter, Ni = Nightshade, Pl = Purslane, S = Sowthistle
Grasses: Barnyardgrass, Junglerice

TABLE 19

Herbicide Persistence Study
501, 453, 10, 80-1

Trial Location: West Side Field Station, Field 20
Soil Type: Panoche Clay Loam
Plot Size: 15' x 30', 4 reps
Variety: Varied (see below)

Irrigation Method: Furrow
Planted: 10/23/80
Herbicides Applied: 4/15/80
Evaluated: 12/16/80

Crop Stand and Vigor, Average of 4 Replications

		Barley		Safflower		Sugar Beet		Spinach		Broccoli	
Herbicide	Lb ai/A	Std.	Vig.	Std.	Vig.	Std.	Vig.	Std.	Vig.	Std.	Vig.
A DPX 4198	.04	9.2	7.5	9.7	6.5	8.5	1.7	9.5	2.2	9.0	2.7
B DPX 4189	.16	9.2	5.2	9.7	5.5	6.0	0.7	4.7	0.7	6.0	1.5
C Velpar WP	.5	9.7	8.5	9.7	8.7	9.7	7.7	9.5	7.5	8.0	5.5
D Velpar WP	2.0	5.0	4.7	7.2	7.0	0	0	0.5	0.2	0	0
E Velpar EC	.5	10.0	9.7	9.7	9.2	7.7	7.7	8.2	8.2	6.7	5.5
F Velpar EC	2.0	3.7	4.0	7.0	6.7	0	0	0.2	0.2	0	0
G NC 20484	1.0	10.0	9.7	10.0	9.7	10.0	10.0	10.0	10.0	10.0	9.7
H NC 20484	4.0	3.2	1.7	9.5	7.7	10.0	9.5	10.0	9.2	10.0	9.2
J Nortron	1.5	9.7	10.0	9.5	9.7	10.0	10.0	10.0	10.0	10.0	9.7
K Nortron	6.0	7.7	5.0	9.7	7.0	10.0	9.2	10.0	8.7	10.0	9.7
L BAS 9052	1.0	9.7	10.0	10.0	9.7	10.0	10.0	10.0	10.0	10.0	9.5
M BAS 9052	4.0	9.7	9.7	10.0	10.0	10.0	10.0	9.7	9.5	9.5	9.2
N Dual	2.0	10.0	9.5	10.0	9.2	9.7	9.5	10.0	9.7	10.0	10.0
P Dual	8.0	9.5	8.7	8.7	9.0	10.0	10.0	10.0	9.7	10.0	10.0
Q Furloe 124	4.0	9.5	9.5	9.7	9.5	10.0	9.2	10.0	8.5	10.0	10.0
R Furloe 124	16.0	10.0	10.0	9.2	9.5	10.0	9.5	10.0	9.7	10.0	9.7
S Devrinol Fl	1.0	9.2	7.7	9.5	9.5	10.0	9.7	10.0	9.7	10.0	10.0
T Devrinol Fl	4.0	7.7	5.0	9.2	8.0	10.0	10.0	10.0	9.2	10.0	10.0
U R-23758	1.0	8.5	5.0	9.2	8.7	10.0	8.7	9.5	7.7	10.0	10.0
V R-23758	4.0	5.7	3.0	9.2	7.5	10.0	8.0	9.5	4.2	10.0	9.7
W Sencor	2.0	6.7	8.0	9.5	9.0	9.7	10.0	10.0	9.5	6.2	5.7
X Untreated	---	9.7	10.0	10.0	9.7	10.0	10.0	10.0	9.2	10.0	9.7

Remarks: Values above are based on a 0 to 10 scale. 0=no stand, no vigor; 10=100% stand, excellent vigor.

HERBICIDE PERSISTENCE STUDY
501, 453, 10, 80-1

TABLE 20

Trial Location: West Side Field Station
Soil Type: Panoche Clay Loam
Plot Size: 15' x 30', 4 Reps
Variety: Varied (see below)

Irrigation Method: Furrow
Herbicides Applied: 4-15-80
Planted: 4-21-80, 7-11-80, 10-23-80, 12-1-80, 4-28-81 *
Evaluated: 6-2-81

Herbicide	Lb ai/ Acre	Crop Vigor					Weed Control		
		Melon	Tomato	Sugar Beet	Millet	Cotton	Brdlf. Control	Grass Control	Weeds Present 1/
A DPX 4189	.04	8.0	8.2	0.7	9.5	8.7	8.5	6.0	Gr, I, La, S
B DPX 4189	.16	7.2	4.0	0.2	8.7	4.0	7.2	6.3	O, S
C Velpar WP	.5	8.2	9.0	9.7	10.0	9.2	0	0	I, La, S
D Velpar WP	2.0	0	1.5	0.7	6.7	4.0	6.0	8.0	I, La, Pl
E Velpar EC	.5	9.5	9.2	10.0	10.0	9.2	1.7	2.0	I, La, P, S
F Velpar EC	2.0	0.7	2.0	3.0	7.5	6.0	5.2	7.5	I, La, P, Pl
G NC 20484	1.0	9.2	9.0	10.0	10.0	9.5	1.5	0	I, La, P, Pl, S
H NC 20484	4.0	8.0	9.5	9.7	10.0	5.0	1.7	2.2	I, La
J Nortron	1.5	9.5	9.2	9.5	9.5	9.2	2.2	2.0	I, La, P, S
K Nortron	6.0	9.2	9.5	10.0	10.0	9.5	3.0	3.0	I, La
L BAS 9052	1.0	9.5	9.2	9.2	9.5	10.0	1.5	1.5	I, La, Pl, S
M BAS 9052	4.0	9.5	9.2	9.5	9.2	9.2	0.5	1.5	I, La, Pl, S
N Dual	2.0	9.0	9.7	9.5	10.0	9.5	1.5	2.5	I, La, Pl
P Dual	8.0	8.5	9.5	9.5	8,7	9.5	0.7	1.5	I, La, Pl
Q Furloe 124	4.0	9.2	9.7	9.5	9.2	9.7	0	1.5	I, La, Pl
R Furloe 124	16.0	9.7	10.0	10.0	10.0	9.5	0.5	1.0	I, La, Pl, S
S Devrinol Flo	1.0	10.0	9.7	10.0	10.0	9.6	0	0	Gr, I, La
T Devrinol Flo	4.0	9.0	9.0	10.0	10.0	9.5	5.7	3.2	I, La
U R-23758	1.0	8.5	8.7	10.0	9.0	9.0	5.3	2.6	I, La
V R-23758	4.0	9.0	9.5	9.5	9.5	9.7	8.0	4.5	Ni
W Sencor	2.0	9.2	9.2	10.0	10.0	8.5	1.7	1.7	I, La, Pl
X Untreated	---	9.2	9.5	10.0	9.5	9.6	0.5	0	Gr, I, La, Ni, O, P, Pl, S

Remarks: Crop vigor rating based on 0-10 scale - 0 = poor vigor, 10 = excellent vigor. Weed control rating based on a 0-10 scale - 0 = no control, 10 = perfect control

*Different crops are planted periodically on dates shown. This is a summary of the evaluation of crops planted on 4-28-81.

1/ Weeds Present: Gr = Ground cherry, I = Pigweed, La = Lambsquarter, Ni = Nightshade, O = Common Groundsel, P = Prickley lettuce, Pl = Purslane, S = Sowthistle

TABLE 21

HERBICIDE PERSISTENCE STUDY
501, 453, 10, 80-1

Trial Location: West Side Field Station
Field 20
Soil Type: Panoche Clay Loam
Plot Size: 15' x 30', Reps 4
Crops Planted: See Below

Irrigation Method: Furrow
Planted: 6-17-81
Herbicides Applied: 4-15-80
Evaluated: 7-8-81

Herbicide	Lb ai/ Acre	Average Number of Plants Per Foot of Row 1/					
		Cotton	Millet	Cantel.	Tomato	Sugar Beet	Sorghum
A DPX 4189	.04	5.8*	18.8	2.6	4.0	2.7	1.5
B DPX 4189	.16	6.9*	21.4	1.6	3.6	1.7	0.4
C Velpar WP	.5	6.9	19.4	1.7	2.9	3.3	0.7
D Velpar WP	2.0	5.9*	2.9*	1.7*	2.4	1.4	1.0
E Velpar EC	.5	7.0	21.4	2.1	3.3	3.6	1.6
F Velpar EC	2.0	3.9*	14.7*	1.5*	3.4	1.4	1.1
G NC 20484	1.0	6.2	24.2	1.0	4.5	3.9	0.8
H NC 20484	4.0	7.0	26.1	2.1	2.3	2.4	1.6
J Nortron	1.5	6.6	20.1	1.6	3.6	3.0	0.6
K Nortron	6.0	7.0	24.1	2.1	2.7	3.2	1.6
L BAS 9052	1.0	8.0	22.0	0.7	1.8	2.4	0.8
M BAS 9052	4.0	6.4	21.4	0.9	2.1	2.6	0.8
N Dual	2.0	6.3	23.3	0.4	2.1	3.1	0.9
P Dual	8.0	6.3	21.1	1.2	3.1	2.8	0.7
Q Furloe 124	4.0	8.8	25.2	1.7	2.4	2.2	0.8
R Furloe 124	16.0	6.1	26.4	1.2	3.6	3.1	0.2
S Devrinol Fl	1.0	6.1	26.4	0.6	2.9	2.4	1.0
T Devrinol Fl	4.0	6.8	20.4	1.0	3.4	3.3	1.4
U R-23758	1.0	6.2	21.0	1.2	3.6	4.2	0.8
V R-23758	4.0	7.8	20.3	1.5	2.1	3.1	2.0
W Sencor	2.0	7.2	24.4	1.5	4.1	2.1	0.3
X Untreated	---	6.7	22.9	1.2	3.5	3.1	1.6

1/ Counts were made in a 4'x 6" area in the center of each row of crop planted in each plot. Values represent the average number of plants per foot of row. All plants were counted - whether showing any symptoms or not. The vigor evaluations made 12-16-80 reflect survival and injury.

* - Chlorosis and/or necrosis were evident.

HERBICIDE PERSISTENCE STUDY
501, 453, 10, 80-1

TABLE 22

Trial Location: West Side Field Station
Soil Type: Panoche Clay Loam
Plot Size: 15' x 30', Reps 4
Variety: Varied (see below)

Irrigation Method: Furrow
Herbicides Applied: 4-15-80
Planted: 4-21-80, 7-11-80, 10-23-80
12-1-80, 4-28-81, 6-17-81*
Evaluated: 7-27-81

Herbicide	Lb ai/ Acre	Crop Vigor Evaluations - Avg. of 4 Reps.						Weed Control Evaluation	
		Cotton	Millet	Cantel.	Tomato	Sugar Beet	Sorghum	Brdlf.* Control	Grass * Control
A DPX 4189	.04	8.7	10.0	8.5	9.0	5.6	7.3	6.0	4.2
B DPX 4189	.16	7.5	10.0	6.0	7.0	0	1.5	9.0	5.5
C Velpar WP	.5	10.0	10.0	10.0	10.0	10.0	10.0	0	0
D Velpar WP	2.0	4.0	2.2	2.7	2.3	2.2	7.8	6.2	8.5
E Velpar EC	.5	9.8	10.0	9.2	9.5	10.0	10.0	0.7	1.7
F Velpar EC	2.0	3.7	7.8	5.0	5.8	5.0	5.2	4.5	6.7
G NC 20484	1.0	10.0	10.0	9.5	10.0	10.0	8.5	0	0
H NC 20484	4.0	10.0	10.0	10.0	10.0	10.0	10.0	0	0
J Nortron	1.5	10.0	10.0	10.0	10.0	10.0	10.0	0	0
K Nortron	6.0	9.0	9.0	8.7	7.3	9.0	7.5	3.5	3.7
L BAS 9052	1.0	10.0	10.0	10.0	10.0	10.0	10.0	0	0
M BAS 9052	4.0	10.0	10.0	10.0	10.0	10.0	10.0	0	0
N Dual	2.0	10.0	10.0	10.0	10.0	10.0	10.0	0	0
P Dual	8.0	10.0	10.0	10.0	10.0	10.0	10.0	0	0
Q Furloe 124	4.0	10.0	10.0	10.0	10.0	10.0	10.0	0	0
R Furloe 124	16.0	10.0	10.0	10.0	10.0	10.0	10.0	0	0
S Devrinol Flo	1.0	10.0	10.0	10.0	10.0	10.0	10.0	0	0
T Devrinol Flo	4.0	10.0	10.0	10.0	10.0	10.0	10.0	0	0
U R-23758	1.0	10.0	10.0	10.0	10.0	10.0	10.0	0	0
V R-23758	4.0	10.0	10.0	10.0	10.0	10.0	10.0	6.0	3.5
W Sencor	2.0	10.0	10.0	10.0	10.0	10.0	10.0	0	0
X Untreated	---	10.0	10.0	10.0	10.0	10.0	10.0	0	0

* - Different crops were planted periodically on dates shown. This is a summary of the evaluation of crops planted on 6-17-81.

Remarks: Crop vigor and weed control ratings based on 0-10 scale. 0 = poor vigor or no weed control, 10 = perfect weed control or vigorously growing crops.

Weeds Present: Pigweed, Purslane, Lambsquarter, Barnyardgrass

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 199 commonly occurring weeds in different stages of their growth. The pictures in a sturdy, 3-ring binder, can be purchased from Publications, Division of Agricultural Sciences, University of California, 1422 Harbour Way South, Richmond, California, 94804.

Being able to identify weeds is but the first step. Keeping records of their presence is essential to use selective herbicides intelligently. Cards, such as the one 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 _____

BROADLEAF ANNUALS	A[illegible]	A[illegible]ple	B[illegible]sa Five Hook	B[illegible] Bindweed	B[illegible]sly Oxtongue	B[illegible]rweed	Carpetweed	Cat's Ear	Cheeseweed
C[illegible]ckweed	Clover	Cocklebur	[illegible]orn Spurr[illegible]	Cudweed	Dandelion	Dock	Dodder	Fat Hen	Fiddleneck
F[illegible]laree	Flaxleaved Fleabane	Ground Cherry	Groundsel	Hemlock	Henbit	Jimson Weed	Knotweeds	Lambsquarters	Lettuce Wild
[illegible]ondon Rocket	Mallow[illegible]	Mayweed	Milk thistle	Mustard	Morning Glory	Mustard	Nettle	Nettleleaf Goosefoot	Nightshade
Nuttalls Monolepis	Phacelia	Pigweed	Pineapple Weed	Plantain	Puncture Vine	Purslane	Red Maids	Russian Thistle	Scarlet Pimpernel
Shepherds Purse	Sow Thistle	Spiny [illegible]olbu[illegible]	Spurge	Sunflower Common	Tansy	Telegraph-plant	Toadflax	Turkey Mullein	Velvet Leaf
Vervine Mallow	Veronica	Willow Herb	Yellow Starthistle						
GRASSES ANNUAL	Annual Bluegrass	Barley, Volunteer	Barnyard grass	Bromegrass	Canarygrass	Cupgrass	Dallisgrass	Diffuse Lovegrass	Feather Finger grass
Foxtails (Bristle grass)	Jungle Rice	Orcutts Lovegrass	Rabbitfoot grass	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 Smartweed (Kelp	Tolgoucha	Tule			

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