VELPAR® FOR WINTER WEED CONTROL IN ESTABLISHED ALFALFA

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The proper use of the recently registered herbicide Velpar® for weed control in alfalfa can enable many farmers to produce better quality hay and reduce their costs of weed control.

With the proper use of Velpar®, alfalfa hay producers can prevent the growth of or eliminate from their fields common groundsel (Senecio vulgaris L.) and fiddleneck (Amsinckia intermedio F.M.), two commonly occurring weeds that contain pyrrolizidone alkaloids, a poisonous substance that may be hazardous to the animals consuming the hay. It also controls a large number of other broadleaf weeds and grasses that infest alfalfa hay fields.

What is Velpar®?

Velpar® is the trade name of hexazinone or 3-cyclohexyl -6- (dimethylamino) - 1 methyl - 1, 3, 5- triazine - 2,4(1H 3H) dione. It is a triazine herbicide with long soil residual properties. Its primary activity is through root uptake, but it has limited foliar activity.

Velpar® is formulated as a 90% soluble powder and as a liquid containing two (2) pounds of active ingredient per gallon. The liquid formulation is labeled "Velpar L.®".

Velpar® cannot be used in newly planted alfalfa. It caused severe injury and stand reduction when applied on newly planted alfalfa having 8 to 10 trifoliate leaves. Established alfalfa, one year old or older, exhibited good tolerance to Velpar® up to two pounds of active ingredient per acre (henceforth abreviated as lb ai/A) on Panoche clay loam soil. However, it provided excellent broadleaf weed control at 0.5 lb ai/A.

Velpar® is somewhat less effective for the control of grasses, but applied pre-emergence to winter annuals such as annual bluegrass (Poa annua L.), rabbitfootgrass (Polypogon monspeliensis L.) and Italian ryegrass (Lolium multiflorum Lam.) it provided effective control.

Excessive rainfall or irrigation can leach the herbicide from the surface inch of soil where seeds of chickweed (Stellaria media) and grasses can germinate and become reestablished.

Experimental Results with Velpar®

During the past five years, numerous trials have been conducted in which the effectiveness of Velpar® was evaluated on different types of soils, under sprinkler and flood irrigation, and on dormant and nondormant varieties. To obtain more effective grass control and minimize reestablishment of chickweed, the combination of Velpar® plus Karmex (diuron) was included in many of the applied research trials. Examples of the results obtained in the trials are summarized in Tables 1 through 4.

The results and observations made in all the trials can be briefly outlined as follows:

A. Velpar® at 0.5 lb ai/A provided excellent control of all annual broadleaf weeds, including common groundsel, fiddleneck 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.

C. Established grasses were not controlled adequately.

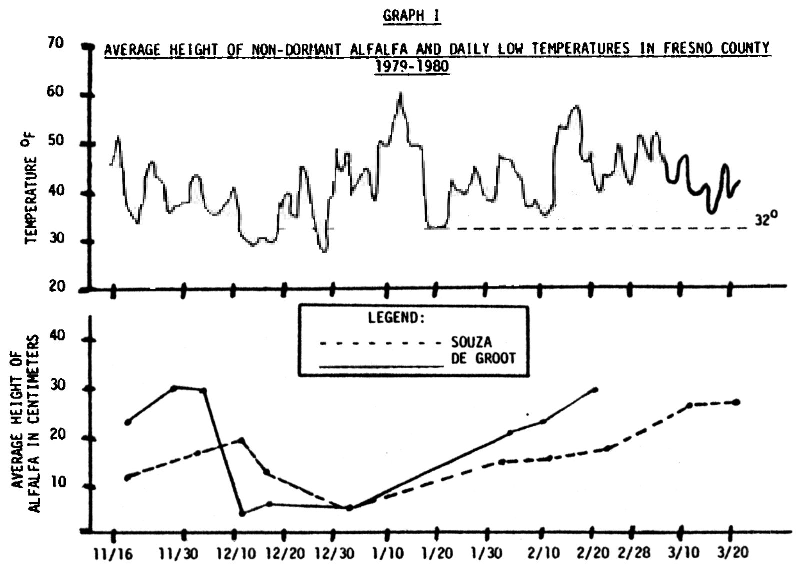
D. Treatment resulted in no statistically significant differences in yield (see Table 6).

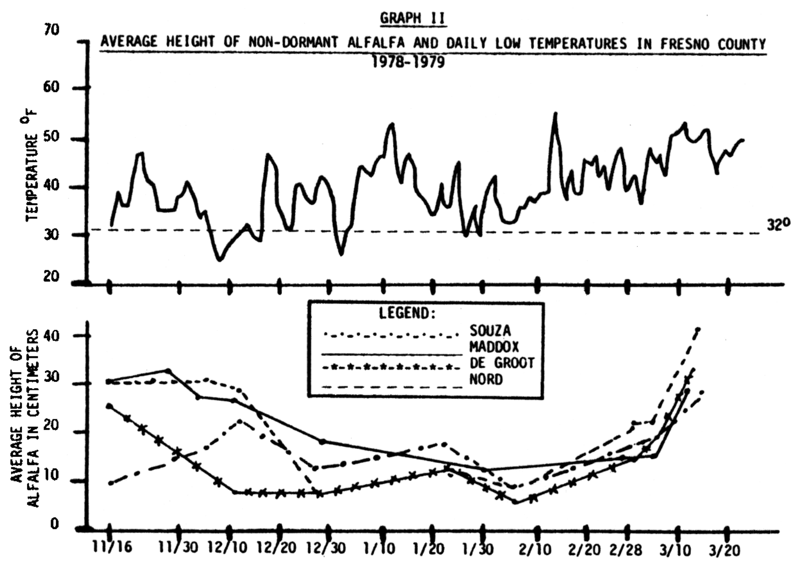
E Very effective weed control was obtained with Velpar®, Velpar® plus Karmex and Karmex plus DNBP. However, in the Karmex plus DNBP treated areas, common groundsel germinated after greatment.

The winter growth pattern of alfalfa in central California has been monitored during past years by William Barnett, University of California, Area IPM Specialist. These observations are summarized in the two graphs to the right. It is evident that the alfalfa's 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.

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.





Air Versus Ground Application of Velpar®

Periodic rainfall during the winter months can prevent the application of herbicides with groundrigs. Some hay growers, to minimize soil compaction and to reduce the time required for application of herbicides, prefer application with airplanes. Therefore, a trial was conducted in which aerial applications of two formulations of Velpar®, Velpar® plus Karmex and Karmex plus Sinox with weed oil were compared with Velpar® applied with a

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.

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. Velpar® 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.

K. In areas in alfalfa hay fields where trash has accumulated, somewhat les effective weed control was obtained.

In areas of fields where the alfalfa was killed by standing water or phytophtera root rot, the Velpar® effectively controlled the weeds resulting in barren areas. Later in the season, annual grasses became established.

<u>Tolerance of Different Varieties of Alfalfa to Velpar®</u>

A large number of different varieties of alfalfa are grown for hay in California. These varieties differ in their habits of growth and dormancy. To study their relative tolerance to Velpar® and the combination of Velpar® and Karmex, a four-times replicated trial was conducted at the West Side Field Station in which 35 different varieties were treated.

The results of this experiment is summarized in Tables 5 and 6. Since the alfalfa varieties were planted October, 1976, the stand percentage was evaluated prior to treatment. This information is also given in Table 5. The observations and measurements made are:

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 5.

groundrig. The results obtained are summarized in Table 4

Ground application of Velpar® in 75 gallons of water per acre provided better weed control than airplane application in 10 gallons of water per acre.

The control obtained with air application was economically acceptable - 90 to 95 percent - compared to 100 percent with ground application. However, to minimize over-application due to overlap and "dressing" the ends of fields, often practiced with air application, groundrig application of Velpar® should be a preferred method of application.

Residual Properties of Velpar®

The soil persistence or residual properties of Velpar® as all other herbicides used in crop production must be known before their use can be recommended. This is especially important in the central San Joaquin Valley where as many as fifteen different crops are grown sequentially or in rotation with alfalfa. Small quantities of herbicide that may be present can adversely effect the alfalfa seedlings. Conversely, one must know the residual properties of herbicides used in alfalfa to select crops to plant following alfalfa.

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. A detailed summary of these studies are available from the Farm Advisors Office in Fresno County.* The results and observations can be briefly summarized 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 cantaloupe.

Effective Methods of Weed Control in Alfalfa

I was asked to discuss "Velpar® for Winter Weed Control in Established Alfalfa," but I don't want to leave anyone with the erroneous impression that Velpar® is the only effective herbicide for winter weed control in alfalfa. Constraints of time prevents me from discussing other effective methods, therefore, I am including in the proceedings two charts that can serve as guides in selecting effective methods of weed control in alfalfa hay production.

These charts contain no recommendations for the use of herbicides. They merely present a summary of herbicide performance and susceptibility of weeds to herbicides evaluated in the central San Joaquin Valley.

Herbicides should not be used in alfalfa hay production unless they have been registered by the EPA and CDFA, and recommendations for their use appear on their labels.

In Summary

The recent registration of Velpar® is a much needed herbicide that can significantly improve weed control in alfalfa hay production, especially the control of common groundsel.

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*Weed Control Studies in Alfalfa Seed Production - A Progress Report, Bill B. Fischer, and Larry M. Brown, Runcina Vol. 23, 9/30/81, U.C. Cooperative Extension, Fresno Co.

Alfalfa 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.

Table 1

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

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

Herbicide	lb ai/A	Weed Control and Alfalfa Injury Evaluation 1/ % Weed Control	Weeds Present 2/	Alfalfa Injury
A Velpar	0.25	65	A_2, Ch, Chw_3, Fb_1, 0_4	0
B Velpar	0.5	75	A_2, Chw_4, Fb_1, 0_3, S_3, Sp_1	0
C Velpar	1.0	91	A_1, Chw_1, Fb_1, 0_2, Sp_1	0
D Velpar Karmex	0.25 1.2	70	A, Ch, Fb, 0_4, S_3	0
E Velpar Karmex	0.5 2.4	81	Ch, Fb, 0_4	0
F Karmex Paraquat X-77	2.4 0.5 ½%	85	Ch, 0_4	0
G Karmex DinitroGen Weed Oil	2.4 2.0 10 gal	70	Ch, Fb, 0_4	0
H Furloe DinitroGen Weed Oil	4.0 2.0 10 gal	73	0_4	0
J Furloe Paraquat X-77	4.0 0.5 ½%	84	Ch, Chw, 0_3, P_2, Sp_2	0
K Untreated		0	A_3, Ch_4, Chw_4, Lr_4, 0_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, 0= 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 3

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

Table 4

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 5

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

		Evaluations Average of 4 Replications					
		% Stand[2/] Prior to	Alfalfa Height in Inches				
VARIETY	Dormancy[1/]	Treatment	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 6

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'

VARIETY	Dormancy[2/]	Alfalfa Yield in Pounds Per Harvested Area - Average 4 Replications[1/] Velpar 1.0[3/]	Karmex 1.2 DNBP 2.0 X-77 ½%	Velpar 0.5 Karmex 1.25	Untreated[4/] 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

CHART I

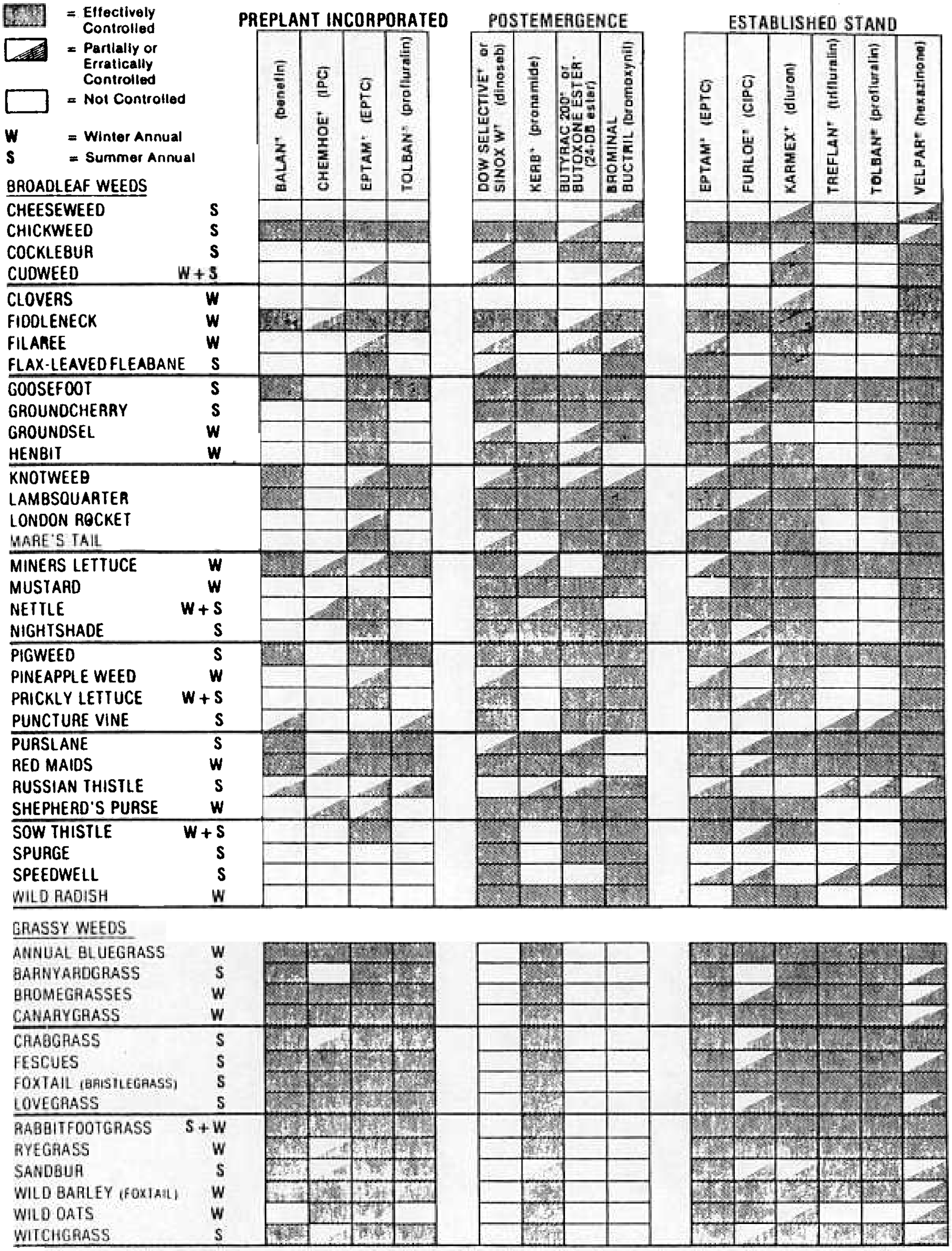
SUMMARY OF HERBICIDE PERFORMANCE EVALUATED IN ALFALFA PRODUCTION IN THE CENTRAL SAN JOAQUIN VALLEY*

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.
	Chemox®	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.

CHART II

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



*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.