WEED CONTROL IN ESTABLISHED ALFALFA - A YEAR-ROUND SYSTEM

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Two herbicides, diuron (Karmex®) and EPTC (Eptam®) are widely used in the San Joaquin Valley for the control of weeds in established alfalfa fields. Diuron is applied to established alfalfa fields in the winter months and is effective in controlling most winter annual weeds. EPTC is applied in the irrigation water during the growing season and is effective in controlling summer annual weeds. Both herbicides have been utilized successfully by many growers as an integral part of their alfalfa production practices. Although these materials are widely used, there is little quantitative information available on their performance in the field. Reported here are the results of a large scale trial examining the effect of these two herbicides on:

Control of weeds in alfalfa fields.
2. Yields.
3. Alfalfa quality.
4. Stand persistence and other factors

Materials and Methods

Herbicides were applied to an established alfalfa field on the M. Curti and Sons Ranch near Waukena, California. The alfalfa field (variety Moapa 69) was planted in December 1972 with a grain drill. The soil type was Chino clay loam. The plot design was a randomized complete block with each of the four treatments replicated six times. Individual plots were 1.46 acres in size. The herbicide treatments were as follows:

Untreated check.
2. Diuron applied during the winter months.
3. Diuron applied during the winter and EPTC applied in summer water runs
4. EPTC applied in summer water runs.

The application rates and dates were as follows

1) Diuron - 1.6 lb. ai/A (48 gallons of water per acre) applied with a ground rig on December 14, 1973 and reapplied to the same plots on December 16, 1974.

2) EPTC - approximately 2 lb. ai/A was applied each water run with three water runs each year. The initial application each year was made during the first irrigation following the first harvest. The next two water runs were made at approximately six week intervals following the initial application.

Cube yields reported here have been adjusted to 0% moisture. The analysis for protein, crude fiber, and TDN were made by Agri Tech Analytics, Tulare, California. Protein figures are for crude protein. Within each plot were three areas from which stand counts plant growth, and weed competition data was obtained.

Results and Discussion

Spectrum of Weeds. The major winter weed found in this field in the early spring was chickweed (Stellaria media L.). Other weed species present were speedwell (Veronica sp.), common groundsel (Senecio vulgaris L.), shepherds purse (Capsella bursa-pastoris L.), annual bluegrass and others. Diuron applied in the winter provided excellent control of chickweed. Common groundsel and speedwell were the two dominant species which were not controlled by the diuron applications. Speedwell, especially, survived and spread in the absence of competition from chickweed. Where diuron was not used, chickweed covered 90-95% of the ground area not occupied by alfalfa.

The primary summer annual grasses were the yellow foxtail (Setaria glauca L.) and cupgrass (Eriochloa gracilis). The 1974 season provided good conditions for the growth of these weeds and the plots not treated with water runs of EPTC were heavily infested. The summer annual grasses were not as severe in 1975 but these same two weed species predominated. Other weeds present were knotweed (Polygonum aviculare L.), green foxtail

(Setaria sp.), Johnsongrass and others

In the fall speedwell and chickweed could be found germinating in the plots depending on which treatment was applied the previous winter. The diuron treated plots had primarily speedwell; those not treated with diuron had chickweed as the main species present.

Yield Data

Utilizing a total weed control program does not necessarily mean that the grower will realize significantly more total yield (Tables 1 and 2) over the course of the season. The grower will realize cleaner alfalfa and more vigorous alfalfa growth. The most evident yield effect of the winter application of diuron seems to occur during the June and July cuttings of both years. Where diuron alone was applied, these two harvests had a yield increase over the untreated check of 0.22 and 0.17 T/A in 1974 and 1975 respectively The plots receiving the winter application of diuron plus the water runs of EPTC had yield increases of .35 and .37 T/A respectively. This type of a yield response is supportive of the findings of Norris (Proceedings 1972 California Alfalfa Symposium pp 31-37.) in trials conducted in Northern California.

TABLE 1. Effect of herbicide treatments on seasonal yields in 1974. Yields are expressed as tons per acre at 0% moisture. M. Curti and Sons, Waukena.

Treatment	Yields - Tons Per Acre (1974)						
	3/26	5/16	6/21	7/23	8/24	10/6	Season Total
Check	green chopped	.31	1.33	1.33	1.20		6.13
Diuron		1.33	.46	.42	1.12	0.92	6.25
Diuron + EPTC		1.30	1.58	.45	1.10	0.85	6.28
EPTC		.27	1.39	1.37	.09	0.84	5.96

TABLE 2. Effect of herbicide treatments on seasonal yields in 1975.(a) Yields are expressed as tons per acre at 0% moisture. M. Curti and Sons, Waukena.

Treatment	Yields - Tons Per Acre (1975)						
	4/9	6/2	7/1	8/1	9/1	10/1	Season Total
Check	0.80	1.40	1.42	1.35	1.09		6.94
Diuron	0.47	1.49	.50	.31	1.06	0.74	6.57
Diuron + EPTC	0.56	1.65	1.52	1.29	0.98	0.68	6.68
EPTC	0.80	1.52	1.45	.25	0.98	0.74	6.74

(a) Plots harvested 4/9 and 10/ were green chopped; all other dates the plots were cubed.

The percentage of the total yield represented by weeds is perhaps the best indicator of what composes the finished product. The alfalfa from the plots was cubed except for the early spring harvest in both years and the last harvest of 1975. Table 3 shows the effect of these herbicides in controlling weeds in established alfalfa. The weeds present in the first three cuttings of the season are the winter weeds, primarily chickweed. Chickweed in 1974 represented 32 to 44 percent of the first cutting yields where diuron was not used and in 1975 represented 72 to 76 percent of the first cutting yields. The plots with heavy chickweed populations also were observed to have many plants infected by

Sclerotinia sclerotiorum, a fungus pathogen that attacks the stems and crown of alfalfa. The wet environment provided by the heavy chickweed infestation is favorable to the development of this disease.

TABLE 3. Percent of seasonal yields represented by weeds following herbicide treatment in established alfalfa. M. Curti and Sons, Waukena.

(A) 1974

Treatment	Percent of Yields Represented by Weeds (0% Moisture)						
	3/26	5/16	6/21	7/23	8/24	10/6	Season Total
Check	32.8	14.1	0.5	16.2	41.2	52.4	23.76
Diuron	0.1	0.3	2.8	12.5	40.2	35.4	15.90
Diuron + EPTC	0.0	0.8	0.0	0.2	0.5	10.1	.66
EPTC	44.6	1.6	0.0	2.	7.2	21.7	10.48

(B) 1975

	4/9	6/2	7/1	8/1	9/1	10/1	
Check	76.6	1.6	0.0	2.5	(15) [a]	21.5	14.6
Diuron	7.9	1.0	0.0	2.6	(10)	16.8	4.6
Diuron + EPTC	20.6	0.6	0.0	2.6	(7)	12.4	4.5
EPTC	72.3	2.3	0.0	0.6	(7)	12.0	11.9

(a) The figures for 9/1 are from incomplete data. All others are based on complete data.

Weeds present in the last three cuttings are primarily yellow foxtail and cupgrass. Table 3 points up the fact that a grower must consider his total weed picture when deciding how best to cope with a field's weed problems.

TABLE 4. Effect of herbicide treatments on protein values. M. Curti and Sons, Waukena.

(A) 1974

Treatment	Percent Crude Protein at 0% Moisture						
	3/26	5/16	6/21	7/23	8/24	10/6	Season Total
Check	24.4	20.69	20.59	20.82	18.66	22.27	20.55
Diuron	29.0	21.58	19.58	20.47	21.38	23.29	21.08
Diuron + EPTC	29.0	21.74	20.21	20.91	21.07	23.54	21.29
EPTC	29.4	21.22	20.76	19.62	20.78	22.21	20.98

(B) 1975

Treatment	Percent Crude Protein at 0% Moisture						
	4/9	6/2	7/1	8/1	9/1	10/1	Season Total
Check	22.50	19.98	19.42	19.35	20.77	20.39	20.18
Diuron	21.28	20.72	19.78	19.28	22.44	20.94	20.55
Diuron + EPTC	21.43	20.11	20.93	20.07	22.15	21.24	20.81
EPTC	21.25	20.04	20.86	20.12	2 26	20.36	20.63

Quality Analysis

Crude protein values (Table 4) provide a standard for the hay grower and buyer to use, but do not always reflect the true quality of the product. The visual observation of the alfalfa field and/or finished product is a very valuable tool in determining the alfalfa cube or bale's value to the buyer.

Alfalfa and Weed Competition

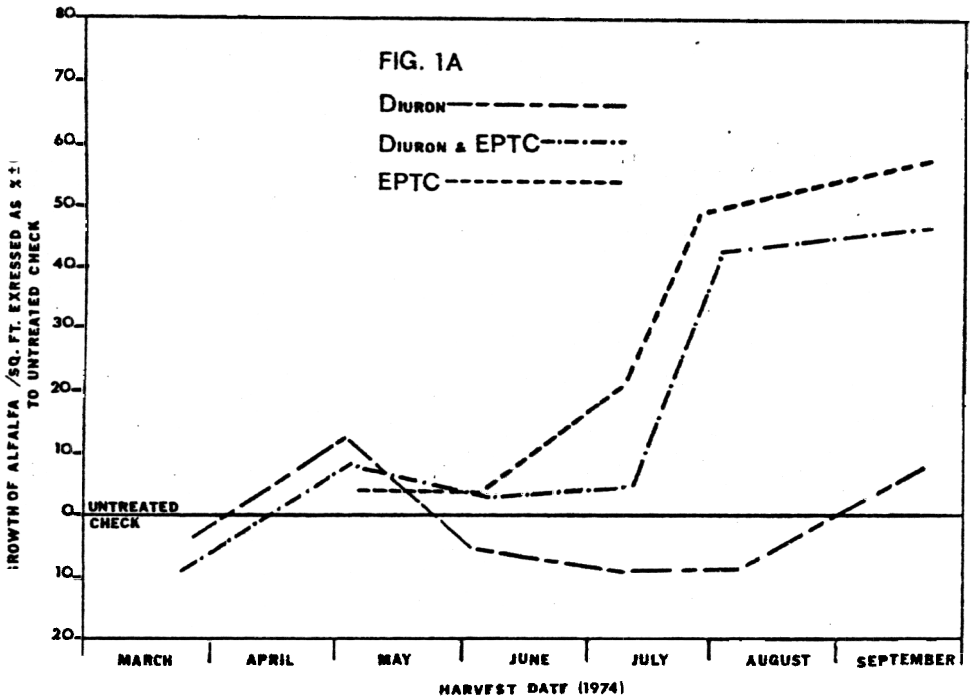
TABLE 5. Stand persistence following herbicide treatments in established alfalfa Stands represent average number of crowns per square foot. M. Curti and Sons, Waukena.

Treatment	Average Number of Crowns Per Square Foot (1974-1975				
	11/1/73	6/27/74	1/14/75	3/24/75	9/31/75
Check	8.5	4.7	3.6	2.2	1 8
Diuron	8.3	4.6	3.7	2.9	7
Diuron + EPTC	8.1	5.3	4.5	3.7	2.3
EPTC	7.8	4.9	4.1	2.9	2.0

When weeds are present the alfalfa plant must compete with them for nutrients, light, and growing space. Figure 1 (A and B) shows the effect weeds can have on the alfalfa growth. Suppression of the summer annual grasses in 1974 had a dramatic effect on the productivity of the alfalfa in contrast to the untreated check and the diuron alone treatments. The 1975 data shows the effect but to a lesser extent due to the decrease in weed pressure. The winter weeds affected alfalfa growth to a greater extent in 1975 compared to 1974.

Stand Counts and Summary

The key to a successful alfalfa management program from a grower's point of view is whether he can keep the alfalfa an extra season or not. Knowledge of plant population, the vigor of the alfalfa plants, and the potential weed problems in an old alfalfa field is important in making the decision whether to keep the field in production another season. The stand counts taken throughout the duration of this trial (Table 5) indicate that the combination treatment of the diuron for winter weed control and water runs of EPTC resulted in the best stand. The 2.3 crowns per square foot for this treatment represents alfalfa plants that are three years old with large crowns and good root systems. These factors plus the knowledge that the weeds can be managed suggest that the areas receiving both herbicides could easily be kept for another season.



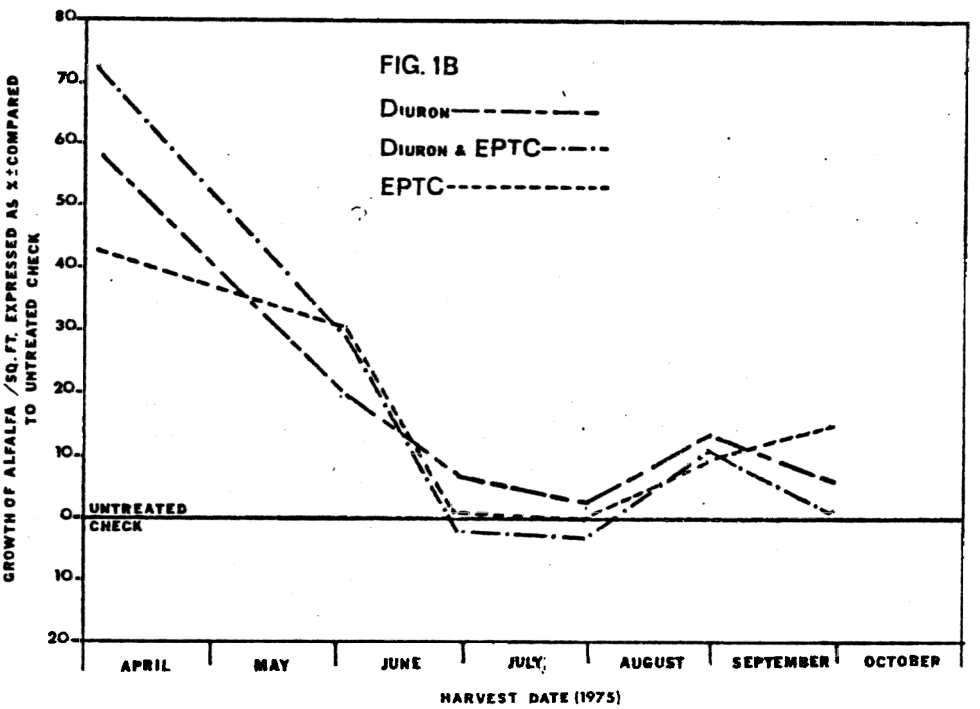


Figure 1. Effect of weed competition on the growth of alfalfa. Figures represent growth of alfalfa per square foot expressed as percent increase or decrease in weight compared to the alfalfa receiving no herbicide treatment. 1A - 1974; 1B - 1975.

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