Project No. 80-N5
(Continuation of Project No 79-P4)

Cooperator:
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Project: Tree and Crop Research
Weed Control

Objectives: (1) To find a safe economic preemergence herbicide for annual weed control; (2) to develop an effective perennial weed control program using both herbicides and cultural practices; (3) to investigate the long term use of herbicides on almond growth and yield under chemical strip and complete nontillage; (4) to evaluate commonly used herbicides on almond varieties, with special emphasis on some of the newer varieties in the variety test plots.

Progress: Still being developed is long term information on the use of pre- and postemergence herbicides in almonds. The five year picture looks good and in favor of continuous use of herbicides and nontillage. A comparison of mowing and chemical nontillage is now underway in addition to nontillage vs. tillage and strip tillage.

More effective ways of controlling perennials appear to be the use of soil active herbicides. Roundup appears safe when applied to the trunks of young, well established trees. This work is continuing.

Research includes weed control in almonds; soil residue studies; layering techniques of application of herbicides; irrigation in relation to herbicide studies.

Plans: (1) To continue the study of long term effects of herbicides by applying the annual and repeated applications in selected almond orchards in ten counties throughout the Central Valley and on the UC Kearney and West Side Field Stations; (2) to test almond varieties including new and unnamed varieties for susceptibility to Devrinol, Surflan, Simazine, Casoron, Eptam, Goal, MSMA, Paraquat and Roundup; (3) Johnsongrass, bindweed, bermudagrass, nutgrass and silver leaf nightshade trials in several counties will be given their annual treatment and results followed. In addition, phytoxicity and residue studies will continue to be conducted in Kern County and at UC Kearney.

Almond Industry Participation $9,200

80-N5

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Project: Tree and Crop Research - Weed Control

Objectives: (1) To find a safe, economic preemergence herbicide for annual weed control; (2) to develop an effective perennial weed control program using both herbicides and cultural practices; (3) to investigate the long term use of herbicides on almond growth and yield under chemical strip and complete nontillage; (4) to evaluate commonly used herbicides on almond varieties, with special emphasis on some of the newer varieties in the variety test plots.

Interpretive Summary: There is considerable evidence that complete non-tillage is beneficial to the growth and yield of all trees and vines including almonds. Certainly this appears to be true when we compare the growth and yields of nontilled almonds, plums, apricots and nectarines with trees from plots with any degree of tillage. It is true that other insect and disease problems under nontillage have not been thoroughly evaluated, nor have several methods of orchard clean-up been adequately studied such as flame, etc.

This year, as in previous years, no detrimental effects of nontillage chemical weed control was apparent as expressed in tree growth or yield. On the other hand, considerable evidence is accumulating to demonstrate what appears to be a detrimental effect from weeds and tillage.

Most of the work thus far has been done on Mission and NonPareil varieties. The initial work with herbicides on additional varieties suggests few if any varieties more susceptible to chemicals than Mission (Texas). Even though more symptoms were seen on Mission there has been as yet no measure-able detrimental effect on growth or yield in current long term studies. This work is continuing because more years of growth and yield data could change this picture.

Perennial weeds continue to be our most difficult weed control problem in almond cultures. Unfortunately, our worries are not over with the registration of glyphosate (Roundup). More work is needed to increase the efficiency and reliability of glyphosate and to develop improved control by a program against perennials that includes tillage, irrigation and soil applied herbicides.

The results this year with combinations on several perennial weed control problems have not been outstanding. For bindweed, johnsongrass and bermudagrass, glyphosate followed by trifluralin (Treflan) incorporated has shown considerable promise. The best timing of application and rates warrants more study. Continued use of oryzalin (Surflan) and prodiamine (Rydex) when registered will add greatly to the control of these perennial weed problems.

For nutsedge, bermudagrass and johnsongrass, fluridone (Brake) has shown more promise than norflurazon (Solicam) but neither are registered. A great deal more work is needed to be certain of the margin of safety and of the economics with fluridone for weed control in almonds.

Experimental Procedure: Fifteen field trials were conducted. The largest number were randomized replicated block experiments conducted on close planted trees at the Kearney Field Station in a Hanford fine sandy loam. These trials were of three types: one type was aimed at studying the long term effects of several cultural and chemical methods of weed control on growth and yield. The other was aimed at the long term effects of repeated applications of postemergence herbicides on the growth of young almond trees. The third type is a study of varietal response to herbicides.

One long term study of the commercially important herbicides on two varieties of almonds is being conducted at the West Side Field Station in a Panoche clay loam.

Twelve other trials designed to solve a number of annual and perennial weed problems were conducted in seven counties during 1980. All of these were replicated small plot trials usually two tree plots with one data tree and two half guard trees on either end of each plot. Most were five to seven feet wide strip treatments with furrow or flood irrigation.

Results: The results and general procedure for each trial will be reported as a separate study because of the diversity of the location, problems and treatment.

Summary and Conclusions: No phytotoxicity was observed from fall and winter applied preemergence herbicides previously found to be safe on young almond trees in Madera and Fresno Counties.

Occasionally napropamide (Devrinol) alone lost control early on specific weeds like pineapple weed, puncture vine, shepherd's purse, London rocket, flax leaved fleabane, and mare's tail.

In combination with simazine (Princep) or oxyfluorfen (Goal) it was usually effective and always safe.

Most herbicides were weak on flax leaved fleabane and mare's tail. Simazine, norflurazon, and fluridone were best.

Most herbicides were weak on puncture vine; the best control was obtained again by norflurazon and fluridone. Oxyfluorfen also gave good control.

By far the best herbicides for cheeseweed (malva) control was oxyfluorfen. Concentrated sprays of glyphosate also gave control. It was much more effective on small than medium or large cheeseweed.

The combination of glyphosate and oryzalin gave better long term control of bermudagrass than either one alone. Continuous use of norflurazon also reduced bermuda stands. These combinations also looked good on johnsongrass control.

There were no detrimental effects of preemergence herbicides on the growth and yield of young almond trees with exception of norflurazon in one trial which received an excess rate for light soils on young trees during a heavy rainfall year. These trees are recovering their growth and yields.

There were consistant significant detrimental effects of weed growth and yield of young almond trees of all varieties tested.

The use of preemergence herbicides for control of annual weeds in almonds. Vargas, R. N. A study was established in a 12 year old almond orchard in Madera County on November 28, 1979 to determine the effect of preemergence herbicides over a prolonged period of time. The trial area was divided into two tree, 6.5 by 48 ft. plots and treatments were applied with a CO_2 plot sprayer at 30 psi with 50 gallons of water per acre. Annual weed control rating was made on March 17, 1980. Evaluation indicated effective annual weed control by all treatments (see table).

No phytotoxicity was observed in the almond trees. (University of California, Cooperative Extension, 128 Madera Avenue, Madera, California 93637.)

Comparison of preemergence herbicides used in almonds

Herbicides	lb/A	Annual Weed Control[1/]	Weeds Present[2/]
Simazine	2	10.0	
Simazine+Napropamide	1+4	9.6	P
Simazine+Oryzalin	1+4	10.0	
Napropamide	4	7.6	S,L,F,P
Oryzalin	4	9.6	
Oxyfluorfen	4	10.0	
Prodiamine	4	7.3	P,S,A
Norflurazon	4	10.0	
Oxyfluorfen+Napropamide	2+4	10.0	
Oxyfluorfen+Oryzalin	2+4	10.0	
Oxyfluorfen+Prodiamine	2+4	10.0	
Oxyfluorfen+Norflurazon	2+4	10.0	
Check	-	0.0	P,S,F

1/ Average of 3 replications were 0 = no control and 10 = complete control. Treated 11/28/79. Evaluated 3/17/80.

2/ Weeds present: P=Pineapple weed, S=Shepherd's purse, L=London rocket, F=Fiddleneck, A=Annual bluegrass.

The use of preemergence herbicides for control of annual weeds in almonds. Vargas, R. N. A study was established in a three year old almond orchard in Madera County on November 15, 1976 to determine the effect of preemergence herbicides over a prolonged period of time. Retreatments were on January 4, 1978, December 15, 1978 and November 30, 1979. The trial area was divided into two tree, 6.5 by 48 ft. plots and treatments were applied with a CO_2 plot sprayer at 30 psi with 50 gallons of water per acre. Annual weed control ratings were made on March 14, 1980. The evaluation indicated that all treatments except for napropamide (Devrinol) and prodiamine (Rydex) were doing an effective job of controlling the annual weeds that were present (see table).

No phytotoxicity to the almonds have been observed to this point. (University of California, Cooperative Extension, 128 Madera Avenue, Madera, California 93637.)

Comparison of preemergence herbicides used in almonds and their effect of annual weeds after three annual applications.

Herbicides	lb/A	Annual Weed Control[1/]	Weeds Present[2/]
Napropamide	4	5.0	S,P
Oryzalin	4	8.0	C
Oxyfluorfen	4	10.0	
Prodiamine	4	6.8	P,C
Norflurazon	2	9.2	C,F
Norflurazon	2	10.0	
Check	-	0.0	S,C,P,F

1/ Average of 4 replications where 0 = no control and 10 = complete control. Treated 11/15/76, 1/4/78, 12/15/78, 11/30/79. Evaluated 3/14/80.

2/ P=Pineapple weed, S=Shepherd's purse, C=Common groundsel, F=Filaree.

Long term weed control studies in almonds. Fischer, B. B. Continuous annual application of several individual and combinations of herbicides have been applied mid-winter since January 26, 1976 on bearing trees growing on a Hanford sandy loam soil. This orchard is irrigated with solid set sprinklers. The organic matter is estimated to be less than 0.5% with about 65% sand. The herbicides have been applied annually with a constant pressure back pack sprayer using a 3-nozzle boom run at about 30 psi in about 35 gallons of water per acre.

No phytotoxicity to a mixed planting of varieties has been observed after five years of applications with herbicides listed in the table that follows.

Excellent weed control has been obtained from all treatments at three months after the last application. Only napropamide (Devrinol) combinations showed some slight reduction in weed control at seven months. Mare's tail and evening primrose appeared to be the most common escapes but all treatments gave season long commercial control. (University of California, Cooperative Extension, 1720 South Maple, Fresno, California 93702.)

Almond weed control trial in Fresno County

Herbicides	lb/A	Weed Control[1/] Evaluation Date 4/7/80	7/29/80
Oryzalin+Simazine	4+1/2	9.5	8.7
Napropamide+Simazine	4+1/2	8.5	6.8
Prodiamine+Simazine	2+1/2	9.2	8.7
Prodiamine	4	9.0	9.8
Prodiamine	8	9.0	9.7
Oxyfluorfen	2	7.5	7.1
Oxyfluorfen	4	9.0	9.5
Oxyfluorfen	8	9.7	9.8
Napropamide+Oxyfluorfen	4+2	9.0	7.0
Oryzalin+Oxyfluorfen	4+2	9.5	8.7
Penoxalin+Simazine	4+1/2	9.2	9.5
Napropamide+Simazine	4+1	8.5	7.5
Oryzalin+Simazine	4+1	9.7	9.2
Simazine+Oxadiazon	1/2+4	8.5	9.2
Check	-	0.0	7.7

1/ Rated as 0 = no weed control and 10 = best weed control Herbicides applied 1/26/76, 1/6/77, 1/17/78, 1/5/79, and 12/28/79. Weeds included in this rating are annual bluegrass, chickweed, cudweed, filaree, evening primrose, mare's tail, wild radish and some annual grasses.

The effect of seven preemergence herbicides on the control of two Compositae weeds in young almonds. Lange, A. H. Young one year old almond trees were planted in a Hanford fine sandy loam in the spring of 1978. Each plot contained one almond and one pistachio tree. Data on the almonds will be reported in this report. The plots were treated annually beginning on December 29, 1978 and repeated on December 28, 1979.

Weed control ratings made April 18, 1980 showed poor control of several weed species from all herbicides except the high rates of norflurazon (Solicam) and fluridone (Brake). A later rating June 18, 1980 on mare's tail and flax leaved fleabane showed the same results. As a result of the superior weed control, these treatments demonstrated good plant growth.

The untreated weedy check showed the poorest growth. (University of California, Cooperative Extension, 9240 South Riverbend Avenue, Parlier, California 93648.)

A comparison of mare's tail and flax leaved fleabane control in young almonds (425-73-501-100-1-77)

Herbicides	lb/A	Average Mare's tail and Flax leaved Fleabane Control 1/	General Weed Control 2/	Trunk Diameters 3/
Napropamide	4	1.8	3.2	108.3
Oryzalin	4	6.2	5.9	116.7
Prodiamine	4	4.4	5.1	131.7
Oxyfluorfen	2	4.3	4.7	118.3
Oxyfluorfen	4	5.9	5.5	118.3
Norflurazon	2	3.7	4.4	111.7
Norflurazon	4	6.9	6.9	125.0
Norflurazon	8	7.5	7.9	113.3
Fluridone	1	7.3	6.8	103.3
Fluridone	2	8.9	8.7	118.3
Oxadiazon	2	1.6	3.0	103.3
Oxadiazon	4	1.6	3.5	101.7
Check	-	0.6	0.2	93.3

1/ Average of 12 replications where 0 = no weed control and 10 = best weed control. Treated 12/28/79. Evaluated 6/18/80.

2/ General weed control rated 4/18/80. Weeds present include cudweed, crabgrass, chickweed, fiddleneck, groundsel, henbit, knotweed, London rocket, nutsedge, nightshade, pigweed, sow-thistle, shepherd's purse, barnyardgrass, willow herb, mare's tail, and flax leaved fleabane.

3/ Average diameter at 10 cm. Measured in mm.

Punctureveine control in mature almonds under drip irrigation. Lange, A. H. A heavy infestation of punctureveine growing in sandy loam near Navelencia was treated annually beginning in the spring of 1977. The plots were treated annually up to and including February 1, 1980 with four pre-emergence herbicides at three rates each compared to napropamide (Devrinol) at one rate. The grower had sprayed through the plots with an unknown herbicide and rate, but the comparison between herbicides is still valid.

The punctureveine control outside the wet zone was better with oxyfluorfen (Goal), prodiamine (Rydex), and oryzalin (Surflan) than it was with norflurazon (Solicam) or napropamide. The control in the wet zone was more erratic but reflected essentially the same results as in the dry area outside the emitter area.

No phytotoxicity to tree foliage was observed. (University of California, Cooperative Extension, 9240 South Riverbend Avenue, Parlier, California 93648.)

The effect of three preemergence herbicides
on the control of punctureveine in a drip irrigated almond orchard
(425-10-501-146-7-77)

Herbicides	lb/A	Average[1/] Weed Control	Weed Control in Wet Spot[2/]
Oxyfluorfen	2	10.0	9.5
Oxyfluorfen	4	10.0	10.0
Oxyfluorfen	8	10.0	7.5
Prodiamine	2	10.0	9.0
Prodiamine	4	10.0	10.0
Prodiamine	8	10.0	7.5
Oryzalin	2	10.0	9.0
Oryzalin	4	10.0	7.5
Oryzalin	8	10.0	9.0
Norflurazon	1	8.0	2.0
Norflurazon	2	9.0	4.5
Norflurazon	4	9.5	3.0
Napropamide	4	6.5	2.0

1/ Average of 2 replications where 0 = no control and 10 = best weed control.
2/ Wet spots sprayed with 1/2 lb. glyphosate and 1/2 lb. paraquat in 50 gallons. Treated 2/14/80. Evaluated 5/6/80.

The effect of continuous norflurazon (Solicam) in a mature almond orchard. Lange, A. H. A heavily bermudagrass infested almond orchard growing in a Delhi sandy loam was treated with norflurazon annually for four years beginning in 1976. A final rating indicated overspray by the grower with unknown herbicides at unknown rates. However, some differences can still be detected. The results showed an increase in bermudagrass control with repeated use of norflurazon. (University of California, Cooperative Extension, 9240 South Riverbend Avenue, Parlier, California 93648.)

The effect of repeated annual application of norflurazon on the control of bermudagrass (425-10-502-146-2-76)

Herbicide	lb/A	Average[1/] Bermudagrass Control Fall	Winter	Spring
Norflurazon	2	9.8	9.5	9.8
Norflurazon	4	10.0	10.0	10.0
Norflurazon	6	9.8	10.0	10.0
Check			8.5	

1/ Average of 4 replications where 0 = no effect and 10 = complete control.

The effect of combinations and timing on the control of two well established perennial grasses. Lange, A. H. Mature, well established johnsongrass and bermudagrass stands were divided into small 5 by 100 ft. plots. The glyphosate (Roundup) was applied September 28, 1979. Other herbicides were applied 1, 3, or 7 days prior to the glyphosate treatment. The oryzalin (Surflan) and norflurazon (Solicam) were applied September 28, 1979 and rained in commencing on November 5, 1979. The temperatures were averaging 81° F. with a high of 103° F. on September 28. The degree of control was evaluated May 30, 1980.

The combination of amitrole (Weedazol) and glyphosate appeared to have some advantage over glyphosate alone if applied 7 days prior to glyphosate on johnsongrass. Glyphosate plus the preemergence application of oryzalin plus norflurazon appeared somewhat better than either one alone for johnsongrass control.

These results were not borne out on bermudagrass (no retreatment columns).

Retreating with glyphosate was not generally as good as retreating the regrowth with paraquat for bermudagrass control. (University of California, Cooperative Extension, 9240 South Riverbend, Parlier, California 93648.)

Table 1.
The effect of combinations and timing of herbicides on the control of johnsongrass (425-73-501-2-80)

Herbicides	lb/A	Days prior to Glyphosate	Oryzalin and Norflurazon Pretreatment	Average[1/] Johnsongrass Control
Amitrole	2	7	+	8.0
Amitrole	2	3	+	3.7
Amitrole	2	1	+	7.0
Amitrole	2	-	+	1.7
Glyphosate	4	-	+	8.7
Glyphosate	4	-	-	5.3
Oryzalin+ Norflurazon	4+2	-	-	3.0
Check	-	-	-	0.0

1/ Average of 3 replications where 0 = no control and 10 = best weed control. Treated 9/21/79. Evaluated 5/30/80.

Table 2. The effect of combination and timing of herbicides on the control of bermudagrass (425-73-502-1-80)

Herbicides	lb/A	Days prior to Glyphosate	Oryzalin and Norflurazon Pretreatment	Approximate Control Retreatment		
				With Paraquat	No Retreatment	With Glyphosate
Amitrole	2	7	+	9	4	8
Amitrole	2	3	+	8	0	4
Amitrole	2	1	+	8	6	6
Amitrole	2	-	+	8	0	3
Glyphosate	4	-	+	8	5	5
Glyphosate	4	-	-	9	5	8
Oryzalin+ Norflurazon	4+2	-	-	8	2	5
Check	-	-	-	8	0	4

Treated 9/21/79. Retreatment 5/6/80. Evaluated 5/30/80.

Nontillage in young almonds. Lange, A. H. Young NonPareil and Mission almond trees from the 1979 screening trial were transferred to a randomized block experiment with two variables: (1) complete chemical weed control vs. (2) strip weed control down the tree row and mowed centers. Each treatment was replicated eight times with 15 trees per plot. The combination of oxyfluorfen (Goal) plus oryzalin (Surflan) was applied February 28, 1980 and rained in with 0.92 inches on March 2, 1980. The Mission variety was alternated with the NonPareil in each row.

Diameters were taken in mm. on October 9, 1980 and showed a 10% greater size in the complete chemical weed control plots over the trees with strip weed control and mowed centers. (University of California, Cooperative Extension, 9240 South Riverbend Avenue, Parlier, California 93648.)

Nontillage almond trial
(425-73-501-146-1-80)

Herbicide	lb/A	Average[1/] Chemical Strip (Mowed Centers)	Complete Chemical Control
Oxyfluorfen+Oryzalin (Triton Ag 98)	2+4 (1/2%)	37.7	41.5

1/ Average of 8 replications. Fifteen trees to each replication. Diameters taken in mm. Treated 2/28/80. Evaluated 10/9/80.

An evaluation of the effect of four herbicides on the growth of ten almond varieties. Lange, A. H. Young 5/16 inch almond trees were planted February 13, 1980 in Field 62 at the Kearney Field Station in a Hanford fine sandy loam and sprinkler irrigated. On February 27, 1980 four preemergence herbicides were applied in a four time randomized block design. Rainfall occurred March 2, 1980 at 0.92 inches. The plots were subsequently furrow irrigated. Each plot contained eight important commercial varieties including NonPareil on two different rootstocks.

The weed control was adequate for all treatments with possible exception of slightly less in the napropamide (Devrinol) plots. The untreated check was sprayed out twice during the season with a directed spray of glyphosate (Roundup).

The effect of partial weed control was most striking reducing tree growth of all varieties. No symptoms occurred and the growth difference between chemicals appear to represent only the differences in weed control if they are indeed at all real. (University of California, Cooperative Extension, 9240 South Riverbend Avenue, Parlier, California 93648.)

Table 1. Average Trunk Diameters[1/]

Herbicides	lb/A	Peerless	NePlus	Mission (Texas)	Butte	Ruby	Carmel	Price	Thompson	NonPareil (Lovell)	NonPareil (Nemaguard)	Average
Simazine	2	25.0	25.0	30.0	22.5	26.3	26.3	25.0	27.5	26.3	25.0	25.9
Napropamide	8	21.3	25.0	26.3	23.8	27.5	27.5	23.8	30.0	23.8	26.3	25.5
Oryzalin	8	27.5	27.5	26.3	30.0	32.5	35.0	30.0	33.8	28.8	30.0	30.1
Oxyfluorfen	8	28.3	26.3	28.8	31.3	31.3	28.8	32.5	30.0	27.5	30.0	29.5
Check (Glyphosate)	3	17.5	18.8	21.3	22.5	22.5	21.3	23.8	21.3	16.3	21.3	20.7
Average		23.9	24.5	26.5	26.0	28.0	27.8	27.0	28.5	24.5	26.5	26.3

1/ Average of 4 replications. Measurements taken in mm. Trees planted 2/13/80. Treated 2/27/80. Measurements taken 10/9/80.

Table 2. The effect of four preemergence herbicides on weeds in almond variety screening trial (425-73-501-146-2-80).

Herbicides	lb/A	Weed Control[1/]	Weeds Remaining[2/]	Diam. as percent of the check
Simazine	2	7.3	N,W,O	125
Napropamide	8	6.3	R,FN,S,FB,N,W,O	123
Oryzalin	8	7.8	O,N,W,CW,R,CL	145
Oxyfluorfen	8	8.0	N,FB	142
Check (Glyphosate)	3	1.3	FN,R,ST,W,S,N,O	100

1/ Average of 4 reps. where 0 = no control and 10 = complete control. Treated 2/27/80. Rainfall 3/2/80 (.92"). Evaluated 4/16/80.

2/ CL-clover, CW-chickweed, FB-flaxleaf fleabane, FN-fiddleneck, N-nutsedge, O-wild oats, R-redmaids, S-shepherd's purse, ST-sowthistle, W-watergrass. No phytotoxicity to first leaf trees.

The long term effect of three cultural practices on the growth of Mission almond trees. Lange, A. H. In 1974 trees were planted in Field 76 at the Kearney Field Station with guard trees left over from a 1973 screening trial. Mission almond was planted with Santa Rosa plum, Tilton apricot and Snow Queen nectarine trees in each plot. Because of poor pollination, no yield has been taken but diameters were recorded in the fall of 1980. A light crop was harvested in 1979. The results suggested a detrimental effect of tillage. However, this apparent effect is not emphasized by the growth measurements since there was no significant difference between an average of all chemical treatments (nontillage, 20 replications) with strip tillage (20 replications) and complete tillage (20 replications). (University of California, Cooperative Extension, 9240 South Riverbend Avenue, Parlier, California 93648.)

The effect of three cultural programs including five herbicide combinations on the growth of almonds (A36-73-501-H-14-2-75)

Herbicides	lb/A	Average Diameter (cm)[1/] Strip	Nontillage	Average
Simazine+Oryzalin	1+4	23.1	23.4	23.2
Simazine+Napropamide	1+4	22.0	20.2	21.1
Oxyfluorfen+Norflurazon	2+2	21.7	23.1	22.4
Oxyfluorfen+Napropamide	2+4	17.6	22.6	20.1
Oxyfluorfen+Penoxalin	2+4	21.0	19.2	20.1
Check (Tillage)[1/]	-	20.7		
Average[1/]		21.1	21.7	

1/ Average of 20 replications.

The control of weeds in an almond orchard growing in a Panoche clay loam soil. Lange, A. H. This is a long term yield study on two varieties of almond trees planted in 1973 and treated in fall or spring annually since April 18, 1974. These trees growing in a Panoche clay loam with about 1% organic matter, have never been tilled. They have had very few weeds except for a few in the untreated check plots. The 1980 yield data indicated no differences due to foliar spring treatments and no differences due to herbicide combinations. An average of both timings suggest slightly fewer nuts in the untreated checks, but this difference is probably not statistically significant. (University of California, Cooperative Extension, 9240 South Riverbend Avenue, Parlier, California 93648.)

Table 1.
The effect of repeated annual preemergence herbicide applications on the yield of almonds (425-78-501-H-14-1-74)

	lb/A	Average[1/] Mission	Average[1/] NonPareil	Average[2/] Both Varieties	Average Both Series[3/]	Percent of Check
Winter Series[4/]		(lb)	(lb)	(lb)	(lb)	(%)
Simazine+ Prodiamine	1+4	25.6	21.2	23.4	19.7	1.06
Simazine+ Oryzalin	1+4	27.2	21.5	24.4	20.1	1.09
Simazine+ Napropamide	1+4	30.2	17.1	23.6	21.4	1.16
Oxyfluorfen+ Norflurazon	2+2	30.7	14.8	22.8	21.4	1.16
Oxyfluorfen+ Napropamide	2+4	29.0	12.7	20.8	22.0	1.19
Spring Series[5/]						
Simazine+ Prodiamine	1+4	21.5	10.6	16.0		
Simazine+ Oryzalin	1+4	23.5	8.0	15.8		
Simazine+ Napropamide	1+4	26.1	12.2	19.2		
Oxyfluorfen+ Norflurazon	2+2	23.5	16.3	19.9		
Oxyfluorfen+ Napropamide	2+4	35.8	10.3	23.1		
Check[6/]	-	26.5	10.5	18.5	18.5	

1/ Average of 3-7 replications. Weights measured in pounds per tree.
2/ Average of 10 replications.
3/ Average of 20 replications.
4/ Latest retreatment 12/20/79.
5/ Simazine and Oxyfluorfen applied 12/20/79. Other herbicides in combinations applied 4/4/80.
6/ Very little weed competition throughout this experiment so no tillage was needed for weed control.

Table 2. A comparison of phytotoxicity symptoms by variety and season of application of the second material (425-78-501-H-14-1-74)

Herbicides	lb/A	Average Almond Phytotoxicity 1/ Mission	NonPareil
Winter Series 2/			
Simazine+Prodiamine	1+4	2.1	0.3
Simazine+Oryzalin	1+4	1.6	0.7
Simazine+Napropamide	1+4	0.7	0.8
Oxyfluorfen+Norflurazon	2+2	0.3	0.3
Oxyfluorfen+Napropamide	2+4	0.4	0.0
Spring Series 3/			
Simazine+Prodiamine	1+4	1.3	0.5
Simazine+Oryzalin	1+4	1.6	0.3
Simazine+Napropamide	1+4	2.3	0.4
Oxyfluorfen+Norflurazon	2+2	0.8	0.4
Oxyfluorfen+Napropamide	2+4	1.8	0.2
Check	-	1.6	0.0

1/ Average of 3-7 replications where 0 = no phytotoxicity and 10 = phytotoxicity symptoms present, tree dead.
2/ Latest retreatment 12/20/79. Evaluated 9/5/80.
3/ Simazine and oxyfluorfen applied 12/20/79. Other herbicides in combinations applied 4/4/80.

Varietal response of young almonds to repeated annual preemergence herbicides. Lange, A. H. Six common almond varieties on nemaguard rootstocks were planted in separate rows, one variety per row, on February 8, 1977 in a close planting, plots measuring 12' by 15'. Each block contained six rows bordered by two guard rows of pistachio trees.

Four combinations of preemergence herbicides were used for satisfactory weed control. No untreated plots were included because of the detrimental effects of weed competition. Rather the objective was to compare the effect of four herbicide combinations on the six almond varieties under two forms of irrigation, i.e., furrow and drip. The herbicides were applied for the first time March 29, 1977 and annually thereafter, the last applications being December 28, 1979. The nuts were harvested beginning September 12, 1980. The results showed no big difference in the effect of irrigation on any variety except Thompson where drip appeared to be inadequate. The average of all varieties showed no difference.

All herbicides were equally safe and effective except norflurazon (Solicam) plus simazine (Princep). The treatment reduced yield primarily where furrow irrigation was used and not under drip. This may have been largely due to previous injury after heavy rains in 1978.

The effects on average diameters did not show any real difference between varieties of herbicide treatment.

The effect on foliar symptoms was closer to yield trends than tree diameter, i.e., furrow showing more foliar symptoms than drip irrigation. Also Mission (Texas) and Thompson showed more symptoms than other varieties. Simazine and norflurazon showed the most symptoms with furrow irrigation as shown by the overall average. (University of California, Cooperative Extension, 9240 South Riverbend Avenue, Parlier, California 93648.)

The effect of four different combinations of herbicides
in two irrigation methods on the harvest weight of six almond varieties
(425-73-501-146-1-77)

Herbicides	lb/A	Average Harvest Weights[1/] Peerless F[2/]	Peerless D[2/]	NonPareil F	NonPareil D	NePlus F	NePlus D	Thompson F	Thompson D	Merced F	Merced D	Mission F	Mission D	Ave. all Varieties F	Ave. all Varieties D
Princep+ Devrinol	1+4	6.8	7.0	6.4	5.8	11.6	7.0	10.5	7.9	11.4	15.6	11.5	10.0	9.7	8.9
Princep+ Surflan	1+4	6.6	5.7	6.4	7.0	13.2	11.6	14.2	2.2	10.4	11.5	17.2	12.2	11.3	8.4
Princep+ Rydex	1+4	6.4	11.1	5.1	6.4	13.3	13.1	10.8	6.5	15.6	11.5	14.2	11.5	10.9	10.0
Princep+ Solicam	1+4	7.0	6.1	6.6	7.4	7.7	9.4	11.0	5.4	6.4	15.2	6.7	22.9	7.6	11.1
Average	-	6.7	7.5	6.1	6.7	11.5	10.3	11.6	5.5	11.0	13.5	12.4	14.2	9.9	9.6

1/ Average of 4 replications. Weights measured in kilograms per tree.
2/ F - furrow irrigation. D - Drip irrigation.
Treated 12/28/79. Evaluated 8/17/80 and 9/12/80.

The effect of four herbicide combinations on almonds under furrow and drip irrigation as measured by trunk diameter (425-73-501-146-1-77)

Herbicides	lb/A	Average trunk diameter as measured in cm.[1] Peerless F[2]	Peerless D[2]	NonPareil F	NonPareil D	NePlus F	NePlus D	Thompson F	Thompson D	Merced F	Merced D	Mission F	Mission D	Ave. all Varieties F	Ave. all Varieties D
Princep+ Devrinol	1+4	8.1	8.1	9.2	9.4	6.9	7.8	8.9	8.9	9.4	9.9	9.9	8.9	8.7	9.0
Princep+ Surflan	1+4	8.1	8.4	9.4	9.5	8.5	8.4	8.9	7.9	9.1	9.6	11.2	10.8	9.2	9.1
Princep+ Rydex	1+4	8.1	8.9	8.9	8.8	8.6	8.4	8.8	10.0	9.4	9.8	10.4	10.7	9.0	9.4
Princep+ Solicam	1+4	7.1	7.6	7.5	8.8	7.7	8.4	8.9	8.1	9.2	10.5	9.5	8.2	8.3	8.6
Average	-	7.8	8.2	8.8	9.1	7.9	8.2	8.9	8.7	9.3	10.0	10.0	9.9	8.8	9.0

1/ Average of 4 replications. Measurements taken 10-12 cm. above ground.
2/ F - Furrow irrigation. D - Drip irrigation. Evaluated 10/17/79.

The effect of four combinations on almond foliage growing with furrow and drip irrigation
(425-73-501-146-1-77)

Herbicides	lb/A	Average Phytotoxicity[1/]												Ave. all Treatments	
		Peerless		NonPareil		NePlus		Thompson		Merced		Mission			
		F[2/]	D[2/]	F	D	F	D	F	D	F	D	F	D	F	D
Princep+ Devrinol	1+4	1.0	0.5	0.0	0.0	0.2	0.2	0.8	0.2	1.2	0.5	2.8	0.8	1.0	0.4
Princep+ Surflan	1+4	0.7	0.2	0.0	0.0	0.5	0.0	1.8	0.5	0.8	0.0	2.2	1.2	1.0	0.3
Princep+ Rydex	1+4	1.2	0.5	0.2	0.0	0.8	0.0	1.5	0.5	0.2	0.2	1.5	1.2	0.9	0.4
Princep+ Solicam	1+4	1.5	0.8	0.2	0.2	0.5	0.2	1.0	0.5	1.0	0.0	3.0	0.8	1.2	0.4
Average	-	1.1	0.5	0.1	0.1	0.5	0.1	1.3	0.4	0.8	0.2	2.4	1.0	1.0	0.3

Average all varieties - Furrow 4.1
Average all varieties - Drip 1.5

1/ Average of 4 replications where 0 = no effect and 10 = tree completely dead. Treated 3/29/77, 1/3/78, 12/28/78, 12/28/79. Evaluated 8/19/80.
2/ F - Furrow irrigation. D - Drip irrigation.

1980 Weed Control Research in Almonds

by

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There is considerable evidence that complete nontillage is beneficial to the growth and yield of all trees and vines including almonds. Certainly this appears to be true when we compare the growth and yields of nontilled almonds, plums, apricots and nectarines with trees from plots with any degree of tillage. It is true that other insect and disease problems under nontillage have not been thoroughly evaluated, nor have several methods of orchard clean-up been adequately studied such as flame, etc.

This year, as in previous years, no detrimental effects of nontillage chemical weed control was apparent as expressed in tree growth or yield. On the other hand, considerable evidence is accumulating to demonstrate what appears to be a detrimental effect from weeds and tillage.

Most of the work thus far has been done on Mission and NonPariel varieties. The initial work with herbicides on additional varieties suggests few if any varieties more susceptible to chemicals than Mission (Texas). Even though more symptoms were seen on Mission there has been as yet no measureable detrimental effect on growth or yield in current long-term studies. This work is continuing because more years of growth and yield data could change this picture.

Perennial weeds continue to be our most difficult weed control problem in almond cultures. Unfortunately, our worries are not over with the registration of Roundup. More work is needed to increase the efficiency and reliability of Roundup and to developing improved control by a program against perennials that includes tillage, irrigation and soil applied herbicides.

The results this year with combinations on several perennial weed control problems have not been outstanding. For bindweed, johnsongrass and bermuda, Roundup followed by Treflan incorporated has shown considerable promise. The best timing of application and rates warrants more study.

Continued use of Surflan and Rydex when registered will add greatly to the control of these perennial weed problems.

For nutsedge, bermudagrass and johnsongrass, Brake has shown more promise than Solicam but neither are registered. A great deal more work is needed to be certain of the margin of safety and of the economics with Brake for weed control in almonds.