WEED CONTROL IN PEACHES USING NORFLURAZON, ORYZALIN AND SIMAZINE

By

LYNN ANN HUGHES

Bachelor of Science in Agriculture

Oklahoma State University

Stillwater, Oklahoma

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Thesis Approved:

Michael Smith, Jr.
Thesis Adviser

Raymond E. Campbell

Ronald W. McNew

Norman N. Durham
Dean of the Graduate College

PREFACE

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CHAPTER I

INTRODUCTION

Providing optimum conditions for tree growth during establishment of a peach orchard cannot be overemphasized. Cultivation and/or herbicides must be used to control weeds in young peach trees to obtain good tree survival, vigorous growth, and earlier commercial production. A common system of management for young trees is strip-in-row where narrow strips are cultivated or treated with herbicides, and a permanent sod cover, such as fescue, orchardgrass, or other suitable sods are maintained in the row middles. Cultivation increases production costs, is detrimental to tree growth because of root pruning, and contributes to soil erosion on orchards located on sloping sites; therefore, frequent cultivation is not usually recommended. The use of herbicides can replace cultivation to control weed growth, and there are several herbicides which have been registered for such use (3, 18, 22).

Results from many studies (5, 8, 14, 15, 17, 18, 23) have shown that tree growth was greater in herbicide treated plots compared to trees grown in a weedy check plot or mowed sod plots. Also, increased growth results in increased fruit yields (7). Young (23) reports that herbicide treatments produced more vigorous trees than clean weeded or untreated plots, and Putnam and Bowers (14, 15) suggest that peach trees treated with certain herbicides have developed more growth and higher N levels than mechanically weeded trees.

Young (23) determined that weed control was increased when combinations of herbicides were applied as compared to an individual herbicide used alone. Tank mixes many times are more effective than a single herbicide for control of either a large number of weed species or an individual species. Total preemergence application is increased while individual herbicides are reduced. This is safer for the trees because of different modes of action of different herbicides (21).

The objectives of this study were:

1. Evaluate three herbicides, norflurazon, simazine and oryzalin plus tank mixes of norflurazon + simazine and oryzalin + simazine for preemergence weed control in peach.
2. Determine the advantages of split applications of each herbicide or tank mix over "normal" single application in the spring.

CHAPTER II

REVIEW OF LITERATURE

Norflurazon

An effective, yet safe chemical weed control program should be a major consideration of every orchardist. Weed control in immature orchards is exceptionally important because weeds compete very strongly with young trees for water, nutrients and light (3, 19), but many of the herbicides now registered for deciduous fruit crops are too phytotoxic on new plantings (5). Norflurazon, a florinated pyridazine preemergence herbicide with trade names of Evitol, Solicam and Zorial, is adsorbed by soil colloids and is not subject to leaching (10). It has demonstrated excellent crop safety when used according to label directions (20). Russo and Ummel (19) state that it can be used on trees that have been established for at least 12 months.

Of the crops that are now registered or being considered for registration, almonds are the most sensitive to preemergence herbicides. For this reason, almonds have been used to evaluate phytotoxicity of many preemergence herbicides. In one such trial there was no damage to almond trees using norflurazon at three times normal rates with three different application timings. In some cases, foliar symptoms have occurred where label rates have been exceeded. These symptoms are normally confined to the lower portions of the tree and do not appear to cause reductions in tree growth or vigor (20).

Although field trials have demonstrated that some weeds (henbit, clovers, dandelion, field bindweeds, johnsongrass from rhizomes, and knotweed) are tolerant to norflurazon, the herbicide has shown efficacy. on a wide spectrum of weeds in orchards throughout the U.S. (20).

Norflurazon has excellent residual activity which allows early fall applications. This residual quality coupled with the control on annual grasses and winter broadleaf weeds offers a distinct advantage over other currently registered materials (20).

Norflurazon is absorbed by roots and translocated to shoots (10). The mode of action is an indirect interference with the formation of chlorophyll by inhibition of carotenoid biosynthesis in plant tissues (20). Since carotenoid pigments protect chlorophyll from photodegradation, chlorophyll is destroyed (10). This results in the typical symptom of norflurazon which is a partial or total loss of chlorophyll in susceptible plants (20), and death following exhaustion of food reserves (10).

For best results, norflurazon should be applied to an orchard floor that is relatively free of trash and weeds, and should be activated by water to a depth of 5 cm within two weeks following application (10, 20).

Oryzalin

Bearing trade names of Surflan and Ryzelan, oryzalin is a dinitroaniline preemergence herbicide for control of annual grasses and certain broadleaf weeds (4, 10, 23). In 1978, Rom et al. (19) found that weed control with oryzalin was satisfactory in the year of planting. A second trial (18) reinforced the findings of his previous work, disclosing no apparent phytotoxic effects on the trees from any of the oryzalin rates used. He concluded that oryzalin appears to be a safe herbicide for use in establishing peach plantings when normal rates for satisfactory weed control are followed.

It has been noted that preemergence control with oryzalin continues to be excellent through the entire season (18). Other work (23) has shown an increase in efficacy when oryzalin was combined with simazine. Weed control with oryzalin at 2.24, 4.48 or 8.96 kg/ha was improved with the addition of 2.24 to 4.48 kg/ha of simazine (24). In a study of herbicidal effects on peach seedling growth and weed control using methazole, napropamide, oryzalin, exadiazon and simazine, Arnold and Aldrich (1) noted that the best overall weed control was with either oryzalin or simazine.

Many studies (6, 7, 8, 15, 16, 18) have disclosed the relationship of herbicides to trees with regard to increased growth, vigor and performance. In a two year trial by Rom et al. (19), trees growing in an oryzalin study were larger than trees in the weedy check plots in both years. In other research (24), Young documented greater tree vigor when oryzalin was combined with simazine than when used alone. Similarly, tree vigor using simazine was greater when combined with oryzalin. In general, data (6, 8, 15, 16, 18, 19, 24) indicated a greater trunk diameter increase where weed control was greatest.

Laboratory studies (10) indicate that oryzalin is biodegradable in soil. Limited research (10) suggests that oryzalin is not readily absorbed and translocated in plants as no significant terminal residues or metabolites have been detected. The mode of action appears to affect seed germination.

All trash and established weeds should be worked into the soil before applying oryzalin (22). This herbicide is relatively stable in sunlight; thus it can be applied to the soil surface for later movement into the upper soil zone by rain or irrigation (10). In field studies (10) at least 50 mm of rainfall or overhead irrigation water was necessary to position oryzalin in the weed-seed-germination layer of soil. Excessive rainfall or irrigation did not leach oryzalin out of the weed-seed-germination zone. Shallow incorporation usually increases the efficacy of the compound (10).

Simazine

Simazine was the first widely used triazine herbicide. It carries the trade names of Princep and Aquazine. Simazine is registered for use on more crops than any other triazine herbicide and is primarily used as a preemergence to control annual grass and broadleaf weeds (10). It has been used in commercial orchards for more than two decades (4) and has generally proven effective and nonphytotoxic in fruit tree nurseries (13, 17).

In a five year study with apples, Heeney et al. (8) found no evidence of phytotoxicity with repeat applications of simazine even though the rates were 50 to 100% higher than recommended. Concurrently, fruit yields and tree growth were higher in plots treated with herbicides as compared to trees grown under sod mowed during the season.

Results were equally favorable in a study (9) of the rotation of simazine with terbacil and dichlorbenil in an apple orchard. In the check trees, the average yield in the "off" year was 34.9% of that obtained in the "on" years. In plots treated with herbicides, the percenage of fruit in the "off" year was increased to 51.2%. This benefit due to herbicide utilization could be explained by reduced competition by weeds resulting in an increase in bloom and fruit set in the "off" year.

It should be noted that Kornatskii and Kornatskaya (11) discovered that, depending on the rate applied, simazine reduced the sugar content and fruit grade and increased the malic acid content of the fruit.

The use of simazine in tank mixes as a method to control more weed species and to reduce the potential for injury from the individual herbicides is becoming more widely used by orchardists (14, 23, 24). Young and Walker (24) determined that when oryzalin was combined with simazine, weed control was better than that which occurred with either herbicide when applied by itself. Similarly, tree vigor of simazine treated trees was greater when combined with oryzalin.

All triazine herbicides are rapidly absorbed by roots and readily translocated throughout the plant. The mode of action is an inhibition of plant growth through interference of the photosynthetic process. This results in foliar chlorosis followed by death of the leaf (10).

Simazine has a water solubility of 3.5 ppm at 20^{o}C. Triazine herbicides are reversably adsorbed by clay and organic colloids, and are not subject to excessive leaching in most soils. Studies indicate the leachability of trazine herbicides is directly related to their adsorbtion to soil colloids and that adsorbtion and leachability have little or no relationship to water solubility of the compounds (10).

CHAPTER III

MATERIALS AND METHODS

The study was conducted at the Fruit Tree Research Station north of Perkins, Oklahoma. A block of two-year-old 'Topaz' peach (Prunus persica Batch.) trees on 'Lovell' rootstock spaced 6.7 m by 5.5 m was selected as the experimental site. Soil type in the area is Teller fine sandy loam. Trickle irrigation was installed where the trees were established, and trees were irrigated as required. Rainfall amounts were recorded on a daily basis; total rainfall for the period from March 1 through October 31, 1982 was 29.43 inches. Total rainfall for the year was 40.29 inches.

Treatments were arranged in a split-plot design with five single tree replications per treatment. Main-plots were herbicide types and sub-plots were herbicide rates. Prior to application of all treatments paraquat was applied at 2.3 l/ha in 257 l of water per ha. This was done to kill existing vegetation thereby allowing for more precise observation of the effects of the preemergence herbicides. The clean control was maintained with paraquat application as required.

A summary of the application rate, herbicide concentration and time of application is listed in Table 1.

Herbicides were applied using 11 liter CO_2 powered back pack sprayer fitted with a 1.2 m boom which had four nozzles. All applications were made using 257 l/ha total spray solution.

Analysis was computed for all grass weeds, broadleaf weeds and

TABLE I

RATES, TIMING AND % MANUFACTURER'S RECOMMENDED CONCENTRATION OF EACH HERBICIDE

	Rate (kg ai/ha) March Application	% Manufacturer's Recommended Concentration	Rate (kg ai/ha) August Application	% Manufacturer's Recommended Concentration	Total % Manufacturer's Recommended Concentration
Norflurazon	2.2	100			100
	1.1	50	1.1	50	100
	1.7	75	1.1	50	125
Oryzalin	4.2	100			100
	2.1	50	2.1	50	100
	3.2	75	2.1	50	125
Simazine	2.7	100			100
	1.4	50	1.4	50	100
	2.0	75	1.4	50	125
Norflurazon + Simazine	2.2 + 2.7	100			100
	1.7 + 2.0	75			75
	1.1 + 1.4	50	1.1 + 1.4	50	100
	1.7 + 2.0	75	1.1 + 1.4	50	125
	1.3 + 1.5	57	0.4 + 0.5	18	75
Oryzalin + Simazine	4.2 + 2.7	100			100
	3.2 + 2.0	75			75
	2.1 + 1.4	50	2.1 + 1.4		100
	3.2 + 2.0	75	2.1 + 1.4	50	125
	2.4 + 1.5	57	0.8 + 0.5	18	75

total weed populations. Cutleaf eveningprimrose (Oneothera laciniata) and fall panicum (Panicum dichotomiflorum) were the major weed species present; therefore, individual analysis was computed for only these two species. Other weeds present but in low populations were: crabgrass (Digitaria sanquinalis), tropic croton (Croton glandulosus), dandelion (Taraxacum officinale), Carolina geranium (Geranium carolinianum), carpetweed (Mollugo verticillata), horseweed (Erigeron canadensis), johnsongrass (Sorghum halepense), lambsquarter (Chenopodium album), Pennsylvania smartweed (Polygonum pensylvanicum), Virginia pepperweed (Lepidium virginicum), redroot pigweed (Amaranthus retroflexus), spiny pigweed (Amaranthus spinosus), nutsedge (Cyperus spp.), prostrate spurge (Euphorbia supina), yellow toadflax (Linaria vulgaris) and narrowleaf vetch (Vicia angustifolia).

Weed ratings were made once a month beginning in March and continuing through October. The method of rating was visual estimation expressed as percent of total ground covered by each weed species. For statistical analysis these values were converted to percent weed control based on the weedy control within a block.

Leaf samples (50 leaves per tree from the middle of current season's growth) were collected in July. Samples were washed in a liquinox solution, .1N HCl, and two deionized water rinses, then oven dried at 75^{o}C for 48 hours. Samples were ground to 20 mesh in a Wiley stainless steel mill, then stored in air-tight jars until analysis. Prior to analysis samples were redried at 80^{o}C for 24 hours then analyzed using standard methods for N by macro-Kjeldahl, P colormetrically and the other elements with atomic absorption spectroscopy. For statistical comparison only the 1X rates of each herbicide or combination and the check plots were used.

CHAPTER IV

RESULTS AND DISCUSSION

Cutleaf eveningprimrose was controlled equally well by all herbicides and tank mixes on May 11 when applied as a single 1X application (Table II). Norflurazon at 1.1 kg ai/ha or oryzalin at 2.1 kg ai/ha (0.5X concn.) did not effectively control cutleaf eveningprimrose by May 11. Other rates of individual herbicides or herbicide tank mixes were not significantly different from the single 1X application rates of each herbicide on May 11. On June 18, control of cutleaf eveningprimrose was significantly less using norflurazon at 2.2 kg ai/ha (1X concn.) than the other herbicides or tank mixes at single 1X concn. Oryzalin (1X), simazine (1X, 0.5X, 0.75X), norflurazon + simazine (1X, 0.75X, 0.5X, 0.6X) and oryzalin + simazine (1X, 0.75X, 0.5X, 0.6X) controlled cutleaf eveningprimrose equally well on June 18.

Control of fall panicum with oryzalin at all three rates was significantly lower than any of the other herbicides applied individually or as tank mixes at all rates on May 11 (Table III). By June 18, control with simazine at 1.4 kg ai/ha (0.5X concn.) and 2.1 kg ai/ha (0.75X concn.) was significantly lower than at 4.2 kg ai/ha (1X concn.). Norflurazon and both tank mixes were equally effective in controlling fall panicum at all rates on both June 18 and July 19.

Broadleaf weeds were controlled equally well at all rates by simazine and both tank mixes on May 11 and June 18 (Table IV). Control

TABLE II

THE INFLUENCE OF HERBICIDE AND RATE ON CUTLEAF EVENINGPRIMROSE (*Oenothera laciniata*) CONTROL

Herbicide	Rate (kg ai/ha)	% Weed Control May 11	% Weed Control June 18
Norflurazon	2.2	65 A[z]	19 A
	1.1 + 1.1	21 A	0 A
	1.7 + 1.1	58 A	0 A
Oryzalin	4.2	89 A	68 A
	2.1 + 2.1	25 B	34 A
	3.2 + 2.1	71 AB	21 A
Simazine	2.7	96 A	100 A
	1.4 + 1.4	100 A	100 A
	2.0 + 1.4	96 A	97 A
Norflurazon + Simazine	(2.2 + 2.7)	100 A	100 A
	(1.7 + 2.0)	91 A	98 A
	(1.1 + 1.4) (1.1 + 1.4)	96 A	92 A
	(1.7 + 2.0) (1.1 + 1.4)	93 A	100 A
	(1.3 + 1.5) (0.4 + 0.5)	82 A	92 A
Oryzalin + Simazine	(4.2 + 2.7)	96 A	100 A
	(3.2 + 2.0)	98 A	100 A
	(2.1 + 1.4) (2.1 + 1.4)	93 A	91 A
	(3.2 + 2.0) (2.1 + 1.4)	100 A	100 A
	(2.4 + 1.5) (0.8 + 0.5)	98 A	95 A

[z]Means within the same herbicide and date followed by the same letter are not significant at the 5% level. LSD .05 for comparison of herbicides at the same or different rates are 45.1, and 36.2 for May 11 and June 18, respectively.

[y]Split application applied March 13 and August 13, 1982.

TABLE III

THE INFLUENCE OF HERBICIDE AND RATE ON FALL PANICUM (Panicum dichotomitlorum) CONTROL

Herbicide	Rate (kg ai/ha)	% Weed Control		
		May 11	June 18	July 19
Norflurazon	2.2	99 A[z]	98 A	88 A
	1.1 + 1.1	91 A	93 A	66 A
	1.7 + 1.1	100 A	98 A	84 A
Oryzalin	4.2	58 A	74 A	75 A
	2.1 + 2.1	55 A	51 B	27 B
	3.2 + 2.1	53 A	61 AB	42 B
Simazine	2.7	91 A	90 A	40 A
	1.4 + 1.4	84 A	64 B	7 B
	2.1 + 1.4	83 A	70 B	29 AB
Norflurazon + Simazine	(2.2 + 2.7)	100 A	99 A	96 A
	(1.7 + 2.0)	100 A	98 A	97 A
	(1.1 + 1.4) (1.1 + 1.4)	100 A	97 A	91 A
	(1.7 + 2.0) (1.1 + 1.4)	100 A	99 A	93 A
	(1.3 + 1.5) (0.4 + 0.5)	99 A	99 A	94 A
Oryzalin + Simazine	(4.2 + 2.7)	98 A	98 A	92 A
	(3.2 + 2.0)	98 A	95 A	89 A
	(2.1 + 1.4) (2.1 + 1.4)	90 A	92 A	81 A
	(3.2 + 2.0) (2.1 + 1.4)	98 A	99 A	93 A
	(2.4 + 1.5) (0.8 + 0.5)	87 A	88 A	74 A

[z]Means within the same herbicide and date followed by the same letter are not significant at the 5% level. LSD .05 for comparison of herbicides at the same or different rates are 17.0, 16.3 and 31.1 for May 11, June 18 and July 19, respectively.

[y]Split application applied March 13 and August 13, 1982.

TABLE IV

THE INFLUENCE OF HERBICIDE AND RATE ON BROADLEAF WEED CONTROL

Herbicide	Rate (kg ai/ha)	% Weed Control				
		May 11	June 18	July 19	Sept. 21	Oct 19
Norflurazon	2.2	56 A[z]	31 A	0 A	33 A	25 A
	1.1 + 1.1	47 A	21 A	0 A	67 A	72 B
	1.7 + 1.1	66 A	22 A	0 A	59 A	69 B
Oryzalin	4.2	73 A	53 A	81 B	66 A	75 A
	2.1 + 2.1	46 A	24 A	33 A	77 A	83 A
	3.2 + 2.1	54 A	34 A	59 AB	100 A	100 A
Simazine	2.7	92 A	97 A	43 A	96 A	91 A
	1.4 + 1.4	98 A	71 A	30 A	100 A	100 A
	2.1 + 1.4	86 A	78 A	21 A	100 A	100 A
Norflurazon + Simazine	(2.2 + 2.7)	100 A	95 A	49 B	100 B	72 A
	(1.7 + 2.0)	78 A	95 A	19 AB	44 A	100 A
	(1.1 + 1.4) (1.1 + 1.4)	96 A	84 A	12 A	100 B	75 A
	(1.7 + 2.0) (1.1 + 1.4)	94 A	100 A	28 AB	100 B	100 A
	(1.3 + 1.5) (0.4 + 0.5)	87 A	91 A	22 AB	100 B	100 A
Oryzalin + Simazine	(4.2 + 2.7)	96 A	100 A	98 A	62 A	100 B
	(3.2 + 2.0)	93 A	100 A	100 A	66 A	47 A
	(2.1 + 1.4) (2.1 + 1.4)	95 A	94 A	89 A	100 A	100 B
	(3.2 + 2.0) (2.1 + 1.4)	100 A	100 A	100 A	100 A	100 B
	(2.4 + 1.5) (0.8 + 0.5)	93 A	86 A	94 A	100 A	100 B

[z] Means within the same herbicide and date followed by the same letter are not significant at the 5% level. LSD .05 for comparison of herbicides at the same or different rates are 33.6, 31.1, 36.2, 38.4 and 42.2 for May 11, June 18, July 19, Sept. 21 and October 19, respectively.

[y] Split application applied March 13 and August 13, 1982.

with oryzalin at 4.2 kg ai/ha (1X concn.) equalled that of simazine at 2.7 kg ai/ha (1X concn.) and both tank mixes at the 1X concn. on May 11 only. By July 19 control with oryzalin + simazine at all rates and oryzalin at 4.2 kg ai/ha (1X concn.) was significantly higher than control with norflurazon, simazine and norflurazon + simazine.

Control of broadleaf weeds with norflurazon + simazine at 1.7 and 2.0 kg ai/ha, respectively (0.75X concn.) was significantly lower than all other rates of the same tank mix on September 21. On October 19, control with norflurazon at 2.2 kg ai/ha (1X concn. single application) and oryzalin + simazine at 3.2 and 2.0 kg ai/ha (0.75X concn. single application) was significantly lower than other rates within the respective herbicides. Oryzalin and simazine at 1X single application and each tank mix at 1X single and .75X split application controlled weeds equally well on September 21 and October 19.

Grass weeds were controlled equally well by norflurazon, simazine and both tank mixes at all rates on May 11 (Table V). By June 18, control with simazine at 1.4 kg ai/ha (1X concn. split) was significantly less than control with 2.8 kg ai/ha (1X concn. single application). Control with oryzalin at 4.2 kg ai/ha (1X concn. single application) had increased from the previous month and was significantly higher than the other concentrations of that herbicide. Oryzalin or simazine at 4.2 and 2.7 kg ai/ha, respectively (1X concn.) and both tank mixes at all rates controlled grass weeds equally well on June 18. By July 19 control with simazine at the 1X concn. was significantly less than with other herbicides at the 1X concn. Norflurazon and both tank mixes controlled grass weeds equally well at 0.5X concn. and higher.

TABLE V

THE INFLUENCE OF HERBICIDE AND RATE ON GRASS WEED CONTROL

Herbicide	Rate (kg ai/ha)	% Weed Control May 11	June 18	July 19
Norflurazon	2.2	99 A	97 A	89 A
	1.1 + 1.1	87 A	93 A	70 A
	1.7 + 1.1	100 A	98 A	86 A
Oryzalin	4.2	56 A	73 B	79 B
	2.1 + 2.1	51 A	47 A	40 A
	3.2 + 2.1	52 A	61 AB	51 AB
Simazine	2.7	92 A	89 B	48 B
	1.4 + 1.4	82 A	54 A	11 A
	2.1 + 1.4	82 A	69 AB	27 A
Norflurazon + Simazine	(2.2 + 2.7)	100 A	99 A	95 A
	(1.7 + 2.0)	100 A	98 A	96 A
	(1.1 + 1.4) (1.1 + 1.4)	100 A	96 A	84 A
	(1.7 + 2.0) (1.1 + 1.4)	100 A	99 A	92 A
	(1.3 + 1.5) (0.4 + 0.5)	99 A	99 A	93 A
Oryzalin + Simazine	(4.2 + 2.7)	97 A	97 A	93 A
	(3.2 + 2.0)	98 A	95 A	91 A
	(2.1 + 1.4) (2.1 + 1.4)	90 A	92 A	85 A
	(3.2 + 2.0) (2.1 + 1.4)	96 A	99 A	95 A
	(2.4 + 1.5) (0.8 + 0.5)	89 A	89 A	80 A

[z]Means within the same herbicide and date followed by the same letter are not significant at the 5% level. LSD .05 for comparison of herbicides at the same or different rates are 19.4, 18.5 and 19.8 for May 11, June 18 and July 19, respectively.

[y]Split application applied March 13 and August 13, 1982.

Total weeds (all broadleaf and grass weeds) were controlled equally well by all herbicides excluding oryzalin on May 11 when applied as a single 1X application (Table VI). Control with norflurazon at 1.4 kg ai/ha (0.5X concn.) was equal to control with simazine at 1.7 kg ai/ha (0.5X concn.), but was significantly less than norflurazon + simazine at 2.8 and 3.4 kg ai/ha, respectively (0.5X concn.) and oryzalin + simazine at 5.6 and 3.4 kg ai/ha, respectively (0.5X concn.). On June 18 control with all herbicides excluding oryzalin was still equal at the 0.5X concn. Control with norflurazon, oryzalin and simazine at the 0.5X concn. was significantly less than control with either tank mix at the 0.5X concn. By July 19, control with norflurazon and simazine at all concentrations was significantly less than control with oryzalin and both tank mixes at all concentrations except norflurazon + simazine at the 0.5X concn.

On September 21, oryzalin, simazine and both tank mixes were controlling total weeds equally well at all rates. By October 19, oryzalin + simazine at 3.2 and 2.0 kg ai/ha, respectively (.75X concn. single application) was failing to control total weeds equally well at all rates on October 19.

Leaf N and P concentrations were less in the weedy plots than the paraquat weeded and preemergence herbicide treated plots (Table VII). Leaf Ca and Mg concentrations were higher in the weedy plots than most herbicide treated plots. Leaf concentrations of K, Zn and Fe were not affected by herbicide treatment, and the effect on leaf Mn concentration was erratic. These data suggest that weed competition reduces N availability to the tree. Leaf Ca and Mg concentrations were greater in weedy plots; however more study is needed before an explanation of this action can be offered.

TABLE VI

THE INFLUENCE OF HERBICIDE AND RATE ON TOTAL WEED CONTROL

Herbicide	Rate (kg ai/ha)	% Weed Control				
		May 11	June 18	July 19	Sept. 21	Oct. 19
Norflurazon	2.2	90 B[z]	83 A	56 A	33 A	37 A
	1.1 + 1.1	72 A	73 A	36 A	63 AB	69 B
	1.7 + 1.1	89 B	80 A	54 A	68 B	69 B
Oryzalin	4.2	66 B	72 B	81 B	77 A	91 A
	2.1 + 2.1	46 A	44 A	42 A	91 A	90 A
	3.2 + 2.1	59 AB	51 AB	50 A	100 A	100 A
Simazine	2.7	93 A	90 B	49 B	96 A	91 A
	1.4 + 1.4	87 A	64 A	18 A	100 A	100 A
	2.1 + 1.4	87 A	73 AB	26 A	100 A	100 A
Norflurazon + Simazine	(2.2 + 2.7)	100 A	98 A	89 B	100 A	72 A
	(1.7 + 2.0)	98 A	98 A	85 AB	80 A	100 B
	(1.1 + 1.4) (1.1 + 1.4)	99 A	94 A	65 A	100 A	75 AB
	(1.7 + 2.0) (1.1 + 1.4)	98 A	99 A	85 AB	100 A	100 A
	(1.3 + 1.5) (0.4 + 0.5)	94 A	97 A	79 AB	100 A	100 A
Oryzalin + Simazine	(4.2 + 2.7)	97 A	98 A	93 A	83 A	100 B
	(3.2 + 2.0)	98 A	96 A	91 A	71 A	47 A
	(2.1 + 1.4) (2.1 + 1.4)	91 A	93 A	85 A	100 A	100 B
	(3.2 + 2.0) (2.1 + 1.4)	98 A	99 A	95 A	100 A	100 B
	(2.4 + 1.5) (0.8 + 0.5)	90 A	90 A	80 A	100 A	100 B

[z]Means within the same herbicide and date followed by the same letter are not significant at the 5% level. LSD .05 for comparison of herbicides at the same or different rates are 15.9, 16.3, 20.2, 32.7 and 26.9 for May 11, June 18, July 19, Sept. 21 and Oct. 19, respectively.

[y]Split application applied March 13 and August 13, 1982.

TABLE VII

THE INFLUENCE OF HERBICIDE TREATMENT ON LEAF ELEMENTAL CONCENTRATION OF 'TOPAZ' PEACH

	% Dry Weight					µg/g Dry Weight		
Treatment	N	P	K	Ca	Mg	Zn	Fe	Mn
				1982				
Clean Control	3.40 B[z]	0.24 B	2.40 A	1.03 AB	0.30 A	31 A	79 A	130 AB
Weedy Control	2.90 A	0.19 A	2.26 A	1.23 C	0.37 B	39 A	88 A	129 AB
Simazine	3.41 B	0.23 B	2.43 A	0.91 A	0.29 A	35 A	84 A	113 A
Norflurazon	3.36 B	0.23 B	2.39 A	1.01 AB	0.31 A	34 A	83 A	118 A
Oryzalin	3.36 B	0.22 B	2.37 A	1.09 BC	0.31 A	39 A	88 A	150 B
Norflurazon + Simazine	3.68 C	0.24 B	2.23 A	0.94 AB	0.29 A	36 A	78 A	126 AB
Oryzalin + Simazine	3.64 C	0.24 B	2.28 A	0.99 AB	0.29 A	39 A	80 A	111 A

[z]Means followed by the same letter are not significantly different, by Duncan's multiple range test, 5% level.

Herbicides used in this experiment caused no visible phytotoxicity to the young peach trees.

CHAPTER V

SUMMARY AND CONCLUSIONS

Weed control is an essential prerequisite to tree survival, vigorous growth, earlier production and large fruit size. The use of herbicides can provide this means of control. Many herbicides are labeled for use in home and commercial orchards.

The objectives of this study were:

(1) Evaluate three herbicides; norflurazon, simazine and oryzalin; plus tank mixes of norflurazon + simazine and oryzalin + simazine for preemergence weed control in peach.

(2) Determine the advantages of split applications of each herbicide or tank mix over "normal" single application in the spring.

Cutleaf eveningprimrose was controlled equally well through June 18 by simazine and both tank mixes at the 0.5X concn. and higher. Oryzalin was not acceptable in controlling cutleaf eveningprimrose and norflurazon failed to control this species.

Fall panicum was controlled equally well through July 19 with norflurazon and both tank mixes at the 0.5X concentration and higher. Simazine at all rates gave good control in early spring but was failing to control fall panicum by mid summer.

Norflurazon as a control for broadleaf weeds was unacceptable. The best season-long control for broadleaf weeds was oryzalin + simazine using a single 1X concentration. Oryzalin, simazine, and norflurazon + simazine were intermediate in control of the broadleaf weeds.

Simazine as a control for grass weeds through July 19 was unacceptable. Equally good control of grass weeds was obtained from norflurazon and both tank mixes at the 0.5X concentration and higher.

Norflurazon as a season-long control for the total weed population was the least acceptable herbicide. Oryzalin and simazine at all concentrations gave good end-of-season control. The best season-long control of the total weed population was obtained from either tank mix at all rates except oryzalin + simazine at the 0.75X concn. split.

Results from this study indicate that better than 90% season-long control of the total weed population was obtained with norflurazon + simazine using a single or split 0.75X concentration and a single or split 1X concentration. Significant control of the total weed population was also obtained with oryzalin using a single 1X concentration and norflurazon using a single 1.25X concentration.

Split herbicide applications reduce the amount of active ingredient exposed to "weathering" at one time. It was therefore theorized that the effective weed control of the herbicide would be lengthened by split applications. However, under conditions of soil type and rainfall existing in this experiment, it was determined that there was no advantage to the split applications over the "normal" single application in the spring. Single applications afford equally good weed control while offering the grower the distinct advantage of less time spent in actual physical deployment of the herbicide and therefore lower labor and equipment costs.

Tests showed that leaf N and P concentrations were higher in trees from herbicide treated plots and clean control plots than in weedy control plots. This data suggests that N availability to the tree is reduced by weed competition. Leaf Ca and Mg concentrations were greater in weedy control plots than in herbicide treated plots. Concentrations of K, Zn and Fe were not affected by herbicide treatment.

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VITA 2

Lynn Ann Hughes

Candidate for the Degree of

Master of Science

Thesis: WEED CONTROL IN PEACHES USING NORFLURAZON, ORYZALIN AND SIMAZINE

Major Field: Horticulture

Biographical:

Personal Data: Born in Oklahoma City, Oklahoma, February 7, 1945. Married Joe H. Hughes, June, 1973.

Education: Graduated from Edmond High School, Edmond, Oklahoma, in May, 1963; received Bachelor of Science Degree with a major in Home Economics Education from Oklahoma State University in May, 1968; received Bachelor of Science degree in Horticulture from Oklahoma State University in May, 1980; completed requirements for the Master of Science Degree in Horticulture at Oklahoma State University in May, 1984.

Professional Experience: Home Service Advisor, Texas Power and Light, Nacogdoches, Texas, 1968-1969; Home Economics teacher, Oklahoma City Public School System, 1969-1973; Graduate Teaching Assistant, Department of Horticulture and Landscape Architecture, Oklahoma State University, Fall, 1983 and Spring, 1984.