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## Field Evaluation of Herbicides on Small Fruit, Vegetable, and Ornamental Crops, 1996

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# **FIELD EVALUATIONS OF HERBICIDES ON SMALL FRUIT, VEGETABLE AND ORNAMENTAL CROPS, 1996**

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## **INTRODUCTION**

**F**ield evaluations of herbicides provide the chemical industry, government agencies such as IR-4, and the Arkansas Agricultural Experiment Station with an evaluation of herbicide performance on small fruit, vegetable and ornamental crops grown under Arkansas conditions. This report also provides a means for disseminating information to interested private and public service weed scientists.

Experiments at the Main Experiment Station in Fayetteville were conducted on strawberry, raspberry, summer squash, tomato, watermelons, cantaloupe, southern pea, sweet potatoes and ornamentals. At the Vegetable Substation near Kibler, experiments were conducted on spinach, fall greens and watermelon. A snapbean trial was conducted on a private farm near Stark City, MO.

The chemical names and formulations of the herbicides used in these experiments are listed in Appendix Table 1. A table for converting metric units to English units can be found on page 32.

At the Main Experiment Station, Fayetteville, trials were conducted on a Captina silt loam with 1 to 2% organic matter and pH of 5.9. Soil at Stark City, MO, was a silt loam with 1.5% organic matter and pH of 6.5. At the Vegetable

Substation at Kibler, trials were conducted on a Roxana silt loam with 1% organic matter and pH of 6.9. Unless stated otherwise, the experimental design for all experiments was a randomized complete block with four replications. Pre-plant-incorporated, preemergence and postemergence treatments were applied in 187 L/ha of water. Liquid herbicides were applied with a hand-held, carbon-dioxide pressurized sprayer.

Treatments involving timing and incorporation were (1) preplant incorporated (PPI), applied to the soil and incorporated prior to planting; (2) preemergence (PRE), applied to the soil surface soon after planting; (3) cracking (CRAC), applied 3-5 days after planting prior to emergence; (4) over-the-top of transplants preemergence to weeds (POST-TP); (5) postemergence (POST), applied over-the-top to emerged crops and weeds at various stages—determined either by days after planting or by crop and weed growth stage; (6) early postemergence (EPOST) applied over-the-top of the crop 3 wk after emergence; and (7) late postemergence (LPOST) applied over-the-top of the crop in the spring after a fall planting. The following environmental conditions were recorded for each application: air temperature (C); soil temperature (C) at 8 cm deep; soil surface moisture as wet, moist or dry; and percent relative humidity (RH).

Percentage of weed control by species was visually estimated: 0 represents no effect, and 100 represents complete control. Ranges for weed control are as follows: 70 to 79%, fair; 80 to 89%, good; and 90 to 100%, excellent. Weed control less than 70% is considered to be poor. Crop injury was assessed by visual estimation of percent injury: 0 represents no effect, and 100 represents complete plant kill. Crop injury ratings of less than 30% indicate crop tolerance. Crop yields are reported in metric tons per hectare. Least Significant Difference (LSD) values at the 0.05 level of significance were calculated for each set of treatment means.

Climatological data for 1996 for the Main Experiment Station at Fayetteville are presented in Appendix Table 2 and for the Vegetable Substation at Kibler in Appendix 3. Standardized Plant (Bayer) Codes as recognized by the Weed Science Society of America for weeds appearing in this report are presented in Appendix Table 4.

## METHODS AND RESULTS

Pertinent experimental details and a brief discussion of the results of these studies follow, and tabulated results are shown in Tables 1 to 14. The following abbreviations are used in the tables: cm, centimeter; COC, crop oil concentrate; cv, cultivar; DAT, days after treatment; fb, followed by; kg/ha, kilograms active ingredient per hectare; NS, not significant; pl, plants; TM, tank mix; V2, first trifoliate stage of legume; var, variety; v/v, volume per volume; WA, wetting agent; WAE, weeks after emergence; WAP, weeks after planting, and wk, week(s).



**Snapbeans (*Phaseolus vulgaris*), Stark City, Missouri (Table 1).**

Snapbeans (cv. Garden Green Roma II) were planted in plots 3 by 6 m with four rows spaced 75 cm apart on May 3, 1996. PPI and PRE treatments were applied the same day (air 25 C; soil 25 C, moist; RH 69%). Cracking treatments were applied May 10, 1996 (air 28 C; soil 23 C, moist; RH 75%). POST treatments were applied at the V2 growth stage on May 21, 1996 (air 26 C; soil 21 C, moist; RH 68%). Ratings were taken for weed control and crop injury 7 WAP. Plots were harvested 9 WAP on June 26, 1996.

Common ragweed and johnsongrass were the most predominant and competitive weeds in the experiment. All treatments provided excellent control of common ragweed except sulfentrazone at any timing or rate; 1.12 kg/ha metolachlor PRE; 0.56 kg/ha clomazone PPI or PRE; and 0.56 kg/ha trifluralin PPI fb 0.034 kg/ha imazethapyr alone or in combination with 0.42 kg/ha bentazon POST. The only treatments providing >70% control of johnsongrass were 0.28 kg/ha sulfentrazone PRE and 0.56 kg/ha trifluralin PPI fb 0.034 kg/ha imazethapyr alone or in combination with 0.42 kg/ha bentazon POST. All treatments gave good to excellent control of pigweed, common lambsquarters and velvetleaf (data not shown for lambsquarters and velvetleaf). Applications of 1.12 kg/ha clomazone PPI and 0.28 or 0.56 kg/ha sulfentrazone applied either PPI or PRE reduced snapbean stand and yields. Treatments in which snapbean yield was equivalent to the hand-weeded check included 1.12 kg/ha clomazone PRE; 1.12 kg/ha metolachlor PRE + 0.14 kg/ha fomesafen at cracking; 0.56 kg/ha trifluralin PPI fb 0.035 kg/ha imazethapyr POST; 0.56 kg/ha trifluralin PPI fb 0.56 kg/ha bentazon + 0.21 kg/ha fomesafen POST; 0.56 kg/ha trifluralin fb 0.035 kg/ha imazethapyr + 0.42 kg/ha bentazon POST; and 0.42 kg/ha bentazon + 0.21 kg/ha fomesafen + 0.22 kg/ha sethoxydim POST.

**Fall Spinach (*Spinachia oleracea*), Kibler (Table 2).**

Spinach (cv. Fall Green) was planted October 5, 1995, in plots 1.3 by 5 m with six rows spaced 20 cm apart. PPI and PRE treatments were applied the same day (air 17 C; soil 17 C, moist; RH 70%). POST treatments were applied October 26, 1995 (air 22 C; soil 21 C, moist; RH 78%). Plots were harvested April 30, 1996.

Metolachlor at 1.12 or 2.24 kg/ha PRE; cycloate 2.24 kg/ha PPI fb metolachlor 0.84 kg/ha PRE; and 0.28 kg/ha phenmedipham tank-mixed with 1.12 kg/ha metolachlor POST gave excellent control of all weeds present including annual bluegrass, sibara, shepherdspurse and henbit. POST applications of 2.24 kg/ha chlorpropham alone or tank-mixed with 0.28 kg/ha Betamix (desmedipham + phenmedipham 1:1 ratio) were also very effective in controlling the weed spectrum present. Tank-mixing chlorpropham with phenmedipham at 0.28 kg/ha POST or 0.28 kg/ha desmedipham POST provided very good to excellent control of the weed species present, with the exception of henbit, as compared to

phenmedipham or desmedipham alone. Postemergence applications of clopyralid at all rates did not control any weeds present in the experiment except when used as a follow-up POST treatment to 0.84 kg/ha metolachlor PRE, which controlled annual bluegrass and henbit. Cycloate alone or tank-mixed with metolachlor and chlorpropham alone or tank-mixed with phenmedipham caused moderate injury to spinach at 5 WAP, but injury was only slight when evaluated at 18 WAP. Metolachlor at 2.24 kg/ha PRE produced the highest yield of 25.1 mt/ha.

### **Fall Greens (*Brassica* spp.), Kibler (Table 3).**

Greens [kale (*Brassica oleracea*), turnip (*Brassica rapa*) and mustard (*Brassica juncea*)] were planted April 8, 1996, in plots 1.2 by 4.5 m in rows spaced 27 cm apart. PPI and PRE treatments were applied the same day (air 17 C; soil 16 C, moist; RH 64%). POST treatments were applied May 9, 1996 (air 22 C; soil 20 C, moist; RH 72%). Ratings were taken 6, 7 and 8 WAP. Mustard and turnip greens were harvested and stand counts taken 8 WAP on May 30, 1996. Kale was harvested and stand counts taken 10 WAP on June 14, 1996.

Metolachlor at 2.24 kg/ha PRE provided good control of common purslane, but control was poor with 1.12 kg/ha PRE. Both rates of metolachlor, 1.12 and 2.24 kg/ha, applied PRE gave excellent control of barnyardgrass. Pendimethalin at 0.75 kg/ha PPI provided excellent control of both common purslane and barnyardgrass, but when applied PRE, poor control of both weeds was observed. Oxyfluorfen 0.22 kg/ha PRE provided good control of common purslane but only fair control of barnyardgrass. POST treatments of pyridate at 0.5 and 1 kg/ha provided good to excellent control of common purslane and fair to good control of barnyardgrass depending on rate. Trifluralin 0.5 kg/ha PPI fb clopyralid 0.5 or 1 kg/ha provided good control of common purslane and barnyardgrass by 7 WAP. DCPA at 9 kg/ha PRE fb 0.11 kg/ha clethodim POST or 0.22 kg/ha sethoxydim POST provided excellent season-long control of both common purslane and barnyardgrass. Treatments including pendimethalin 0.75 kg/ha PRE or oxyfluorfen 0.22 kg/ha PRE caused substantial injury to all greens resulting in significant yield and stand reductions. Turnip greens and kale were very susceptible to 2.24 kg/ha metolachlor PRE resulting in reduced yields and stands, as well.

### **Sweet Potatoes (*Ipomoea batatas*), Fayetteville (Table 4).**

Sweet potatoes (cv. Beurogard) were planted July 6, 1996, in plots 2 by 8 m with two rows spaced 1 m apart. PRE treatments were applied the same day (air 33 C; soil 30 C, moist; RH 83%). Pre-harvest ratings were taken 8 WAP for weed control and crop injury. Plots were harvested on September 2, 1996.

Alachlor 2.8 kg/ha PRE provided excellent control of all weed species present in the experiment. Yellow nutsedge was the only weed that escaped control from 1.12 kg/ha clomazone PRE. DCPA 11.2 kg/ha PRE provided fair control of Palmer

amaranth and yellow nutsedge and excellent control of the remaining weed species. Pendimethalin 1.12 kg/ha PRE provided excellent control of common lambsquarters, barnyardgrass, goosegrass and Palmer amaranth and good control of smooth crabgrass and yellow nutsedge. No injury was evident at 11 wk from any treatment. Sweet potato yield from herbicide plots was significantly greater than the yield from the untreated check, with plants in clomazone plots yielding significantly more than other herbicide plots.

**Control of Yellow Nutsedge in Southern Pea [*Vigna unguiculata* (L.) Walp.] Using Metolachlor at Different Application Times, Fayetteville (Table 5).**

Southern peas (cv. Coronet) were planted in 2- by 3-m plots with three rows per plot and rows spaced 50 cm apart. Prior to planting the peas, the entire area was sprayed with 3.48 L/ha paraquat (air 18 C; soil 13 C, dry; RH 60%). Applications of metolachlor were applied February 26 (air 25 C; soil 18 C, moist; RH 95%), April 30 (air 17 C; soil 18 C, moist; RH 70%) and day of planting (air 31 C; soil 31 C, dry; RH 95%).

Yellow nutsedge was the most predominant and competitive weed species in all plots. All applications of metolachlor applied in June provided good control of yellow nutsedge. Earlier applications of metolachlor without a follow-up treatment did not provide good weed control. Metolachlor did not show a significant amount of injury at any rate or application time.

**Yellow Nutsedge (*Cyperus esculentus*) Control in Southern Peas [*Vigna unguiculata* (L.) Walp.], Fayetteville (Table 6).**

Southern peas (cv. Coronet) were planted June 21, 1996, in plots 2 by 3 m with 3 rows spaced 50 cm apart. PPI and PRE treatments were applied the same day (air 37 C; soil 37 C, moist; RH 90%). Cracking treatments were applied June 25, 1996 (air 31 C; soil 36 C, moist; RH 79%). POST treatments were applied July 13, 1996 (air 38 C; soil 28 C, moist; RH 88%). Plots were harvested September 3, 1996.

Bentazon is the only herbicide currently labeled for yellow nutsedge control in southern peas that provided effective control. Metolachlor + fomesafen at cracking provided poor control of yellow nutsedge with significant crop injury. Overall, sulfentrazone provided good control of yellow nutsedge with slight injury to southern peas. The PRE applications of sulfentrazone provided better weed control and less injury to southern peas than did PPI treatments. Halosulfuron applied POST provided excellent control of yellow nutsedge at 0.42 and 0.21 kg/ha. It caused crop injury following treatment, but the crop recovered and yield was not affected.

### **Summer Squash (*Cucurbita pepo* L.) Study for Yellow Nutsedge Control, Fayetteville (Table 7).**

Squash seeds (cv. Dixie, Hybrid) were planted May 24 in 2- by 3.5-m plots with one row per plot. PRE treatments were applied the same day (air 27 C; soil 26 C, dry; RH 70%) and POST were applied June 21 (air 37 C; soil 37 C, moist; RH 90%). Yellow nutsedge control and crop injury evaluations were made 3, 5, 7 and 9 WAP. Plots were harvested four times throughout the growing season.

Yellow nutsedge was by far the most predominant and competitive weed in the test plots. All rates of halosulfuron POST and 0.053 kg/ha applied PRE provided good control of yellow nutsedge by 9 WAP. PRE applications of sulfentrazone also provided fair suppression of yellow nutsedge, but PRE applications of bensulide provided very poor control.

PRE applications of sulfentrazone caused significant injury to the squash throughout the growing season. PRE and POST applications of halosulfuron caused no significant injury to the squash.

### **Mixed Cover Crops for Tomato (*Lycopersicon esculentum* Mill.), Fayetteville (Table 8).**

'Mt. Spring' tomatoes were transplanted into plots with mixed cover crops of rye plus vetch and wheat plus vetch, black plastic and without cover at 24 plants per plot on May 10, 1996. Tomato plants were staked, fertilized as recommended and drip irrigated.

The total number of tomato fruits and the average fruit weight per plant were similar in plots with mixed cover crops and no cover but were significantly reduced in plots with black plastic. Tomatoes were planted on flat beds causing inefficient drainage under the plastic mulch. This led to reduced growth and increased plant mortality from soil-borne diseases in plots with black plastic.

### **Primocane Suppression in Raspberries (*Rubus idaeus* L.), Fayetteville (Table 9).**

Pre-established raspberry (cv. Autumn Bliss) plots were 1 by 3 m with 1 row. POST treatments were applied to 15-cm primocanes on May 16, 1996 (air 23 C; soil 19 C, moist; RH 77%) and 14 days later to 22-cm primocanes on May 30, 1996 (air 21 C; soil 17 C, moist; RH 71%). The standard included a mowing treatment that was performed on the same dates as the herbicide applications. Evaluations of raspberry injury and primocane suppression were taken at 1, 2, 3, 4 and 5 wk after EPOST.

Two POST applications of 1.12 kg/ha lactofen suppressed primocanes initially, but primocane regrowth was evident at 5 wk. Two applications of 2.24 kg/ha lactofen provided excellent primocane suppression throughout 5 wk and only slightly injured the raspberries. All raspberry yields were significantly greater than the untreated check. Lactofen 2.24 kg/ha produced yields that were not

significantly different from the standard.

**Strawberry (*Fragaria x ananassa*), Fayetteville (Table 10).**

Strawberry plots (cv. Chandler) were established in the fall of 1995. Each plot contained two beds, 0.6 m wide by 2.3 m long, with 30 plants/plot. Fall broadleaf treatments were applied November 8, 1995 (air 11 C; soil 14 C, wet; RH 65%). Rye was planted in the appropriate plots on September 29, 1995, at a rate of 70 kg/ha. Sethoxydim was applied on March 10, 1996 (air 5 C; soil 5 C, wet; RH 72%).

Weeds were hand removed from treatments without black plastic (one and four) on April 5, 1996, because of the extreme level of competition. Liquid nitrogen was applied to all plots at 6.7 kg/ha through a drip irrigation system on a weekly basis beginning April 6, 1996. Strawberry harvest began on June 9, 1996, and continued at two- to three-day increments until June 26, 1996. The first four harvests were combined and evaluated for early yield potential. Total yield was also evaluated, and final stand counts were recorded on June 26, 1996.

Overall weed control was best in the black plastic + rye treatment. This treatment gave good weed control in the middles due to the allelopathic activity of the rye. This allelopathy remained for two to three wk after desiccation of the rye with sethoxydim. The no-plastic, no-herbicide treatment had a heavy infestation of weeds throughout the time of the study except when hand weeded. The foliage from these weeds provided some mulch, which insulated the plants from the extreme 1995-96 winter. Strawberry stand loss was highest in the no-plastic + herbicide treatment because the strawberry plants were exposed to more intense cold conditions. Significant stand count differences were noticed between treatments with and without black plastic. Those transplants placed in the plastic recovered faster from the shock of transplanting and were able to establish shoot and root growth before the first freeze.

Yield was lower than expected due to stand reduction and injury experienced from the cold winter and spring. The black plastic + rye treatment had the best early yield potential, and the yield of 892 kg/ha was significantly higher than all other treatments. The treatment of black plastic followed by herbicides had good initial growth, but yield was reduced due to the regrowth of weeds surrounding the plastic. The early yield potential of this treatment may have been comparable to the plastic + rye treatment if herbicides having residual activity had been used in the strawberry weed control system.

Total yield was also significantly higher with the black plastic + rye treatment. Plant mortality along with severe weed competition caused the treatments without plastic to yield considerably less than those with plastic.

### **Weed Control in Watermelon (*Citrullus lanatus*) Using Bensulide (Prefar), Kibler (Table 11).**

Watermelon seeds (cv. Crimson Sweet) were planted May 9 in plots 3.5 by 9 m with one row per plot. PRE and PPI treatments were applied the same day (air 22 C; soil 22 c, moist; RH 63%). PRE applications were immediately followed by irrigation with 0.64 cm of water. Evaluations for weed control were made at 1, 2, 4 and 8 WAE. Plots were harvested 12 WAE on August 13.

The predominant weed species were goosegrass, johnsongrass and eclipta. Overall, bensulide at both rates was more effective when applied PRE and immediately irrigated than when applied PPI. Both rates of bensulide PRE plus irrigation provided fair to good control of all weed species up to 4 WAE. By 8 WAE, control of all weeds was poor.

### **Watermelon (*Citrullus lanatus*) Study for Yellow Nutsedge Control, Fayetteville (Table 12).**

Watermelon seeds (cv. Crimson Sweet) were planted on May 24 in 2- by 3.5-m plots with one row per plot. PRE treatments were applied the same day (air 27 C; soil 26 C, dry; RH 70%) and POST treatments were applied June 21 (air 37 C; soil 37 C, moist; RH 90%). Yellow nutsedge control and crop injury evaluations were made 3, 5, 7 and 9 WAP. Plots were harvested 12 wk after planting on August 20.

Yellow nutsedge was the most predominant and competitive weed in the test plots. All rates of halosulfuron applied PRE and POST provided fair control of yellow nutsedge throughout the nine weeks. PRE applications of sulfentrazone provided suppression of yellow nutsedge and PRE applications of bensulide provided very poor control.

PRE applications of sulfentrazone caused significant injury to watermelon early in the season; however, the watermelons overcame this injury to produce good yields. PRE and POST applications caused no significant injury to the watermelons.

### **Cantaloupe (*Cucumis melo*) Study for Yellow Nutsedge Control, Fayetteville (Table 13).**

Cantaloupe seeds (cv. Mission, Hybrid) were planted on May 24 in 2- by 3.5-m plots with one row per plot. PRE treatments were applied the same day (air 26 C; soil 25 C, dry; RH 70%) and POST treatments were applied June 21 (air 37 C; soil 37 C, moist; RH 90%). Yellow nutsedge control and crop injury evaluations were made 3, 5, 7 and 9 WAP. Plots were harvested 12 WAP on August 20.

Yellow nutsedge was the most predominant and competitive weed in the test plots. All of the rates of halosulfuron applied PRE provided good control of yellow nutsedge through the nine weeks. PRE applications of sulfentrazone pro-

vided suppression of yellow nutsedge and PRE applications of bensulide provided very poor control.

PRE applications of sulfentrazone caused a significant amount of injury to the cantaloupe early in the season; this injury continued to be significant throughout the entire growing season. PRE and POST applications of halosulfuron caused no significant injury to the watermelons.

**Foxglove (*Digitalis purpurea*): Evaluation of Various Herbicides Applied Three Weeks After Transplanting, Fayetteville (Table 14).**

Foxglove plants were transplanted on July 25 into 15-cm plastic pots. Sunshine Potting Soil Mix™ was used as the growing medium. Plot size was one pot, with one plant per pot.

All herbicides were applied POST on August 12 (air 26 C; soil 31 C, moist; RH 80%), and those that required a second application were treated on October 7 (air 23 C; soil 23 C, moist; RH 55%). Sprayable formulations were applied using a laboratory spray chamber. Granular oxyfluorfen + oryzalin was applied using a shaker jar applicator. The foxglove were 5 cm tall at the time of first application and 8 cm tall at the time of second application.

There were no weeds present in any of the plots during the experiment. Napropamide and oxyfluorfen + oryzalin caused moderate injury on the foxglove at all rates. Isoxaben and oxadiazon caused severe injury and ultimately killed the foxglove even at low rates. Metolachlor caused moderate stunting at the 3.4 and 6.7 kg/ha rates and severe injury at the 13.4 kg/ha rate.

Table 1. Evaluation of herbicides in snapbeans, Stark City, MO, 1996.

Treatment (kg ai/ha)	Wed control											Effect			
	A M B E L					S E T A F					S O R H A	Injury			
	5 wk	5 wk	5 wk	5 wk	5 wk	5 wk	5 wk	5 wk	5 wk	5 wk	5 wk	Stand	5 wk	Yield	
	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	(pt/2	m	row)	%	(mt/ha)
Weddy check	0	0	0	0	0	0	0	0	0	0	2	3	0	0.8	
Hand-weeded check	100	100	100	100	100	100	100	100	100	100	3	5	0	7.0	
Clomazone, 0.56, PPI	6.5	8.4	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	3	1	2	3.7	
Clomazone, 1.12, PPI	8.9	8.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	1	7	4	1.4	
Clomazone, 0.56, PRE	7.9	9.4	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	3	3	3	4.8	
Clomazone, 1.12, PRE	9.3	9.6	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	3	6	8	5.0	
Metolachlor.1.12, PRE	5	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	3	2	0	1.8	
Metolachlor.12 + fomesafen, 0.14, TM, cracking	9.8	9.8	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	3	6	0	5.3	
Metolachlor.12 + fomesafen, 0.28, TM, cracking	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	3	6	1	4.8	
Metolachlor.12 + imazethapyr 0.025, TM, PRE fb bentazon, 0.56, AW (AG-98, 0.25%), POST	9.0	9.9	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	2	1	3	4.7	
Tifluralin, 0.56, PPI fb halosulfuron, 0.085 W (AG-98, 0.25%), POST	9.9	9.9	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	3	3	5	4.9	
Metolachlor.12, PRE fb halosulfuron, 0A035, W (AG-98, 0.25%), POST	9.9	9.9	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	3	7	0	4.3	
Sulfentrazone, 0.14, PPI	8	9.9	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	2	8	1	1.0	
Sulfentrazone, 0.14, PRE	1.3	9.9	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	3	0	1	1.6	
Sulfentrazone, 0.28, PPI	3	9.9	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	2	5	8	1.0	
Sulfentrazone, 0.28, PRE	5.5	9.9	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	1	9	8	1.0	
Sulfentrazone, 0.56, PPI	2.4	9.5	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	2	3	2	0.5	
Sulfentrazone, 0.56, PRE	6.5	10.0	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	1	7	9	0.9	

continue



Table 1. Continued

Treatment (kg ai/ha)	description	Wed control										Effect on snapbean										
		A	M	B	E	L	A	M	S	S	E	T	A	F	S	O	R	H	A	Stand	Injury	
		5 wk	5 wk	5 wk	5 wk	5 wk	5 wk	5 wk	5 wk	5 wk	5 wk	5 wk	5 wk	5 wk	5 wk	5 wk	5 wk	5 wk	5 wk	5 wk	(mt/ha)	(%)
Lactofen, 0.14, PRE		7 6	9 4	9 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3 3	5
Lactofen, 0.28, PRE		8 6	9 9	9 9	1 5	1 5	1 5	1 5	1 5	1 5	1 5	1 5	1 5	1 5	1 5	1 5	1 5	1 5	1 5	1 5	3 3	2 8
Tifluralin, 0.56, PPI fb		7 6	9 9	9 9	9 5	9 5	9 5	9 5	9 5	9 5	9 5	9 5	9 5	9 5	9 5	9 5	9 5	9 5	9 5	9 5	4 0	3
imazethapyr, 0.035, A W																						
(AG-98, 0.25%), POST																						
Tifluralin, 0.56, PPI fb		9 6	9 9	9 9	7 8	7 8	7 8	7 8	7 8	7 8	7 8	7 8	7 8	7 8	7 8	7 8	7 8	7 8	7 8	7 8	3 5	0
bentazon, 0.42 + fomesafen, 0.21, AW (AG-98, 0.25%), POST																						
Bentazon, 0.42 + fomesafen, 0.21 + sethoxydim, 0.22, W (AG-98, 0.25%), POST		9 3	9 9	9 9	7 0	7 0	7 0	7 0	7 0	7 0	7 0	7 0	7 0	7 0	7 0	7 0	7 0	7 0	7 0	7 0	3 3	3
Tifluralin, 0.56, PPI fb, imazethapyr, 0.035 + bentazon, A 0.42, W (AG-98, 0.25%), POST		4	9 9	9 9	9 5	9 5	9 5	9 5	9 5	9 5	9 5	9 5	9 5	9 5	9 5	9 5	9 5	9 5	9 5	9 5	3 1	3

LSD (0.05) 1 3 8 8 1 0 1 0 2 2 8 1 9 2 0

<sup>a</sup> Evaluations were made 5 wk after PPI at the PRE applications correspond to 4 wk after cracking and 1 wk after POST applications.

<sup>b</sup> PPI = preplant incorporated immediately after spraying, PRE = preemergence immediately after planting.

<sup>c</sup> LSD values may be used to compare means within the same column.



**Table 2. Continued.**

Treatment Description (kg ai/ha)	Wed control											Effect on spinach	
	L A M A M 5 w k 8 w 2 k 8 w k 5	S I B V I w 1 k 8 w 2 k 8 w k 5	C A P B P w k 8 w 2 k 8 w k 5	P O A N N w k 8 w 2 k 8 w k 5	----- (%) -----							Injury	on
Chlorpropham, 2.24 Betamix, 0.28, POST	+7 8 5 9 8 4	1 0 0 9 8 9 4	9 4 1 0 0 9 8	7 8 1 0 0 9 8	2 4 1 0 1 1	1 9 0							
Phenmedipham, 0.28 metolachlor 1.12, POST	8+9 1 0 0 9 8	1 0 0 0 0 9 6	1 0 0 9 8 9 8	8 0 1 0 0 9 8	0 3 4	1 7 . 8							
Phenmedipham, 0.28 (AG-98, 0.25%), POST	7 8 W 5 0 4 8	9 8 1 0 0 8 6	9 8 1 0 0 9 1	3 8 6 4 9	0 9 1 5	2 1 . 8							
LSD (0.05)	1 2 2 6 2 8	1 1 6 2 3	1 0 1 3 2 5	1 7 6 1 8	1 7 1 0 1 1	5 . 2							

<sup>a</sup> Evaluations were made 5, 18 and 28 wk after PRE and POST application. PRE and POST evaluations correspond to 2, 5 and 8 wk after application.

<sup>b</sup> PPI = preplant incorporated; PRE = preemergence immediately after planting; and POST = early preplant incorporated.

<sup>c</sup> LSD may be used to compare numbers in the same column.

Table 3. Evaluation of weed control in fall greens, Kibler, 1996.

Treatment (kg/ha)	description	P O R O L					E C H C G					
		5 wk	6 wk	7 wk	7 wk	5 wk	6 wk	6 wk	7 wk	7 wk		
Untreated	check	0	0	0	0	0	0	0	0	0	0	0
Metolachlor	1.12, PRE	4 3	4 3	7 7	7 7	6 7	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0
Metolachlor	2.24, PRE	9 0	8 7	8 8	8 8	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0
Pendimethalin,	0.75, PPI	9 7	8 7	9 5	9 5	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0
Pendimethalin,	0.75, PRE	5 3	5 7	6 3	6 3	4 3	1 2	5 7	5 7	5 0	5 0	5 0
Oxyfluorfen,	0.22, PRE	1 0 0	7 5	8 5	8 5	8 7	7 7	5 7	7 7	7 7	7 7	7 7
Pyridate,	0.5, POST	2 3	4 3	8 3	8 3	6 3	3 3	3 3	7 5	7 5	7 5	7 5
Pyridate,	1.0, POST	3 7	8 2	9 2	9 2	6 7	7 6	7 6	8 5	8 5	8 5	8 5
Tifluralin,	0.5, PPI fb											
clopyralid,	0.5, POST	4 3	8 2	9 0	9 0	3 3	6 0	6 0	8 3	8 3	8 3	8 3
Tifluralin,	0.5, PPI fb											
clopyralid,	1.0, POST	6 7	5 7	7 8	7 8	1 0 0	7 0	7 0	9 3	9 3	9 3	9 3
D&P 8.96,	PRE fb											
clethodim,	0.105, COC											
(Agri-Dex,	1% v/v), POST	0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0
D&P 8.96,	PRE fb											
sethoxydim,	0.22, COC											
(Agri-Dex,	1% v/v), POST	9 3	9 8	9 8	9 8	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0
LSD (0.05)		3 9	3 3	2 5	2 5	6 2	4 5	4 5	3 9	3 9	3 9	3 9

Continued

Table 3. Continued.

Treatment description (kg/ha)	Kale				Turnip				Mustard greens			
	Injury (%)		Yield (t/ha)		Injury (%)		Stand (pl/m)		Injury (%)		Stand (pl/m)	
	6 wk	7 wk	Stand	Yield	6 wk	7 wk	Stand	Yield	6 wk	7 wk	Stand	Yield
Untreated check	0	0	4.6	4.3	0	0	2.7	10.8	0	0	3.1	5.1
Metolachlor 1.12, PRE	1.0	3.3	1.5	4.0	8	2.3	2.9	7.5	3	2.7	3.6	3.8
Metolachlor 2.24, PRE	7.3	7.8	1.4	1.5	8.0	7.6	1.3	1.8	7	1.8	3.6	6.1
Pendimethalin, PRE 0.75, PRE	1.3	1.1	1.1	7.9	3.7	2.7	1.7	5.8	3.0	3.2	1.7	3.7
Pendimethalin, PRE 0.75, PRE	7.3	3	3	1.2	8.7	8.3	4	2.5	5.7	6.3	6	3.2
Oxyfluorfen, PRE 0.22, PRE	8.6	2	5	4.8	7.4	7.8	4	1.9	6.2	8.8	4	2.6
Pyridate, 0.5, POST 1.3, POST	1.8	1.8	1.9	4.7	7	1.2	3.5	9.3	0	1.7	4.6	5.0
Pyridate, 1.0, POST 3, POST	2.2	2.2	2.4	4.9	1.3	1.7	3.0	7.8	7	2.3	4.7	3.7
Tifluralin, 0.5, PPI fb												
clopyralid, 0.5, POST 3, POST	3	4.8	1.6	4.9	1.3	2.8	3.4	9.2	1.8	3.3	2.8	2.9
Tifluralin, 0.5, PPI fb												
clopyralid, 1.0, POST 3, POST	0	3.2	1.4	5.6	3.8	3.8	2.4	5.0	1.3	2.5	3.4	5.9
DSP 8.96, PRE fb												
clethodim, 0.105, COC												
(Agri-Dex, 1% v/v), POST 8	1.3	0	1.3	3.1	0	2.5	3.4	8.3	3	2.5	4.7	3.9
DSP 8.96, PRE fb												
sethoxydim, 0.22, COC												
(Agri-Dex, 1% v/v), POST 7	2.2	4.3	2.2	4.3	0	8	2.8	8.9	0	2.0	3.8	5.6
LSD (0.05)	2.7	3.1	1.5	3.0	2.3	2.3	2.3	5.0	2.1	1.9	1.6	5.0

Evaluations were made 5, 6 and 7 wk after application. PRE applications correspond to 1, POST applications.

PPI = preplant incorporated after spraying, PRE = preemergence after planting, POST = postemergence after spraying.

LSD values may be used to compare means within the same column.

Table 4. Sweet Potato: Evaluation of herbicides for weed control and phytotoxicity, Fayetteville, 1996.

Treatment description (kg ai/ha)	Weed control												Effect on	
	C H E A L E C H C G E L E I N D I G I S			A M A A P C Y P E S			sweet			potato				
	11 wk	11 wk	11 wk	11 wk	11 wk	11 wk	11 wk	11 wk	11 wk	Injury	Yield	Yield	Yield	
Untreated check	0	0	0	0	0	0	0	0	0	0	0	13.9	13.9	
DSP 112, PRE	100	100	89	95	71	73	73	73	73	0	0	18.6	18.6	
Clomazone, 1.12, PRE	100	100	100	100	96	60	60	60	60	0	0	28.7	28.7	
Pendimethalin, 1.12, PRE	100	100	100	83	96	84	84	84	84	0	0	18.6	18.6	
Alachlor 2.8, PRE	98	100	96	95	95	100	100	100	100	0	0	20.6	20.6	
LSD (0.05)	4	0	10	14	16	32	32	32	32	0	0	5	5	

<sup>a</sup> Evaluations were 1 made after PRE applications.

<sup>b</sup> PRE = preemergence immediately after planting.

<sup>c</sup> LSD values may be used to compare means within the same column.

**Table 5. Control of yellow nutsedge in southern pea using metolachlor at different application times, Fayetteville, 1996.**

Treatment description (kg ai/ha)	Yellow nutsedge (CYPES)						Southern pea		
	Wed			control			Injury		
	5 wk	7 wk	9 wk	5 wk	7 wk	9 wk	5 wk	7 wk	9 wk
Untreated check	0	0	0	0	0	0	0	0	0
Metolachlor.5, PPL, Feb fb									
metolachlor.5, PPL April	7.0	8.0	8.0	1.0	1.4	1.5			
fb metolachlor.5, PRE, June									
Metolachlor.5, PPL, Feb fb	7.0	6.8	7.0	4	1.0	9			
metolachlor.3, PRE, June	8.0	7.9	7.3	1.1	1.4	1.0			
Metolachlor.5, PRE, June	2.0	1.0	0	0	0	0			
Metolachlor.5, PPL, Feb									
LSD (0.05)	2.2	3.1	8	1.2	1.1	8			

<sup>a</sup>Evaluations were made 5, 7 and 9 wk after June applications.

<sup>b</sup>PPL = preplant to southern pea, applications were made in April. PRE = pre-emergence to southern pea planting.

<sup>c</sup>LSD values may be used to compare numbers within the same column.

Table 6. Southern pea study for nutsedge control, Fayetteville, 1996.

Treatment description (kg ai/ha)	Yellow nutsedge (CYPES)								Southern pea							
	control				Injury				control				Injury			
	1 wk	2 wk	4 wk	8 wk	1 wk	2 wk	4 wk	8 wk	1 wk	2 wk	4 wk	8 wk	1 wk	2 wk	4 wk	8 wk
Untreated check	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bentazon, 0.84 + sethoxydim, 0.45 + COC (Agri-Dex, 1.25% v/v) + Imazethapy, 0.07	9	1	4	4	8	1	0	0	0	0	6	6	1	0	6	1
trifluralin, 0.56, PPI	2	8	2	5	3	3	4	1	0	0	3	5	0	0	3	5
Metolachlo, 0.24, PPI	4	5	6	0	4	0	6	8	0	0	3	0	0	0	0	0
Sulfentrazone, 0.42, PRE	8	9	9	4	5	0	8	9	0	1	4	1	0	3	1	0
Sulfentrazone, 0.42, PPI	8	5	7	5	4	4	7	8	3	0	3	3	2	3	3	0
Sulfentrazone, 0.21, PRE	9	1	8	6	4	6	8	6	3	2	3	5	0	5	9	5
Sulfentrazone, 0.21, PPI	6	0	4	1	2	3	6	0	5	9	0	0	0	0	11	5
Sulfentrazone, 0.21 + trifluralin, 0.56, PPI	2	5	6	5	3	5	6	9	0	5	5	0	0	0	8	2
Sulfentrazone, 0.42 + trifluralin, 0.56, PPI	3	8	7	6	8	0	4	0	8	1	8	5	3	0	6	1
Metolachlo, 0.24 + fomesafen, 0.14, GRAC	3	8	5	0	5	3	5	5	7	0	7	5	6	0	4	3
Metolachlo, 0.24 + fomesafen, 0.28, CRAC	4	5	6	0	6	0	5	0	8	6	9	4	7	9	7	0
Halosulfuron, 0.038A + W	0	0	6	8	5	1	9	0	0	0	3	0	1	5	2	0
(AG-98, 0.25%), POST	0	0	6	9	4	3	8	6	0	0	2	9	1	4	1	5
Halosulfuron, 0.019A + W	0	0	2	3	3	5	1	9	1	7	2	2	1	9	1	7
(AG-98, 0.25%), POST	2	2	2	1	2	3	3	5	1	7	2	2	1	9	1	7
LSD (0.05)	2	2	2	1	2	3	3	5	1	7	2	2	1	9	1	7

<sup>a</sup>Evaluations were made 1, 2, 4, 6 and 8 wk after planting.  
<sup>b</sup>PPI = preplant incorporated; PRE = preemergence; CRAC = cracking stage; POST = postemergence  
<sup>c</sup>LSD values may be used to compare numbers within the same column.



Table 7. Evaluation of yellow nutsedge control in summer squash, Fayetteville, 1996.

Treatment description (kg ai/ha)	Weed control			Effect on summer squash			
	C Y P E S			Injury			
	3 wk	5 wk	7 wk	3 wk	5 wk	7 wk	Yield row)(mt/ha)
Untreated	0	0	0	0	0	0	1 7
Hand-weeded	1 0 0	1 0 0	1 0 0	0	0	0	1 5
Bentazon, 0.84, (Agri-Dex, 1.25%), POST <sup>c</sup> , COC							
Sulfentrazone, 0.28, PRE	6 0	6 3	6 9	9 7	9 9	5 0	1 9
Halosulfuron, 0.049, W							1
(AG-98, 0.25%), POST	—	1 5	8 4	—	1 5	8	2 5
Halosulfuron, 0.049, W							
(AG-98, 0.25%), POST	—	6 6	7 6	—	1 8	9	2 5
Halosulfuron, 0.027, PRE	7 1	7 9	5 8	2 3	1 0	4	2 3
Halosulfuron, 0.053, PRE	8 5	7 1	8 9	4 3	2 5	9	1 3
Bensulide, 6.73, PRE	3 8	2 8	3 3	3	8	3	2 5
LSD (0.05)	2 3	2 7	2 9	1 8	1 9	3 6	4

<sup>a</sup> Evaluations were made 3, 5 and 7 wk after PRE application. Evaluations correspond to 1 and 3 applications.

<sup>b</sup> PRE = preemergence immediately after planting, POST = postemergence over-the-top of foliage.

<sup>c</sup> — = ratings not taken.

<sup>d</sup> LSD values may be used to compare means within the same column.

**Table 8. Summary of 'Mt. Spring' tomato yield, Fayetteville, 1996.**

Treatment description	Avg. total no. of fruit/plant	Avg. no. of marketable (no.)	Avg. fruit weight/plant (g)
No cover	3 1	2 4	6. 3
Black plastic	2 2	1 7	4. 8
Rye + vetch	3 3	2 7	7. 3
Wheat + vetch	3 3	2 8	7. 4
LSD (0.05)	4	4	1. 3

<sup>a</sup> Disked in September one week prior to transplanting; trifluralin, 0.84 kg/ha, POST; PPI; metribuzin, 0.28 kg/ha, POST; and 0.5-D, 30 kg/ha, POST

<sup>b</sup> Same as no cover crop treatment; laid black plastic on May 10,

<sup>c</sup> Planted two parts rye or wheat plus one part vetch, about 39 plus September 1995. Cover crops desiccated with 0.8 kg/ha paraquat plus metribuzin on May 1, 1996. sethoxydim, 0.25, kg/ha, POST metribuzin, 0.28 kg/ha, POST DAP

**Table 9. Evaluation of primocane suppression in raspberry, Fayetteville, 1996.**

Treatment description (kg ai/ha)	Effect on raspberries										
	Primocane suppression					Injury					
	1 wk	2 wk	3 wk	4 wk	5 wk	1 wk	2 wk	3 wk	4 wk	5 wk	Yield (mt/ha)
Untreated check	0	0	0	0	0	0	0	0	0	0	0. 9
Lactofen, 1.12, EPOST	9	6	8	7	8	1	8	9	8	3	0 1. 3
Lactofen, 2.24, EPOST	9	5	9	4	9	0	1	5	9	8	3 0 1. 7
Standard (Mowig)	1	0	0	1	0	0	9	5	9	0	0 1. 8
LSD (0.05)	8	2	6	3	3	4	4	5	5	N S	0. 3

<sup>a</sup> Evaluations were made 1, 2, 3, 4 and 5 wk after first, second, third, fourth and fifth evaluations correspond to 1, 2 and 3 wk after second application.

<sup>b</sup> EPOST = postemergence over-the-top of plants on May 16, 1996 emergence over-the-top on May 30, 1996.

<sup>c</sup> LSD values may be used to compare numbers within the same

**Table 10. Summary of strawberry yield, Fayetteville, 1996.**

Treatment description (kg/ha)	Stand yield (no.)	Early yield (kg/ha)	Total yield (kg/ha)
No plastic	1 8	11 6	2 6 8
Black plastic fb 2,4-D amine, 0.56, EPOST fb sethoxydim, 0.34, LPOST	4 2 2	1 6 3 4	
Black plastic + rye fb 2,4-D amine, 0.56, EPOST fb sethoxydim, 0.34, LPOST	8 9 2	2 6 9 8	
No plastic fb 2,4-D amine, 0.56, EPOST fb sethoxydim, 0.34, LPOST	1 4	7 4	1 2 4
LSD (0.05)	5	3 3 2	7 5 4

<sup>a</sup> EPOST = fall broadleaf treatments, in 1995; EPOST spring burndown treatments in March, 1996.

<sup>b</sup> LSD can be used to compare numbers in the same column.

Table 11. Evaluation of herbicides in watermelon, Kibler, 1996.

Treatment description (kg ai/ha)	Wet control												Effect on watermelon		
	E L E I N				S O R H A				E C L A L				Injury		
	2 w k	4 w k	8 w k	2 w k	4 w k	8 w k	2 w k	4 w k	8 w k	2 w k	4 w k	8 w k	2 w k	4 w k	Yield (mt/ha)
Untreated check	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.4
Untreated check + irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.4
Bensulide, 5.6, PPI	6.5	4.9	1.5	6.0	8.1	2.0	6.8	2.5	0	0	0	0	0	0	4.9
Bensulide, 6.7, PPI	6.1	5.4	2.3	5.3	7.8	2.5	6.8	1.8	0	0	0	0	0	0	1.5
Bensulide, 5.6, PRE + irrigation	6.3	7.6	2.5	7.1	9.3	2.0	8.5	8.9	3.3	0	0	0	0	0	5.4
Bensulide, 6.7, PRE + irrigation	7.5	8.0	3.0	8.3	9.1	2.5	8.3	8.3	7.4	0	0	0	0	0	7.4
Ethalfuratin, 1.2, PRE + irrigation	8.5	8.5	1.3	8.5	9.6	2.3	9.9	9.4	1.8	0	0	0	0	0	8.8
LSD (0.05)	1.5	1.6	0.9	1.1	1.6	0.8	1.2	1.7	0.7	N	S	N	S	N	6.3

<sup>a</sup> Evaluations were made 2, 4 and 8 wk after PPI and PRE applications.

<sup>b</sup> PPI = preplant incorporated, PRE = preemergence immediately after planting.

<sup>c</sup> LSD values may be used to compare means within the same column.

Table 12. Evaluation of yellow nutsedge control in watermelon, Fayetteville, 1996.

Treatment description (kg ai/ha)	Wed control									Effect on watermelon					
	Yellow nutsedge			(CYPEs)			Injury			Yield					
	3 wk	5 wk	9 wk	3 wk	5 wk	9 wk	3 wk	5 wk	7 wk	9 wk	3 wk	5 wk	7 wk	9 wk	Yield (mt/ha)
Untreated	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7.1
Hand-weeded	10.0	10.0	10.0	10.0	10.0	10.0	0	0	0	0	0	0	0	0	13.2
Bentazon, 0.84, W	— <sup>c</sup>	5.9	5.2	4.3	—	—	—	0	1	1	1	1	1	1	17.9
(Agri-Dex, 1.25%)	—	5.9	5.2	4.3	—	—	—	0	1	1	1	1	1	1	17.9
Sulfentrazone, 0.28, PRE	5.5	5.0	5.0	6.3	8.5	5.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	14.2
Halosulfuron, 0.089, W	—	3.0	7.6	7.4	—	—	—	0	1.0	0	0	0	0	0	21.2
(AG-98, 0.25%), POST	—	3.0	7.6	7.4	—	—	—	0	1.0	0	0	0	0	0	21.2
Halosulfuron, 0.049, W	—	3.3	7.4	6.0	—	—	—	0	1.1	0	0	0	0	0	7.8
(AG-98, 0.25%), POST	—	3.3	7.4	6.0	—	—	—	0	1.1	0	0	0	0	0	7.8
Halosulfuron, 0.027, PRE	8.4	6.9	6.4	7.0	1.3	0	4	1	4	1	4	1	4	1	10.4
Halosulfuron, 0.053, PRE	7.4	7.9	6.4	5.6	1.6	0	1.4	1	1.4	1	1.4	1	1.4	1	19.8
Bensulide, 6.73, PRE	2.1	1.1	1	1.3	0	0	1	1	1	1	1	1	1	1	14.1
LSD (0.05)	3.5	1.9	2.6	2.0	1.3	2.0	7	5	7	5	7	5	7	5	N S

<sup>a</sup>Evaluations were made 3, 5, 7 and 9 wk after PRE application. PRE ratings correspond to 1, 3 and 5 wk applications.

<sup>b</sup>PRE = preemergence immediately after planting. POST = postemergence, over-the-top of foliage.

<sup>c</sup>— = ratings not taken.

<sup>d</sup>LSD values may be used to compare means within the same column.

Table 13. Evaluation of yellow nutsedge control in cantaloupe, Fayetteville, 1996.

Treatment description (kg ai/ha)	Weed control						Effect on cantaloupe					
	C Y P E S			Injury			Injury			Yield		
	5 wk	7 wk	9 wk	5 wk	7 wk	9 wk	5 wk	7 wk	9 wk	5 wk	7 wk	9 wk
Untreated	0	0	0	0	0	0	0	0	0	0	0	0
Hand-weeded	10.0	10.0	10.0	10.0	10.0	10.0	0	0	0	0	0	0
Bentazon, 0.84, check												
(Agri-Dex, 1.25%), POST	5.8	5.3	3.3	1.8	3.0	0	1.8	3.0	0	1.8	3.0	0
Sulfentrazone, 0.28, PRE	6.8	7.6	6.0	8.9	7.4	4.8	8.9	7.4	4.8	8.9	7.4	4.8
Halosulfuron, 0.049, W												
(AG-98, 0.25%), POST	3.8	9.0	8.2	0	6	3	0	6	3	0	6	3
Halosulfuron, 0.089, W												
(AG-98, 0.25%), POST	5.3	9.1	8.5	0	5	0	0	5	0	0	5	0
Halosulfuron, 0.027, PRE	8.3	7.0	6.4	8	0	0	8	0	0	0	0	0
Halosulfuron, 0.053, PRE	8.1	6.7	6.7	2.3	3	0	2.3	3	0	0	3	0
Bensulide, 6.73, PRE	0	0	3	0	0	0	0	0	0	0	0	0
LSD (0.05)	2.1	2.2	2.3	1.1	1.9	0.8	1.1	1.9	0.8	1.1	1.9	0.8

<sup>a</sup> Evaluations were made 5, 7 and 9 wk after PRE application; evaluations correspond to 1, 3 and 5 applications.

<sup>b</sup> PRE = preemergence immediately after planting, POST = postemergence over-the-top of foliage.

<sup>c</sup> LSD values may be used to compare means within the same column.

Table 14. Foxglove: Evaluation of various herbicides applied 3 wk after transplanting, Fayetteville, 1996.

Treatment description	Phytotoxicity after application (%)									
	2 wk	4 wk	8 wk	10 wk	12 wk	16 wk				
(kg ai/ha)										
Untreated check	0	0	0	0	0	0	0	0	0	0
Fluazifop, 0.42, POST-TP <sup>c</sup>	10	0	0	0	0	0	0	0	0	0
Fluazifop, 0.84, POST-TP*	10	0	0	0	0	0	0	0	0	0
Fluazifop, 1.7, POST-TP*	20	10	0	0	10	0	0	10	0	0
Oryzalin, 2.1, POST-TP*	10	10	10	10	10	0	0	0	10	10
Oryzalin, 4.5, POST-TP*	10	10	20	10	20	0	0	0	10	10
Oryzalin, 9.0, POST-TP*	20	30	50	40	40	40	40	40	50	50
Napropamide, 4.5, POST-TP*	20	20	10	20	10	10	10	10	10	10
Napropamide, 9.0, POST-TP*	20	30	10	20	10	10	10	10	10	10
Napropamide, 18.0, POST-TP*	40	60	60	60	60	60	60	60	60	60
Isoxaben, 0.56, POST-TP	80	100	100	— <sup>c</sup>	—	—	—	—	—	—
Isoxaben, 1.12, POST-TP	80	100	100	—	—	—	—	—	—	—
Isoxaben, 2.24, POST-TP	90	100	100	—	—	—	—	—	—	—
Metolachlor, 3.4, POST-TP	40	40	40	—	—	—	—	—	—	—
Metolachlor, 6.7, POST-TP	50	40	30	—	—	—	—	—	—	—
Metolachlor, 13.4, POST-TP	90	90	90	—	—	—	—	—	—	—
Trifluralin, 0.56, POST-TP	10	0	20	—	—	—	—	—	—	—
Trifluralin, 1.12, POST-TP	10	10	20	—	—	—	—	—	—	—
Trifluralin, 2.24, POST-TP	20	30	30	—	—	—	—	—	—	—
Oxadiazon, 4.5, POST-TP	90	100	90	—	—	—	—	—	—	—
Oxadiazon, 9.0, POST-TP	100	100	100	—	—	—	—	—	—	—
Oxadiazon, 18.0, POST-TP	100	100	100	—	—	—	—	—	—	—
(Oxyfluorfen + oryzalin), 3.4, POST-TP	10	10	0	—	—	—	—	—	—	—
(Oxyfluorfen + oryzalin), 6.7, POST-TP	30	10	10	—	—	—	—	—	—	—
(Oxyfluorfen + oryzalin), 13.4, POST-TP	60	40	30	—	—	—	—	—	—	—
LSD (0.05) <sup>d</sup>	17	18	21	25	26	26	26	26	26	26

<sup>a</sup> No weeds were present 6 wk after transplanting.

<sup>b</sup> Treatments with a "\*" indicate a second application at 8 wk.

<sup>c</sup> — = ratings not taken where one application was used.

<sup>d</sup> LSD values may be used to compare means within the same column.

Appendix Table 1. Common, trade and chemical names of herbicides used.

Designation	Chemical name	Trade name	Formulation	Concentration
alachlor	2-chloro-2,6-diethylphenylacetamide,	(Lasso®)	480 g/L	
bensulide	O,O-bis(1-methylethyl) S-[2-[(phenylsulfonyl)amino]ethyl]phosphorodithioate,	(Prefar®)	480 g/L	480
bentazon	1-methyl-1H-1,3,4-benzoxazin-4(3H)-one, 2,2-dioxide,	(Basagran®)	480 g/L	
Betamix®	phenmedipham plus desmedipham,	(trade name)	156 g/L	
chlorpropham	3-chlorophenylcarbamate,	(Furloc®)	480 g/L	
clethodim	(E,E)-(+)-2-[1-[[[3-chloro-2-propenyl]oxy]imino]propyl]-5-[2-(ethylthio)propyl]propanoic acid,	(Select®)	240 g/L	
clomazone	4,4-dimethyl-3-isoxazolinone,	(Comazin®)	360 g/L	
clopyralid	3,6-dichloro-2-pyridinecarboxylic acid,	(Stinger®)	360 g/L	
cycloate	cyclohexylethylcarbamothioate,	(Roneet®)	720 g/L	
DCP	dimethyl 2,3,5,6-tetrachloro-1,4-benzenedicarboxylate,	(Dacthal®)	75 DF	
desmedipham	ethyl 2-phenylamino carbonyl oxyphenyl carbamate	(see et Betamix®)		
ethalfluralin	N-ethyl-N-(2-methyl-2-propenyl)-2,6-dinitro-4-(trifluoromethyl)benzenamine,	(Curbit®)	360 g/L	
fluzazifop-P	[[5-trifluoromethyl]-2-pyridinyl]oxy]propanoic acid,	(Fusilade®)	240 g/L	
fomesafen	5-[2-chloro-4-(trifluoromethyl)phenoxy]-2-nitrobenzamide,	(Reflex®)	240 g/L	
halosulfuron	[2-chloro-6-fluoro-4-(trifluoromethyl)phenoxy]-2-nitrobenzamide,	(Permit®)	75% acid,	
imazethapyr	4,5-dihydro-4-methyl-4-(1H-imidazol-2-yl)oxoethyl-3-pyridinecarboxylic acid,	(Pursuit®)	240 WG	
isoxaben	N-[3-(1-ethyl-1-methylpropyl)-5-isoxazolyl]-2,6-dimethoxybenzamide,	(Gallery®)	75% acid,	
lactofen	(+)-2-ethoxy-1-methyl-2-oxoethyl 5-[2-chloro-4-(trifluoromethyl)phenoxy]-2-nitrobenzoate,	(Cobra®)	936 g/L,	
metolachlor	2-chloro-2-ethyl-1-methyl-2-oxoethyl 5-[2-chloro-4-(trifluoromethyl)phenoxy]-2-nitrobenzoate,	(Dual®)	960 g/L,	
metribuzin	4-amino-6-(1,1-dimethylethyl)-3-(methoxythio)-1,2,4-triazole-5(4H)-thione,	(Sencor®)	DF WP	
napropamide	1-(1-naphthalenyloxy)propanamide,	(Devrinol®)	50	
oryzalin	4-(dipropylamino)-3,5-dinitrobenzenesulfonamide,	(Surflan®)	480 g/L	
oryzalin + oxyfluorfen	oryzalin and oxyfluorfen	(Route®)		
oxadiazon	3-[2,4-dichloro-5-(1-methylethoxy)phenyl]-5-(1,1-dimethylethyl)-1,3,4-oxadiazol-2(3H)-one,	(Chipco®)	192 g/L	WP
oxyfluorfen	2-chloro-1-(3-ethoxy-4-nitrophenoxy)-4-(trifluoromethyl)benzene,	(Goal®)	192 g/L	
paraquat	1,1'-dimethyl-4,4'-bipyridinium ion,	(Gramoxone®)	300 g/L	
pendimethalin	(1-ethylpropyl)-3,4-dimethyl-2,6-dinitrobenzenamine,	(Prowl®)	396 g/L	

Continued

Appendix Table 1. Continued.

Designation	and trade names	Chemical name and formulation	
phenmedipham	(Sipit®)	3-[(methoxycarbonyl)amino]phenyl(3-methylphenyl)carbamate,	156 g/L
phenmedipham desmedipham	+ (Beeamix®)		
pyridate	ougn®	O-(6-chloro-3-phenyl-4-pyridin-2-yl) carbonothioate,	450 g/L
sethoxydim	(Poast®)	2-[1-(ethoxymino)butyl]-5-[2-(ethylthio)propyl]-3-hydroxy-2-cyclohexen-1-one,	180
sulfentrazone	(Authen®)	4-dichloro-5-[4-(difluoromethyl)-4,5-dihydro-2,4-thiazole 5-ylidene]-1-phenylmethanesulfonamide,	75% DF
trifluralin	reflan®	2,6-dimethyl-4-(trifluoromethyl)benzenamine,	480 g/L



Appendix Table 2. Climatological data, Main Experiment Station, Fayetteville, 1996.

Day	April			May			June			July		
	Temp.		Rain-fall (cm)	Temp.		Rain-fall (cm)	Temp.		Rain-fall (cm)	Temp.		Rain-fall (cm)
	Max (%)	Min (%)		Max (%)	Min (%)		Max (%)	Min (%)		Max (%)	Min (%)	
Fayetteville												
1	10	-1		20	6		21	16	2.92	33	21	
2	18	0		24	9		26	12	0.41	34	21	
3	22	11		26	13		27	16		35	20	
4	24	4	1.22	26	10		26	14		34	20	
5	8	1		25	14		26	18		23	18	2.97
6	9	-4		26	15	2.06	28	20	1.27	29	22	
7	10	-1		25	18		29	17	0.46	34	25	0.15
8	19	10		27	20		24	18		34	21	0.10
9	16	4		27	20		23	12		30	20	0.05
10	17	3		27	20		21	14		24	15	0.02
11	22	5		25	9	5.51	26	14	0.64	25	18	0.40
12	26	16		24	7		28	17		22	17	1.17
13	19	16	1.63	21	10		30	18	0.64	23	17	
14	25	15		15	12	0.23	31	20		28	18	1.27
15	11	2		23	13	0.08	31	19		26	15	
16	15	3		27	20		31	20		30	18	
17	23	9		28	21		32	22		32	21	
18	24	15		27	24		32	17		31	24	
19	28	12		30	25		34	18	3.40	32	24	
20	30	9		30	22		34	18		32	24	
21	21	6		28	18		28	20		29	26	1.27
22	25	12	7.34	26	18		32	21		35	24	
23	16	4	2.44	27	18	0.05	32	21		36	20	0.53
24	19	6		21	21	1.52	32	21	1.27	32	20	
25	25	13		26	18		31	19		30	17	0.08
26	25	11		30	20		32	22		30	15	
27	24	13		27	14	1.91	29	22	0.20	30	18	
28	25	15		29	13		31	21		29	20	0.15
29	25	4	0.97	25	12		32	19	1.27	32	25	
30	11	3		24	12	0.51	31	21		32	18	0.94
31				26	15	0.48	32	21		32	18	

\* Underlined numbers are irrigation amounts.

Appendix Table 3. Climatological data, Experiment Station, Kibler, 1996.

Day	April			May			June			July		
	Temp.		Rain-fall	Temp.		Rain-fall	Temp.		Rain-fall	Temp.		Rain-fall
	Max	Min		Max	Min		Max	Min		Max	Min	
(% C)	(% C)	(cm)	(% C)	(% C)	(% C)	(% C)	(% C)	(% C)	(% C)	(% C)	(cm)	
Kibler												
1	21	2		28	9		25	18	5.33	36	24	
2	25	3		29	11		31	16		37	24	
3	26	8		26	16		30	18	0.18	36	23	
4	15	5	0.74	27	17		30	17		27	20	0.95
5	8	2		31	18		32	19		34	21	
6	15	2		28	20		31	20		37	24	
7	21	2		28	18	0.46	26	18	1.04	36	25	
8	21	7		28	19		23	16		34	25	
9	19	8		29	17		25	15		26	21	
10	25	5		31	18		30	15		23	19	0.30
11	30	12		21	15		33	17		25	19	0.84
12	25	14		21	11		34	20		27	21	4.19
13	24	11	2.64	18	15	5.28	34	20	0.13	33	21	
14	28	10		27	15		34	21		30	22	
15	18	7		30	19		35	21		32	20	3.12
16	26	3		31	19		36	22		31	20	
17	27	9		32	20		36	23		34	23	0.91
18	30	15		32	20		36	21	0.86	34	23	
19	33	13		32	20		32	20	2.39	35	23	
20	26	11	6.40	34	21		34	21		36	24	
21	28	10		31	21		36	21		36	25	1.27
22	25	11		27	19	2.49	36	23		36	24	
23	22	8		34	20	0.30	35	24		32	21	2.03
24	28	8		33	21		35	24		33	21	
25	28	15		34	21		36	22		32	20	0.18
26	25	10		32	23		30	24	1.32	31	17	
27	29	10		32	18	0.89	32	23		32	21	0.03
28	26	15		30	18		34	23	2.03	34	21	
29	15	10	1.07	29	17		35	22	0.18	35	22	
30	24	5		28	16		36	22		24	21	1.91
31				21	19					31	21	7.11

**Appendix Table 4. Standardized plant (Bayer) codes,  
Weed Science Society of America, for weeds appearing in this report.**

C o d e	Scientific Name	Common Name
A M AAP	<i>Amaranthus palmeri</i> S. Wats.	Palmer amaranth
A M A S S	<i>Amaranthus</i> spp.	pigweed species
A M B E L	<i>Ambrosia artemisiifolia</i> L.	common ragweed
C A P B P	<i>Capsella bursa-pastoris</i> L.	shepherd's purse
C H E A L	<i>Chenopodium album</i> L.	common lambsquarters
C Y P E S	<i>Cyperus esculentus</i> L.	yellow nutsedge
D I G I S	<i>Digitaria ischamum</i> (Schreb. ex Schum.)	crabgrass
E C H C G	<i>Echinochloa crus-galli</i> (L.) Beauv	barnyard grass
E C L A L	<i>Eclipta prostrata</i> L.	eclipta
E L E I N	<i>Eleusine indica</i> (L.) Gaertn.	goosegrass
L A M A M	<i>Lamium amplexicaule</i> L.	henbit
P O A N N	<i>Poa annua</i> L.	annual bluegrass
P O R O L	<i>Portulaca oleracea</i> L.	common purslane
S E T A F	<i>Setaria faberi</i> Herrm.	giant foxtail
S I B V I	<i>Sibara virginica</i> (L.) Rollins	sibara
S O R H A	<i>Sorghum halepense</i> (L.) Pers.	johnsongrass
V I C S A	<i>Vicia sativa</i> L.	common vetch
V I C V I	<i>Vicia villosa</i> Roth	hairy vetch

### CONVERSION TABLE

U.S. to Metric				Metric to U.S.			
to convert from:	to:	Multiply U.S. unit	by	to convert from:	to:	Multiply metric unit	the by
<b>length</b>				<b>length</b>			
miles	kilometers	1.61		kilometers	miles	0.62	
yards	meters	0.91		meters	yards	1.09	
feet	meters	0.31		meters	feet	3.28	
inches	centimeters	2.54		centimeters	inches	0.39	
<b>area and volume</b>				<b>area and volume</b>			
sq yards	sq meters	0.84		sq meters	sq yards	1.20	
sq feet	sq meters	0.09		sq meters	sq feet	10.76	
sq inches	sq centimeters	6.45		sq centimeters	sq inches	0.16	
cu inches	cu centimeters	6.39		cu centimeters	cu inches	0.06	
acres	hectares	0.41		hectares	acres	2.47	
<b>liquid measure</b>				<b>liquid measure</b>			
cu inches	liters	0.02		liters	cu inches	61.02	
cu feet	liters	28.34		liters	cu feet	0.04	
gallons	liters	3.79		liters	gallons	0.26	
quarts	liters	0.95		liters	quarts	1.06	
fluid ounces	milliliters	29.57		milliliters	fluid ounces	0.03	
<b>weight and mass</b>				<b>weight and mass</b>			
pounds	kilograms	0.45		kilograms	pounds	2.21	
ounces	grams	28.35		grams	ounces	0.04	
<b>temperature</b>				<b>temperature</b>			
F	C	$5/9(F - 32)C$		C	F	$(9/5)C + 32$	



