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

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INTRODUCTION

Field evaluations of herbicides provide the chemical industry, governmen tal agencies such as IR-4, and the Arkansas Agricultural Experiment Sta tion 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. Preplant-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 trifoliolate 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 bentazone 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 provided 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.

	Weed control[a]				Effect on snapbean		
	AMBEL	AMASS	SETAF	SORHA		Injury	
Treatment description[b]	5 wk	5 wk	5 wk	5 wk	Stand	5 wk	Yield
(kg ai/ha)	(%)				(pl/2 m row)	(%)	(mt/ha)
Weedy check	0	0	0	0	23	0	0.8
Hand-weeded check	100	100	100	100	35	0	7.0
Clomazone, 0.56, PPI	65	84	99	40	31	20	3.7
Clomazone, 1.12, PPI	89	88	98	44	17	49	1.4
Clomazone, 0.56, PRE	79	94	99	53	33	3	4.8
Clomazone, 1.12, PRE	93	96	99	35	36	8	5.0
Metolachlor, 1.12, PRE	5	96	96	38	32	0	1.8
Metolachlor, 1.12 + fomesafen, 0.14, TM, cracking	98	98	99	48	36	0	5.3
Metolachlor, 1.12 + fomesafen, 0.28, TM, cracking	99	99	99	65	36	10	4.8
Metolachlor, 1.12 + imazethapyr, 0.025, TM, PRE fb bentazon, 0.56, A W (AG-98, 0.25%), POST	90	99	96	21	32	3	4.7
Trifluralin, 0.56, PPI fb halosulfuron, 0.035 A W (AG-98, 0.25%), POST	99	99	84	33	35	5	4.9
Metolachlor, 1.12, PRE fb fb halosulfuron, 0.035, A W (AG-98, 0.25%), POST	99	99	96	31	37	0	4.3
Sulfentrazone, 0.14, PPI	8	99	91	3	28	13	1.0
Sulfentrazone, 0.14, PRE	13	99	96	20	30	15	1.6
Sulfentrazone, 0.28, PPI	3	99	90	20	25	8	1.0
Sulfentrazone, 0.28, PRE	55	99	95	80	19	86	1.0
Sulfentrazone, 0.56, PPI	24	95	93	40	23	28	0.5
Sulfentrazone, 0.56, PRE	65	100	99	58	17	95	0.9

continued

Table 1. Continued

Treatment description[b] (kg ai/ha)	Weed control[a] AMBEL 5 wk	AMASS 5 wk	SETAF 5 wk	SORHA 5 wk	Effect on snapbean: Stand	Injury 5 wk	Yield
	----------	---------- (%)	----------	----------	(pl/2 m row)	(%)	(mt/ha)
Lactofen, 0.14, PRE	76	94	0	0	33	5	1.6
Lactofen, 0.28, PRE	86	99	15	9	33	28	2.8
Trifluralin, 0.56, PPI fb imazethapyr, 0.035, AW (AG-98, 0.25%), POST	76	99	95	80	40	3	6.5
Trifluralin, 0.56, PPI fb bentazon, 0.42 + fomesafen, 0.21, AW (AG-98, 0.25%), POST	96	99	78	43	35	0	6.3
Bentazon, 0.42 + fomesafen, 0.21 + sethoxydim, 0.22, AW (AG-98, 0.25%), POST	93	99	70	18	33	3	5.7
Trifluralin, 0.56, PPI fb, imazethapyr 0.035 + bentazon, 0.42, AW (AG-98, 0.25%), POST	64	99	95	75	31	3	5.0
LSD (0.05)[c]	13	8	10	22	8	19	2.0

[a] Evaluations were made 5 wk after PPI and PRE applications. The 5-wk evaluations correspond to 4 wk after cracking ap
wk after POST applications.

[b] PPI = preplant incorporated immediately after spraying, PRE = preemergence immediately after planting, POST = postemergence over-the-top of plants.

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

Table 2. Evaluation of herbicides for fall spinach, Kibler, 1996.

Treatment Description[b] (kg ai/ha)	Weed control[a] LAMAM 5 wk	LAMAM 8 wk	LAMAM 8 wk	SIBVI 5 wk	SIBVI 8 wk	SIBVI 8 wk	CAPBP 5 wk	CAPBP 8 wk	CAPBP 8 wk	POANN 5 wk	POANN 8 wk	POANN 8 wk	Effect on spinach Injury 5 wk	Injury 8 wk	Injury 8 wk	Yield
	(%)															(mt/ha)
Untreated check	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15.0
Cycloate, 2.24, PPI	85	31	49	99	100	68	100	94	95	100	100	95	36	5	11	16.6
Cycloate, 2.24 + metolachlor, 0.84, PPI	89	79	46	100	100	74	100	100	73	100	100	95	44	18	5	17.0
Cycloate, 2.24, PPI fb metolachlor, 0.84, PRE	90	98	96	100	100	98	100	100	96	99	100	98	33	26	5	21.2
Metolachlor, 1.12, PPI	81	75	64	91	100	30	95	80	90	94	100	95	14	3	1	17.4
Metolachlor, 1.12, PRE	85	85	81	95	100	91	95	90	73	90	100	95	8	0	6	15.0
Metolachlor, 2.24, PRE	94	100	99	100	100	99	100	100	99	95	100	99	21	3	4	25.1
Metolachlor, 0.84, PRE fb clopyralid, 0.03, POST	76	44	45	93	100	71	90	83	51	94	95	95	6	4	8	17.3
Metolachlor, 0.84, PRE fb clopyralid, 0.06, POST	84	89	93	95	100	70	95	88	34	94	95	96	4	3	14	18.3
Metolachlor, 0.84, PRE fb clopyralid, 0.12, POST	81	93	80	100	100	70	100	98	89	91	100	94	3	0	6	19.7
Clopyralid, 0.03, POST	5	3	23	0	10	70	0	5	20	0	0	19	0	0	10	14.7
Clopyralid, 0.06, POST	0	5	19	13	93	25	10	83	13	18	0	5	5	0	15	11.9
Clopyralid, 0.12, POST	0	0	18	8	5	33	8	0	10	18	0	8	10	0	13	12.5
Chlorpropham, 2.24, POST	20	10	19	96	100	91	96	95	94	81	100	94	33	3	16	15.6
Phenmedipham, 0.28, POST	79	38	43	94	100	25	100	86	85	76	60	48	15	0	10	17.4
Chlorpropham, 2.24 + phenmedipham, 0.28, POST	74	43	46	100	100	96	100	100	96	78	100	96	50	11	14	18.0
Betamix, 0.28, POST	63	19	36	91	100	83	100	98	40	58	5	53	5	4	14	15.1
Desmedipham, 0.28, POST	46	24	23	96	100	80	94	95	73	60	3	25	0	0	6	17.0

Continued

Table 2. Continued.

Treatment Description[b] (kg ai/ha)	LAMAM 5 wk	LAMAM 18 wk	LAMAM 28 wk	SIBVI 5 wk	SIBVI 18 wk	SIBVI 28 wk	CAPBP 5 wk	CAPBP 18 wk	CAPBP 28 wk	POANN 5 wk	POANN 18 wk	POANN 28 wk	Injury 5 wk	Injury 18 wk	Injury 28 wk	Yield
	Weed control[a] (%)												Effect on spinach			(mt/ha)
Chlorpropham, 2.24 + Betamix, 0.28, POST	78	59	84	100	98	94	94	100	98	78	100	98	24	10	11	19.0
Phenmedipham, 0.28 + metolachlor 1.12, POST	89	100	98	100	100	96	100	98	98	80	100	98	0	3	4	17.8
Phenmedipham, 0.28 + W (AG-98, 0.25%), POST	78	50	48	98	100	86	98	100	91	38	6	49	0	9	15	21.8
LSD (0.05)[c]	12	26	28	11	6	23	10	13	25	17	6	18	17	10	11	5.2

[a] Evaluations were made 5, 18 and 28 wk after PPI and PRE applications. The 4-, 18- and 28-wk evaluations correspond to 2, wk after POST application.

[b] PPI = preplant incorporated; PRE = preemergence immediately after planting; and POST = early p

[c] LSD may be used to compare numbers in the same column.

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

	Weed control[a]					
	POROL			ECHCG		
Treatment description[b] (kg/ha)	5 wk	6 wk	7 wk	5 wk	6 wk	7 wk
	(%)					
Untreated check	0	0	0	0	0	0
Metolachlor[c], 1.12, PRE	43	43	77	67	100	100
Metolachlor[c], 2.24, PRE	90	87	88	100	100	100
Pendimethalin, 0.75, PPI	97	87	95	100	100	100
Pendimethalin, 0.75, PRE	53	57	63	43	12	50
Oxyfluorfen, 0.22, PRE	100	75	85	87	57	77
Pyridate, 0.5, POST	23	43	83	63	33	75
Pyridate, 1.0, POST	37	82	92	67	76	85
Trifluralin, 0.5, PPI fb clopyralid, 0.5, POST	43	82	90	33	60	83
Trifluralin, 0.5, PPI fb clopyralid, 1.0, POST	67	57	78	100	70	93
DCPA, 8.96, PRE fb clethodim, 0.105, COC (Agri-Dex, 1% v/v), POST	100	100	100	100	100	100
DCPA, 8.96, PRE fb sethoxydim, 0.22, COC (Agri-Dex, 1% v/v), POST	93	98	98	100	100	100
LSD (0.05)[e]	39	33	25	62	45	39

Continued

Table 3. Continued.

Treatment description[b] (kg/ha)	Kale Injury 6 wk (%)	Kale Injury 7 wk (%)	Kale Stand (pl/m row)	Kale Yield (mt/ha)	Turnip greens Injury 6 wk (%)	Turnip greens Injury 7 wk (%)	Turnip greens Stand (pl/m row)	Turnip greens Yield (mt/ha)	Mustard greens Injury 6 wk (%)	Mustard greens Injury 7 wk (%)	Mustard greens Stand (pl/m row)	Mustard greens Yield (mt/ha)
Untreated check	0	0	46	4.3	0	0	27	10.8	0	0	31	5.1
Metolachlor, 1.12, PRE	10	33	15	4.0	8	23	29	7.5	3	27	36	3.8
Metolachlor, 2.24, PRE	73	78	14	1.5	80	76	13	1.8	7	18	36	6.1
Pendimethalin, 0.75, PPI	17	13	11	7.9	37	27	17	5.8	30	32	17	3.7
Pendimethalin, 0.75, PRE	8	73	3	1.2	87	83	4	2.5	57	63	6	3.2
Oxyfluorfen, 0.22, PRE	78	62	5	4.8	74	78	4	1.9	62	88	4	2.6
Pyridate, 0.5, POST	13	18	19	4.7	7	12	35	9.3	0	17	46	5.0
Pyridate, 1.0, POST	3	22	24	4.9	13	17	30	7.8	7	23	47	3.7
Trifluralin, 0.5, PPI fb clopyralid, 0.5, POST	23	48	16	4.9	13	28	34	9.2	18	33	28	2.9
Trifluralin, 0.5, PPI fb clopyralid, 1.0, POST	30	32	14	5.6	38	38	24	5.0	13	25	34	5.9
DCPA, 8.96, PRE fb clethodim, 0.105, COC (Agri-Dex, 1% v/v), POST	8	38	13	3.1	0	25	34	8.3	3	25	47	3.9
DCPA, 8.96, PRE fb sethoxydim, 0.22, COC (Agri-Dex, 1% v/v), POST	0	7	22	4.3	0	8	28	8.9	0	20	38	5.6
LSD (0.05)[c]	27	31	15	3.0	23	23		5.0	21	19	16	5.0

[a] Evaluations were made 5, 6 and 7 wk after PPI and PRE applications. The 5-, 6- and 7-wk evaluations correspond to 1, 2 and POST applications.

[b] PPI = preplant incorporated after spraying, PRE = preemergence after planting, POST = postemergence

[c] 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[b] (kg ai/ha)	Weed control[a] CHEAL 1 wk	ECHCG 1 wk	ELEIN 1 wk	DIGIS 1 wk	AMAAP 1 wk	CYPES 1 wk	Effect on sweet potato Injury	Yield
	(%)							(mt/ha)
Untreated check	0	0	0	0	0	0	0	13.9
DCPA, 11.2, PRE	100	100	89	95	71	73	0	18.6
Clomazone, 1.12, PRE	100	100	100	100	96	60	0	28.7
Pendimethalin, 1.12, PRE	100	100	100	83	96	84	0	18.6
Alachlor, 2.8, PRE	98	100	96	95	95	100	0	20.6
LSD (0.05)[c]	4	0	10	14	16	32	0	5

[a] Evaluations were made 1 wk after PRE applications.
[b] PRE = preemergence immediately after planting.
[c] 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[b] (kg ai/ha)	Weed control[a] Yellow nutsedge (CYPES) 5 wk	7 wk	9 wk	Southern pea Injury 5 wk	7 wk	9 wk
	----------	----------	----------	(%)	----------	----------
Untreated check	0	0	0	0	0	0
Metolachlor, 2.5, PPL, Feb fb metolachlor, 2.5, PPL, April fb metolachlor, 1.3, PRE, June	70	80	80	10	14	15
Metolachlor, 2.5, PPL, Feb fb metolachlor, 1.3, PRE, June	70	68	70	4	10	9
Metolachlor, 2.5, PRE, June	80	79	73	11	14	10
Metolachlor, 2.5, PPL, Feb	20	10	0	0	0	0
LSD (0.05)[c]	22	31	8	12	11	8

[a] Evaluations were made 5, 7 and 9 wk after June applications.
[b] PPL = preplant to southern pea, applications were made in February and April. PRE = preemergence to southern pea imme
planting.
[c] LSD values may be used to compare numbers within the same column.

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

Treatment description[b]	Weed control[a] Yellow nutsedge (CYPES) 1 wk	2 wk	4 wk	6 wk	8 wk	Southern pea Injury 1 wk	2 wk	4 wk	6 wk	8 wk	Yield
(kg ai/ha)	-------	-------	(%)	-------	-------	-------	-------	-------	-------	-------	(kg/ha)
Untreated check	0	0	0	0	0	0	0	0	0	0	632
Bentazon, 0.84 + sethoxydim, 0.45 + COC (Agri-Dex, 1.25% v/v), POST	0	0	91	44	81	0	0	6	6	10	1593
Imazethapyr, 0.07 + trifluralin, 0.56, PPI	28	28	25	33	41	0	0	3	5	0	664
Metolachlor, 2.24, PPI	45	60	60	40	68	0	3	0	0	0	536
Sulfentrazone, 0.42, PRE	18	89	94	50	89	0	14	10	3	10	990
Sulfentrazone, 0.42, PPI	43	85	75	44	78	30	36	33	23	30	710
Sulfentrazone, 0.21, PRE	25	91	86	46	86	3	23	5	0	5	995
Sulfentrazone, 0.21, PPI	28	60	41	23	60	5	9	0	0	0	1158
Sulfentrazone, 0.21 + trifluralin, 0.56, PPI	25	65	55	35	69	0	5	5	0	0	827
Sulfentrazone, 0.42 + trifluralin, 0.56, PPI	38	76	80	40	80	8	18	5	3	0	616
Metolachlor, 2.24 + fomesafen, 0.14, CRAC	13	38	50	53	55	70	75	60	60	43	1056
Metolachlor, 2.24 + fomesafen, 0.28, CRAC	8	45	60	60	50	86	94	79	70	60	796
Halosulfuron, 0.038 + AW (AG-98, 0.25%), POST	0	0	68	51	90	0	0	30	15	20	1174
Halosulfuron, 0.019 + AW (AG-98, 0.25%), POST	0	0	69	43	86	0	0	29	14	15	1088
LSD (0.05)[c]	22	21	23	35	19	17	22	19	17	19	724

[a] Evaluations were made 1, 2, 4, 6 and 8 wk after planting.
[b] PPI = preplant incorporated; PRE = preemergence; CRAC = cracking stage; POST = postemerge
[c] 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[b] (kg ai/ha)	Weed control[a] CYPES 3 wk	CYPES 5 wk	CYPES 7 wk	Effect on summer squash: Injury 3 wk	Injury 5 wk	Injury 7 wk	Yield (squash/1m row)	Yield (mt/ha)
	----------	----------	----------	(%)	----------	----------		
Untreated check	0	0	0	0	0	0	17	10.0
Hand-weeded check	100	100	100	0	0	0	15	10.0
Bentazon, 0.84, COC (Agri-Dex, 1.25%), POST	—[c]	58	53	—	13	10	19	10.0
Sulfentrazone, 0.28, PRE	60	63	69	97	99	50	1	0.0
Halosulfuron, 0.019, W (AG-98, 0.25%), POST	—	15	84	—	15	8	25	13.3
Halosulfuron, 0.039, W (AG-98, 0.25%), POST	—	66	76	—	18	9	25	15.0
Halosulfuron, 0.027, PRE	71	79	58	23	10	4	23	11.7
Halosulfuron, 0.053, PRE	85	71	89	43	25	9	13	8.3
Bensulide, 6.73, PRE	38	28	33	3	8	3	25	15.0
LSD (0.05)[d]	23	27	29	18	19	36	4	2.8

[a] Evaluations were made 3, 5 and 7 wk after PRE applications. The 5 and 7 wk evaluations correspond to 1 and 3 wk after POST applications.
[b] PRE = preemergence immediately after planting, POST = postemergence over-the-top of foliage.
[c] — = ratings not taken.
[d] 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 fruit/plant	Avg. fruit wt./plant
	(no.)		(g)
No cover[a]	31	24	6.3
Black plastic[b]	22	17	4.8
Rye + vetch[c]	33	27	7.3
Wheat + vetch[c]	33	28	7.4
LSD (0.05)	4	4	1.3

[a] Disked in September, 1995, one week prior to transplanting; trifluralin, 0.84 PPI; metribuzin, 0.28 kg/ha, 20 DAP POST-DIR; and 0.5 kg/ha 30 DAP POST-DIR.

[b] Same as no cover crop treatment; laid black plastic on May 10,

[c] Planted two parts rye or wheat plus one part vetch, about 39 plus September, 1995. Cover crops desiccated with 0.8 kg/ha paraquat plu metribuzin on May 1, 1996. Applied sethoxydim, 0.25 kg/ha, 17 DAP POST and metribuzin, 0.28 kg/ha, 20 DAP POST-DIR.

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

Treatment description[b]	Primocane suppression[a] 1 wk	2 wk	3 wk	4 wk	5 wk	Effect on raspberries: Injury 1 wk	2 wk	3 wk	4 wk	5 wk	Yield
(kg ai/ha)	(%)										(mt/ha)
Untreated check	0	0	0	0	0	0	0	0	0	0	0.9
Lactofen, 1.12, EPOST fb lactofen, 1.12, LPOST	91	90	96	87	81	8	9	8	3	0	1.3
Lactofen, 2.24, EPOST fb lactofen, 2.24, LPOST	96	96	95	94	90	15	9	8	3	0	1.7
Standard (Mowing)	96	100	100	95	90	0	0	0	0	0	1.8
LSD (0.05)[c]	8	2	6	3	3	4	4	5	5	NS	0.3

[a] Evaluations were made 1, 2, 3, 4 and 5 wk after first application. The 3-, 4- and 5-wk evaluations correspond to 1, 2 and 3 wk after second application.

[b] EPOST = postemergence over-the-top of plants on May 16, 199 emergence over-the-top on May 30, 1996.

[c] LSD values may be used to compare numbers within the same

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

Treatment description[a]	Stand	Early yield	Total yield
(kg/ha)	(no.)	(kg/ha)	
No plastic	18	116	268
Black plastic fb 2,4-D amine, 0.56, EPOST fb sethoxydim, 0.34, LPOST	27	422	1634
Black plastic + rye fb 2,4-D amine, 0.56, EPOST fb sethoxydim, 0.34, LPOST	28	892	2698
No plastic fb 2,4-D amine, 0.56, EPOST fb sethoxydim, 0.34, LPOST	14	74	124
LSD (0.05)[b]	5	332	754

[a] EPOST = fall broadleaf treatments in November, 1995; LPOST = spring burndown treatments in March, 1996.

[b] LSD can be used to compare numbers in the same column.

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

Treatment description[b]	Weed control[a]									Effect on watermelon			
	ELEIN			SORHA			ECLAL			Injury			
	2 wk	4 wk	8 wk	2 wk	4 wk	8 wk	2 wk	4 wk	8 wk	2 wk	4 wk	8 wk	Yield
(kg ai/ha)	(%)												(mt/ha)
Untreated check	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	3.4
Bensulide, 5.6, PPI	65	49	15	60	81	20	68	25	0	0	0	0	4.9
Bensulide, 6.7, PPI	61	54	23	53	78	25	68	18	0	0	0	0	1.5
Bensulide, 5.6, PRE + irrigation	63	76	25	71	93	20	85	89	33	0	0	0	5.4
Bensulide, 6.7, PRE + irrigation	75	80	30	83	91	25	83	83	74	0	0	0	7.4
Ethalfluralin, 1.2, PRE + irrigation	85	85	13	85	96	23	99	94	18	0	0	0	8.8
LSD (0.05)[c]	15	16	9	11	16	8	12	17	7	NS	NS	NS	6.3

[a] Evaluations were made 2, 4 and 8 wk after PPI and PRE applications.
[b] PPI = preplant incorporated, PRE = preemergence immediately after planting.
[c] 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[b] (kg ai/ha)		Weed control[a] Yellow nutsedge (CYPES)				Effect on watermelon Injury			Yield
	3 wk	5 wk	7 wk	9 wk	3 wk	5 wk	7 wk	9 wk	Yield
	(%)								(mt/ha)
Untreated check	0	0	0	0	0	0	0	0	7.1
Hand-weeded check	100	100	100	100	0	0	0	0	13.2
Bentazon, 0.84, AW (Agri-Dex, 1.25%)	—[c]	59	52	43	—	0	1	1	17.9
Sulfentrazone, 0.28, PRE	55	50	50	63	85	53	13	13	14.2
Halosulfuron, 0.039, AW (AG-98, 0.25%), POST	—	30	76	74	—	0	10	0	21.2
Halosulfuron, 0.019, AW (AG-98, 0.25%), POST	—	33	74	60	—	0	11	0	7.8
Halosulfuron, 0.027, PRE	84	69	64	70	13	0	4	1	10.4
Halosulfuron, 0.053, PRE	74	79	64	56	16	0	14	1	19.8
Bensulide, 6.73, PRE	21	11	1	13	0	0	1	1	14.1
LSD (0.05)[d]	35	19	26	20	13	20	7	5	NS

[a] Evaluations were made 3, 5, 7 and 9 wk after PRE applications. The 5-, 7- and 9-wk ratings correspond to 1, 3 and 5 wk applications.
[b] PRE = preemergence immediately after planting. POST = postemergence, over-the-top of foliage.
[c] — = ratings not taken.
[d] 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[b]	Weed control[a] CYPES 5 wk	7 wk	9 wk	Effect on cantaloupe Injury 5 wk	7 wk	9 wk	Yield
(kg ai/ha)	----	----	----	(%) ----	----	----	(mt/ha)
Untreated check	0	0	0	0	0	0	0.7
Hand-weeded check	100	100	100	0	0	0	2.9
Bentazon, 0.84, COC (Agri-Dex, 1.25%), POST	58	53	33	18	30	0	1.9
Sulfentrazone, 0.28, PRE	68	76	60	89	74	48	2.5
Halosulfuron, 0.019, W (AG-98, 0.25%), POST	38	90	82	0	6	3	3.4
Halosulfuron, 0.039, W (AG-98, 0.25%), POST	53	91	85	0	5	0	3.0
Halosulfuron, 0.027, PRE	83	70	64	8	0	0	3.1
Halosulfuron, 0.053, PRE	81	67	67	23	3	0	3.5
Bensulide, 6.73, PRE	0	0	3	0	0	0	1.6
LSD (0.05)[c]	21	22	23	11	19	8	1.6

[a] Evaluations were made 5, 7 and 9 wk after PRE applications. The 5, 7 and 9 wk evaluations correspond to 1, 3 and 5 applications.
[b] PRE = preemergence immediately after planting, POST = postemergence over-the-top of foliage.
[c] 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[b]	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
Fluazifop, 0.42, POST-TP*[c]	10	0	0	0	0	0
Fluazifop, 0.84, POST-TP*	10	0	0	0	0	0
Fluazifop, 1.7, POST-TP*	20	10	0	0	10	0
Oryzalin, 2.1, POST-TP*	10	10	10	10	0	10
Oryzalin, 4.5, POST-TP*	10	10	20	10	0	10
Oryzalin, 9.0, POST-TP*	20	30	50	40	40	50
Napropamide, 4.5, POST-TP*	20	20	10	20	10	10
Napropamide, 9.0, POST-TP*	20	30	10	20	10	10
Napropamide, 18.0, POST-TP*	40	60	60	60	60	60
Isoxaben, 0.56, POST-TP	80	100	100	—[c]	—	—
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)[d]	17	18	21	25	26	26

[a] No weeds were present 6 wk after transplanting.
[b] Treatments with a "*" indicate a second application at 8 wk.
[c] — = ratings not taken where one application was used.
[d] LSD values may be used to compare means within the same column.

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

Designation and trade names	Chemical name and formulation
alachlor (Lasso®)	2-chloro-N-(2,6-diethylphenyl)-N-(methoxymethyl)acetamide, 480 g/L
bensulide (Prefar®)	O,O-bis(1-methylethyl) S-[2-[(phenylsulfonyl)amino]ethyl]phosphorodithioate, 480 g/L
bentazon (Basagran®)	3-(1-methylethyl)-(1H)-2,1,3-benzothiadiazin-4(3H)-one 2,2-dioxide, 480 g/L
Betamix® (trade name)	see phenmedipham plus desmedipham, 156 g/L
chlorpropham (Furloe®)	1-methylethyl 3-chlorophenylcarbamate, 480 g/L
clethodim (Select®)	(E,E)-(+)-2-[1-[[(3-chloro-2-propenyl)oxy]imino]propyl]-5-[2-(ethylthio)propyl]-3-hydroxy-2-cyclohexen-1-one, 240 g/L
clomazone (Command®)	2-[(2-chlorophenyl)methyl]-4,4-dimethyl-3-isoxazolidinone, 360 g/L
clopyralid (Stinger®)	3,6-dichloro-2-pyridinecarboxylic acid, 360 g/L
cycloate (Roneet®)	S-ethyl cyclohexylethylcarbamothioate, 720 g/L
DCPA (Dacthal®)	dimethyl 2,3,5,6-tetrachloro-1,4-benzenedicarboxylate, 75 DF
desmedipham (see Betamix®)	ethyl [3-[[(phenylamino)carbonyl]oxy]phenyl]carbamate
ethalfluralin (Curbit®)	N-ethyl-N-(2-methyl-2-propenyl)-2,6-dinitro-4-(trifluoromethyl)benzenamine, 360 g/L
fluazifop-P (Fusilade DX®)	(R)-2-[4-[[5-trifluoromethyl]-2-pyridinyl]oxy]phenoxy]propanoic acid, 240 g/L
fomesafen (Reflex®)	5-[2-chloro-4-(trifluoromethyl)phenoxy]-N-(methylsulfonyl)-2-nitrobenzamide, 240 g/L
halosulfuron (Permit®)	5-[2-chloro-6-fluoro-4-(trifluoromethyl)phenoxy]-N-(ethylsulfonyl)-2-nitrobenzamide, 75% WG
imazethapyr (Pursuit®)	2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-5-ethyl-3-pyridinecarboxylic acid, 240
isoxaben (Gallery®)	N-[3-(1-ethyl-1-methylpropyl)-5-isoxazolyl]-2,6-dimethoxybenzamide, 75% WG
lactofen (Cobra®)	(+)-2-ethoxy-1-methyl-2-oxoethyl 5-[2-chloro-4-(trifluoromethyl)phenoxy]-2-nitrobenzoate, [illegible]
metolachlor (Dual®, Pennant®)	2-chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1-methylethyl)acetamide, 960 g/L, 936 g/L, 5 [illegible]
metribuzin (Sencor®)	4-amino-6-(1,1-dimethylethyl)-3-(methylthio)-1,2,4-triazin-5(4H)-one, 75 DF
napropamide (Devrinol®)	N,N-diethyl-2-(1-naphthalenyloxy)propanamide, 50 WP
oryzalin (Surflan®)	4-(dipropylamino)-3,5-dinitrobenzenesulfonamide, 480 g/L
oryzalin + oxyfluorfen (Rout®)	see oryzalin and oxyfluorfen
oxadiazon (Chipco®)	3-[2,4-dichloro-5-(1-methylethoxy)phenyl]-5-(1,1-dimethylethyl)-1,3,4-oxadiazol-2-(3H)-one, 50% WP
oxyfluorfen (Goal®)	2-chloro-1-(3-ethoxy-4-nitrophenoxy)-4-(trifluoromethyl)benzene, 192 g/L
paraquat (Gramoxone Extra®)	1,1'-dimethyl-4,4'-bipyridinium ion, 300 g/L
pendimethalin (Prowl®)	N-(1-ethylpropyl)-3,4-dimethyl-2,6-dinitrobenzenamine, 396 g/L

Continued

Appendix Table 1. Continued.

Designation and trade names	Chemical name and formulation
phenmedipham (Spin-Aid®)	3-[(methoxycarbonyl)amino]phenyl(3-methylphenyl)carbamate, 156 g/L
phenmedipham + desmedipham (Betamix®)	(see Betamix)
pyridate (Tough®)	*O*-(6-chloro-3-phenyl-4-pyridazinyl) *S*-octyl carbonothioate, 450 g/L
sethoxydim (Poast®)	2-[1-(ethoxyimino)butyl]-5-[2-(ethylthio)propyl]-3-hydroxy-2-cyclohexen-1-one, 180
sulfentrazone (Authority®)	*N*-[2,4-dichloro-5-[4-(difluoromethyl)-4,5-dihydro-3-methyl-5-oxo-1*H*-1,2,4-triazol-1-yl]phenyl]methanesulfonamide, 75% DF
trifluralin (Treflan®)	2,6-dinitro-*N,N*-dipropyl-4-(trifluoromethyl)benzenamine, 480 g/L

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

	April			May			June			July		
	Temp.		Rain-	Temp.		Rain-	Temp.		Rain-	Temp.		Rain-
Day	Max	Min	fall	Max	Min	fall	Max	Min	fall	Max	Min	fall
	(%C)	(%C)	(cm)	(%C)	(%C)	(cm)	(%C)	(%C)	(cm)	(%C)	(%C)	(cm)
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		23	17	
14	25	15		15	12	0.23	31	20	0.64	28	18	
15	11	2		23	13	0.08	31	19		26	15	1.27
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		28	18		34	25	
21	21	6		28	18		34	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		31	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	18	

* Underlined numbers are irrigation amounts.

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

Day	April Temp. Max	April Temp. Min	April Rainfall	May Temp. Max	May Temp. Min	May Rainfall	June Temp. Max	June Temp. Min	June Rainfall	July Temp. Max	July Temp. Min	July Rainfall
	(%C)	(%C)	(cm)	(%C)	(%C)	(cm)	(%C)	(%C)	(cm)	(%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	2.64	21	11		34	20		27	21	4.19
13	24	11		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	2.03	32	21	0.03
28	26	15		30	18		34	23	0.18	34	21	
29	15	10	1.07	29	17		35	22		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.

Code	Scientific Name	Common Name
AMAPA	*Amaranthus palmeri* S. Wats.	Palmer amaranth
AMASS	*Amaranthus* spp.	pigweed species
AMBEL	*Ambrosia artemisiifolia* L.	common ragweed
CAPBP	*Capsella bursa-pastoris* L.	shepherd's-purse
CHEAL	*Chenopodium album* L.	common lambsquarters
CYPES	*Cyperus esculentus* L.	yellow nutsedge
DIGIS	*Digitaria ischamum* (Schreb. ex Schweig)	smooth crabgrass
ECHCG	*Echinochloa crus-galli* (L.) Beauv.	barnyardgrass
ECLAL	*Eclipta prostrata* L.	eclipta
ELEIN	*Eleusine indica* (L.) Gaertn.	goosegrass
LAMAM	*Lamium amplexicaule* L.	henbit
POANN	*Poa annua* L.	annual bluegrass
POROL	*Portulaca oleracea* L.	common purslane
SETFA	*Setaria faberi* Herrm.	giant foxtail
SIBVI	*Sibara virginica* (L.) Rollins	sibara
SORHA	*Sorghum halepense* (L.) Pers.	johnsongrass
VICSA	*Vicia sativa* L.	common vetch
VICVI	*Vicia villosa* Roth	hairy vetch

CONVERSION TABLE

U.S. to Metric			Metric to U.S.		
to convert from:	to:	Multiply the U.S. unit by	to convert from:	to:	Multiply the metric unit by
length			**length**		
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
area and volume			**area and volume**		
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	16.39	cu centimeters	cu inches	0.06
acres	hectares	0.41	hectares	acres	2.47
liquid measure			**liquid measure**		
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
weight and mass			weight and mass		
pounds	kilograms	0.45	kilograms	pounds	2.21
ounces	grams	28.35	grams	ounces	0.04
temperature			**temperature**		
F	C	5/9(F-32)	C	F	(9/5)C+32

SINCE 1888

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