SECTION III: WEED MANAGEMENT IN HORTICULTURAL CROPS

CHEMICAL WEED CONTROL AND RESPONSE TO COMPETITION IN MARJORAM (*ORIGANUM SYRIACUM*). J.R. Qasem and C.L. Foy, Faculty of Agriculture, University of Jordan, Amman, Jordan and Department of Plant Pathology, Physiology and Weed Science, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061.

ABSTRACT

Oxyfluorfen and oxadiazon were evaluated in the field for weed control and crop tolerance, and the effects of weed interference in transplanted marjoram (*Origanum syriacum* L.), a desert spice and medicinal plant. Oxyfluorfen was applied immediately prior to transplanting at 0.62 kg ai/ha or postemergence at 0.48 kg/ha when weeds had an average of two to three leaves and were no taller than 10 cm. Oxadiazon was evaluated in similar manner as both pre-transplant (0.96 kg ai/ha) and postemergence (0.62 kg/ha) applications. Untreated controls and hand-weeded (weed-free) plots were also included for comparison. Four replications of all treatments were arranged in a randomized complete block design, and all data recorded were analyzed statistically. Marjoram seedlings were grown in greenhouse flats, then transplanted into the field on June 1, 2000. The plots were sprinkler irrigated once on the following day to activate the herbicides and to promote weed seed germination. Rainfall thereafter was frequent and adequate to support germination and rank growth of the following weed species: common lambsquarters (*Chenopodium album* L.), fall panicum (*Panicum dichotomiflorum* Michx.), Eastern black nightshade (*Solanum ptycanthum* Dun.), stinkgrass (*Eragrostis cilianensis* (All.) E. Mosher), common ragweed (*Ambrosia artemisiifolia* L.), giant foxtail (*Setaria faberi* Herrm.), hairy galinsoga (*Galinsoga ciliata* (Raf.) Blake), quackgrass (*Elytrigia repens* (L.) Nevski), common pokeweed (*Phytolacca americana* L.), Pennsylvania smartweed (*Polygonum pensylvanicum* L.), barnyardgrass (*Echinochloa crus-galli* (L.) Beauv.), and dandelion (*Taraxacum officinale* Weber in Wiggers).

Data recorded during July and August included weed control ratings, percent weed ground cover, marjoram plant height and number of individual shoots. Total shoot growth of marjoram and all weeds were harvested on August 21, 2000 and the data analyzed separately by species. Weed growth was very rank, with some species exceeding 2 m in height and representing 100% ground cover in the nonweeded plots and 88 to 100% in plots treated postemergence. Whereas the postemergence treatments were ineffective, both oxyfluorfen and oxadiazon applied pre-transplanting and activated immediately, along with triggering the maximum flush of weed seed germination, provided satisfactory control during nearly 3 mo, with weed ground cover of 2.5 and 23.8%, respectively. Although the highest shoot production of marjoram occurred in the hand weeded controls, followed by all herbicide-treated plots, then by the nonweeded controls, the only statistically significant differences were between the hand weeded and nonweeded controls. Possibly, some of the gains achieved by chemically reducing weed interference was offset by a low level of growth inhibition of marjoram by the herbicides.

HALOSULFURON RATE AND TIMING APPLICATION AFFECTS ON SUMMER SQUASH AND MUSKMELON. R.S. Buker III and W.M. Stall, University of Florida, Gainesville, Fl.

ABSTRACT

There are currently no available options for chemical control of nutsedge in squash or muskmelon. Halosulfuron provides excellent control of nutsedges and was evaluated for use in summer squash and muskmelon. Tolerance of watermelon and cucumber to halosulfuron has been shown to be dependent on rate and timing of applications. Therefore this research was focused on the affect of rate and timing of applications on yield.

Trials were conducted at the University of Florida Horticultural Unit in Gainesville, Fl , from the spring of 1999 through the spring of 2000. Trails of the summer squash were repeated three times using the variety ‘Gentry’, while the muskmelon trials were repeated twice using the variety ‘Athena’. All trials were designed as a factorial experiment with plots arranged in a randomized complete block. Summer squash was treated with halosulfuron at 0, 1, 2, 3, 4, and 5 weeks after emergence (WAE). Muskmelon was treated with halosulfuron at 3, 4, 5, and7 WAE. In all trials, halosulfuron was applied at each application timing with the rate of 0, 0.024, 0.032, 0.040, and 0.048 kg ai/ha. ANOVA was used to detect significant interactions from treatments and treatment means.

Yield of summer squash was negatively affected by halosulfuron at all application timings before 5 WAE. At each application timing there were negatively linear relationships between yield and rate. The greatest yield loss occurred from applications at 1WAE, ranging from 50 - 60% compared to the control. At 5 WAE squash was being harvested, so applications of halosulfuron at this time are questionable. Applications at 3 WAE had the least impact on yield. Halosulfuron applied at this time may provide an economically viable weed control option. Yield of muskmelon was affected by the timing of halosulfuron, but not the rate. Application timing had a negatively linear affect on yield in the spring of 2000. Maximum yield loss was 12% at 7 weeks after emergence. Yield loss from 2 to 5 WAE was minimal (<10%), except the 3 WAE applications in 1999. The data indicates muskmelon have excellent tolerance to halosulfuron, with minimal impact on yield.

EVALUATION OF HALOSULFURON IN BAREGROUND WATERMELON CULTURE. R.B. Batts, A.S. Culpepper, and K.L. Lewis. North Carolina State University, Raleigh; University of Georgia, Tifton and Cordele.

ABSTRACT

Halosulfuron is the active ingredient in the registered herbicides Permit, Sempra, and Manage. In previous research, halosulfuron preemergence (PRE) and early postemergence (POST) controlled nutsedge (*Cyperus* spp.) and pigweed (*Amaranthus* spp.) well. Pigweed and nutsedge species are two of the most common and troublesome weeds in southeastern vegetable production. Indications are that a halosulfuron-containing herbicide will be available soon for use in vegetables.

An experiment was conducted at two locations in Georgia and one in North Carolina to evaluate weed control and watermelon response to halosulfuron. The experiment included 18 herbicide systems and two non-treated checks. The first nine treatments were halosulfuron at 0.024, 0.036, and 0.048 lb ai/A applied PRE, POST to 1-leaf watermelon, or POST to12- to 15-inch watermelon. The other nine treatments included the following: halosulfuron 0.024 lb/A PRE followed by (fb) halosulfuron 0.024 lb/A POST to 1-leaf watermelon, POST to 12- to 15-inch watermelon, or POST to 1-leaf and 12- to 15-inch watermelon; ethalfluralin at 1.5 lb ai/A PRE with no POST herbicide or with halosulfuron 0.024 lb/A POST at either 1-leaf or 12- to 15-inch watermelon; and bensulide at 0.83 lb ai/A plus naptalam at 3 lb ai/A PRE with no POST herbicide or with halosulfuron 0.024 lb/A POST at either 1-leaf or 12- to 15-inch watermelon.

Averaged over rates, halosulfuron was most effective on yellow nutsedge (*Cyperus esculentus*) in late season when applied POST to 12- to 15-inch watermelon and least effective applied PRE. However, control by halosulfuron at higher rates applied to 1-leaf watermelon was similar to control by all rates applied POST to 12- to 15-inch watermelon. Poor late-season control of yellow nutsedge, coffee senna (*Cassia occidentalis*), and a mixture of ivyleaf morningglory (*Ipomoea hederacea*) and entireleaf morningglory (*I. hederacea* var. *integriuscula*) was noted with all PRE herbicides. Halosulfuron PRE plus POST was more effective than PRE on morningglory, coffee senna, and yellow nutsedge. Halosulfuron PRE plus POST was more effective than POST on coffee senna and morningglory but not yellow nutsedge. At the lower two application rates, halosulfuron was more effective on coffee senna when applied POST. Control of coffee senna was similar from the high rate regardless of application timing. Late-season morningglory control was less than 60% with all single applications of halosulfuron regardless of rate or application timing and with ethalfluralin or bensulide plus naptalam PRE fb halosulfuron POST. Halosulfuron PRE plus POST twice controlled morningglory 90%. Halosulfuron PRE at 0.024 lb/A controlled Palmer amaranth (*Amaranthus palmeri*) 95% late in the season. Halosulfuron applied to 1-leaf and 12- to 15-inch watermelon controlled Palmer amaranth 72 to 85 and 66 to 78%, respectively. Palmer amaranth was controlled at least 85% in all systems with a PRE herbicide followed by halosulfuron POST. Goosegrass (*Eleusine indica*) control was acceptable only in systems with ethalfluralin or bensulide plus naptalam PRE.

Crop injury was evaluated 14 days after PRE applications, 6 and 16 days after 1-leaf applications, and 6 days after 12- to 15-inch applications. Injury from PRE herbicides was less than 10%. Watermelon was injured 38 to 58% 6 days after halosulfuron application at the 1-leaf stage. Injury declined to 25 to 38% at 16 days. Larger watermelon was more tolerant of halosulfuron POST and recovered from injury more quickly. Halosulfuron applied to 12- to 15-inch watermelon injured the crop about 30% regardless of application rate. Watermelon was injured 55% following halosulfuron applied at both the 1-leaf and 12- to 15-inch stages.

Yields in Georgia were closely associated crop injury as well as Palmer amaranth and morningglory control. Although not significantly different, yields with single applications of halosulfuron were numerically greatest with halosulfuron PRE. Yields declined as application date was delayed. Yields were greatest with halosulfuron PRE plus POST at 12- to 15-inch watermelon. Due to injury, yields with halosulfuron PRE fb two POST applications were similar to that with halosulfuron PRE alone. Halosulfuron POST significantly increased yields in systems with ethalfluralin PRE but not with bensulide plus naptalam or halosulfuron PRE. Yields in North Carolina were related primarily to goosegrass control. Poor yields were obtained in all systems that did not include ethalfluralin or bensulide plus naptalam.

MILESTONE - A WEED MANAGEMENT TOOL FOR FLORIDA CITRUS. S.H. Futch and S.D. Delaney; University of Florida, Lake Alfred, FL 33850 and DuPont Agricultural Products, Clermont, FL 34711.

ABSTRACT

Milestone (azafenidin) is an experimental herbicide for use in Florida citrus, sugarcane, and other crops in the United States and the world. Milestone is formulated as an 80DF water-dispersible granule. The herbicide is very safe for use on any age citrus tree. Low use rates, compared to many other products, and the fact that it strongly binds to soil particles resulting in low soil mobility provides favorable environmental properties. Milestone provides effective preemergence weed control for many key broadleaf and grass weeds which are commonly found in Florida citrus groves. Broadleaf weeds controlled by Milestone include: balsam apple vine (*Momordica charantia*), pusley (*Richardia brasiliensis, R. scabra),* hairy beggartick (*Bidens pilosa*), and pigweed (*Amaranthus* spp.). Grasses controlled by Milestone include: alexandergrass (*Brachiaria plantaginea*), crabgrass (*Digitaria* spp.), crowfootgrass (*Dactyloctenium aegyptium*), goosegrass (*Eleusine indica*), guineagrass (*Panicum maximum*), and signalgrass (*Brachiaria platyphylla*). Milestone applied at 20 oz per treated acre provided weed control of 84 to 95 percent at 120 days after treatment. Weed

control up to 180 days has been provided in some locations, depending on application rate and season. Milestone has proven safe for use in Florida citrus providing effective weed control of many of the common key weeds found in all citrus production regions.

WEED CONTROL OPTIONS FOR SELECTED CONTAINERIZED ANNUALS AND PERENNIALS. P.R. Knight *, S.L. File, J.M. Anderson, P. Sciarabba, and K. Martin. Mississippi State University, Coastal Research and Extension Center, P.O. Box 193, Poplarville, MS 39470.

ABSTRACT

Although ornamentals comprise a $10 billion a year industry, plant material diversity dictates that they are minor-use crops for most chemical companies. The IR-4 program aids in labeling new or experimental pesticides for minor use crops. The objective of this experiment was to determine the ornamental phytotoxicity and herbicide efficacy for several herbicides and ornamental crops. Fluazipop-B-butyl, Metalochlor, Napromide, Oryzalin, Oxyfluorfen+Oryzalin, and Oxyfluorfen+Pendimethalin were evaluated for weed control on *Gaillardia x grandiflora*. Clethodim, Dithiopyr, and Oxadiazon+Pendimethalin were evaluated on *Echinacea purpurea, Hemerocallis spp., Impatiens walleriana,* and *Begonia semperflorens.* Herbicides were applied at 1, 2, and 4x label rates. Additionally, a control treatment was evaluated. *Gaillardia* treated with Napromide at 1x had acceptable plant quality with reduced weed numbers and percent weed coverage compared to the control. Oxadiazon+Pendamethalin, regardless of rate, provided excellent weed control while maintaining plant quality of *Impatiens.* Oxadiazon+Pendamethalin at 2 or 4x provided excellent weed control and did not reduce plant quality for *Hemerocallis or Echinacea.* Finally, Clethodim, Dithiopyr, and Oxadiazon+Pendimethalin all provided excellent weed control without reduced plant quality for *Begonia*, regardless of rate.

NEW HERBICIDES FOR SNAPBEAN AND SOUTHERNPEA. R.E. Talbert, M.L. Lovelace, E.F. Scherder, N.W. Buehring, Department of Crop, Soil, and Environmental Sciences, University of Arkansas, Fayetteville, AR 72704 and W.R. Russell, Allen Canning Company, Siloam Springs, AR 72761.

ABSTRACT

Snapbean and southernpea are important vegetable legume food crops grown for human consumption throughout the Southern U.S. region. The land area devoted to these crops is quite minor compared to the major legume crop of the region, soybean, and there is less economic incentive to register new herbicide technologies for these crops. Field trials were conducted each year to evaluate new herbicides for potential use in these crops through new limited support for herbicide efficacy evaluation in minor crops from the IR-4 program and commodity support. This summarizes our results for the 1999 and 2000 growing seasons.

The snapbean field trails were conducted on a producer's field on a silt loam soil each year in cooperation with the Allen Canning Company Pest Management Specialist. Immediately after planting snapbean (cv. Roma II), preemergence (PRE) treatments were applied on May 3, then early postemergence (POST) treatments applied when snapbeans were at the first trifoliate stage on May 27, 1999. In 2000, planting and PRE treatments were applied May 15. The POST treatments were applied in a separate experimental area to weeds 1 to 3 in tall on May 31, 2000. Weeds present included common lambsquarters and goosegrass in 1999 and Palmer amaranth, common ragweed, common lambsquarters, and giant foxtail in 2000. Promising newer treatments for snapbean controlling one or more weed species were dimethenamid PRE at 1 lb/A, flufenacet PRE at 0.3 to 0.6 lb/A, lactofen PRE at 0.2 lb/A, clomazone PRE at 0.5 lb/A fomesafen PRE at 0.2 lb/A, clomazone PRE at 0.5 lb/A, imazamox POST at 0.024 to 0.032 lb/A, imazethapyr POST at 0.032 lb/A, halosulfuron POST at 0.047 to 0.064 lb/A, and imazethapyr + bentazon POST at 0.032 +0.75 lb/A. Treatments not tolerated by snapbean were flumetsulam PRE at 0.063 lb/A, diclosulam PRE at 0.032 lb/A, and cloransulam POST at 0.016 lb/A.

The southernpea field trials were conducted at the Main Experiment Station, Fayetteville, on Captina silt loam soil using cv. Encore planted in July each year. PRE treatments were applied immediately and POST treatments applied 2 to 3 wk after planting. Weed control ratings from these trials included goosegrass, Palmer amaranth, yellow nutsedge, cutleaf groundcherry, and clammy groundcherry. Promising newer treatments for southernpea controlling one or more weed species were dimethenamid PRE at 1 lb/A, flufenacet PRE at 0.25 lb/A, and halosulfuron PRE at 0.026 lb/A. Treatments not tolerated by southernpea were fomesafen PRE at 0.25 lb/A, diclosulam PRE at 0.032 lb/A, imazapic POST at 0.063 lb/A, cloransulam POST at 0.018 lb/A, imazamox POST at 0.036 lb/A, and halosulfuron POST at 0.026 lb/A.

COMPARISON OF WEED CONTROL SYSTEMS FOR YOUNG PECANS. W.H. Faircloth, M.G. Patterson, W.G. Foshee, W.D. Goff, and M.L. Nesbitt. Auburn University, Auburn, AL.

ABSTRACT

Six weed control systems in combination with two irrigation programs were compared in pecan [*Carya illinoensis* Koch. var. 'Desirable'] near Tallassee, AL, in an eight-year study. Newly established pecan trees (planted Oct. 1991) were subjected to one of six weed control systems: 1) preemergence (PRE) herbicides only; 2) PRE herbicides plus mowing; 3) postemergence (POST) herbicides only; 4) POST herbicides plus mowing; 5) PRE plus POST herbicides; and 6) mowing only. Each of the above systems was also tested with and without irrigation, giving a total of 12 treatments. The study had a randomized complete block design with 8 replications. Trees were planted 30ft. apart in rows 40ft. apart. A 10ft. by 10ft. square centered on each tree was the treatment area. PRE herbicides included combinations of diuron, norflurazon, oryzalin, or simazine. POST herbicides were glyphosate or paraquat. Mowings were scheduled on three week intervals throughout the growing season. Weeds of interest to researchers included the perennials bermudagrass [*Cynodon dactylon* (L.) Pers.] and bahiagrass [*Paspalum notatum* Fluegge], and an assortment of broadleaved annuals. Tree growth (diameter or circumference) and nut yield were measured and analyzed for significant differences (P=0.05).

Pecan growth, measured by increase in diameter, showed that irrigation consistently resulted in larger trees at the end of eight seasons. One exception being the PRE+POST system which showed no difference due to irrigation. Trees that received mowing only ranked last in growth each year, and in overall growth at the end of the eighth season. Weed control systems that included POST herbicides (POST only, PRE+POST, or POST+mowing) resulted in the most growth regardless of irrigation regime. Yields for 1998 showed that a PRE+POST weed control system gave highest yields in both the irrigated and non-irrigated trees, with irrigated trees numerically yielding higher than non-irrigated. The POST+mowing, PRE+POST, and PRE only systems (irrigated) gave equivalent yields in 1999 (434 lb/A, 393 lb/A, and 343 lb/A, respectively). Non-irrigated trees that had POST herbicides produced statistically equivalent yields to those mentioned above (308-330 lb/A). Mowing only trees produced fewer nuts than other trees in 1998 and 1999, both irrigated and non-irrigated. Both tree growth and nut yields suggested that using POST herbicides and irrigation gave best results. However, should irrigation not be available or economically feasible, a PRE+POST weed control system gives best results. These data show choice of weed control system is as important as choosing whether or not to irrigate pecan trees.

INFLUENCE OF RIMSULFURON RATES ON THE INTERFERENCE OF PURPLE AND YELLOW NUTSEDGE (*CYPERUS ROTUNDUS* L. AND *C. ESCULENTUS* L.) WITH TOMATO (*LYCOPERSICON ESCULENTUM* MILL). J.P. Morales-Payan, W.M. Stall, R. Charudattan, J.A. Dusky, D.G. Shilling, and T.A. Bewick, University of Florida, Gainesville, FL, Apopka, FL and CSREES, Washington, D.C.

ABSTRACT

Nutsedges (*Cyperus rotundus* L. and *Cyperus esculentus* L) are the most common weeds found in tomato fields in Florida. Even though tomato is a stronger competitor than nutsedges, the interference of nutsedges can significantly decrease tomato growth and fruit yield. Cultural and chemical treatments have been proposed and tested as alternatives to methyl bromide to suppress weeds in vegetable crops. Satisfactory and consistent nutsedge control has not been achieved with most of the preemergence herbicides tested. Sulfonylurea herbicides such as rimsulfuron, halosulfuron and nicosulfuron have been reported to strongly suppress the growth of nutsedges in several crops. They have been reported to be more effective against nutsedges when applied postemergence. Rimsulfuron has been shown to be efficacious in selectively controlling broadleaf weeds, some grasses, and nutsedges in potato. When tested in tomato, the extent of rimsulfuron selectively is cultivar-dependent. Complete eradication of nutsedges might not be economically or biologically justified in order to obtain adequate tomato fruit yield. The objective of this study was to determine the effect of post-emergence applications of selected rimsulfuron rates on purple and yellow nutsedge control and their influence on tomato yield and grade. Field trials were carried out at Matanzas, Dominican Republic in 1996 and Gainesville, FL with purple nutsedge, and at Gainesville, FL and Live Oak, FL with yellow nutsedge in 1997. Sprouted nutsedge tubers were planted just prior to tomato transplanting. Purple nutsedge were planted at 100 plants/m^2 and yellow nutsedge at 50 plants /m^2. These were at the biological threshold populations established for tomato. Rimsulfuron was applied to tomato and nutsedge 15 days after transplanting when the nutsedge were in the 3-5 leaf stage. A non-ionic surfactant was added in all applications at 0.25% v/v. The rimsulfuron rates used were 0, 3.76, 9.37, 23.36, 58.22, 145.09, 361.58, 901.09 and 2245 g/ha. The effect of rimsulfuron rates on both nutsedge species showed that as rate increased, growth decreased. For purple nutsedge, the shoot dry weight of the treated plants were reduced 90% at the 58.22 g/ha rate. Tuber production was inhibited when purple nutsedge plants were treated with 145.09 g/ha and plants were killed at the 361.58 g/ha rate. Tuber production of yellow nutsedge plants was inhibited at the 145.09 g/ha rate, and shoot dry weight was reduced 95% at the 361.58 g/ha rate. Yellow nutsedge plant were not killed with rimsulfuron until they were treated at the 901.09 g/ha rate. Total yield of weed-free tomato was not impacted by rimsulfuron rate until the rate exceeded 145.09 h/ha. Rimsulfuron rate did, however, affect tomato fruit size. Extra-large sized tomato fruit were reduced at rimsulfuron rates exceeding 58.22 g/ha. Purple nutsedge competition reduced tomato total yield at rimsulfuron rates lower than 23.36 g/ha. Tomato total yield was the same as the check from rates of 23.36 g/ha through 145.09 g/ha. Above that rate, total yield was reduced by rimsulfuron toxicity. Highest yields of extra-large fruit were obtained in

purple nutsedge infested plots when rimsulfuron was applied at 23.36 g/ha through the 361.58 g/ha treated plots. Highest yields of extra-large fruit were obtained in the plots treated with 23.36 - 145.09 g/ha rimsulfuron. Purple and yellow nutsedge competition can be minimized to allow maximum total and extra-large fruit production when rimsulfuron is applied post-emergence at 23.36 g/ha to 58.22 g/ha.