**Southern Region Small Fruits Consortium Funding Proposal- 2008**

**Proposal Category:** ___X___ Research _____ Outreach

**Proposal Status:** __ X___ New proposal _____ Previously funded by SRSFC:
Has been previously funded for _0_ years.

**Title:** Evaluation of potential synergistic combinations of synthetic herbicides and/or biofumigants for weed control in small fruits.

**SRSFC Project#:** 2008-17

**Name, Mailing, and E-mail Address of Principal Investigators(s):**


**Principal Investigator**
Greg R. Armel
Dept. of Plant Sciences
University of Tennessee
252 EPS, 24231 Joe Johnson Drive
Knoxville, TN 37996-4561
Email: garmel@utk.edu

**Co-Investigators**

Carl Sams
Dept. of Plant Sciences
University of Tennessee
252 EPS, 24231 Joe Johnson Drive
Knoxville, TN 37996-4561
Email: carlsams@utk.edu

Dennis Deyton
Dept. of Plant Sciences
University of Tennessee
252 EPS, 24231 Joe Johnson Drive
Knoxville, TN 37996-4561
Email: deyton@utk.edu

Finis Stribling
Tennessee State University
350 John A. Merritt Blvd.
Nashville, TN 37209
Email: FSTRIBLING@tnstate.edu

## Objectives:

To evaluate various combinations of experimental herbicides and biofumigants in combinations with current herbicide control strategies to determine if improved weed control and concurrent crop yields could be achieved with reduced pesticide inputs.

## Justifications and Descriptions:

There are many challenges associated with growing high quality small fruit, especially when considering the limited choices producers have available for low-cost, broad-spectrum, and environmentally friendly weed management. In addition, the challenges associated with developing herbicide programs in small fruits are finding rates and ratios of various herbicide combinations that provide broad-spectrum weed control with adequate safety margins to the target crop. In addition, variations in several factors such as cultivar/varietal sensitivity, soil type, climatic conditions, rainfall, and weed population densities make refinement of these herbicide rates and ratios somewhat difficult when evaluating over many geographic regions. In particular, differences in varietal sensitivity to herbicides increases the level of concern for chemical manufacturers when considering expanded registrations for use in small fruits. Couple these concerns over varietal sensitivity with a relatively higher value in use (net income/acre) for small fruits in comparison to larger acreage row crops (i.e. corn, soybean, cotton, rice, etc.) and you can see why there is greater liability and fewer herbicides registered for use in small fruits. Therefore, it becomes the challenge of university horticultural weed specialists to generate supporting tolerance and efficacy data for experimental herbicides alone and in combinations with current programs in order to encourage chemical manufacturers to register their products for additional uses in small fruits. The benefit of these evaluations could be new and better weed control solutions for small fruit producers.

## Materials and Methods:

Three field studies were conducted to evaluate several experimental herbicides and/or biofumigants for crop safety and weed control in strawberry variety 'Chandler', blueberry variety 'Rabbiteye', and blackberry variety 'Apache'. Herbicides were applied using a backpack sprayer calibrated to deliver the spray solution at 23 gallons/acre. Fumigants were applied by evenly distributing spreading the granules or meal over the plot area by hand prior to cultivating the beds. The strawberry study was initiated at the University of Tennessee Plant Sciences farm in Knoxville, TN on September 19, 2007. Currently, one observation for crop injury and weed control was made approximately 4 weeks after treatment (4 WAT) or approximately 2 weeks after transplanting strawberries. This study will continue through next season with additional data recorded on weed control, crop response, and yield. The blueberry study was initiated on May 9, 2008 in a producer's field near Unicoi, TN, while the blackberry study was initiated at the Plateau Research Station in Crossville, TN on May 20, 2008. In general, weed control and crop response were evaluated at 2, 4, and 8 WAT for both the blueberry and blackberry studies.

All field trials were arranged in a randomized complete block design with three replicates in the blueberry and blackberry trial and 4 replicates in the strawberry trial. Weed control was evaluated on a scale from 0 to 100 where 0= no crop injury or weed control and 100= complete death of the crop or the weed evaluated. Data were subjected to analysis of variance (ANOVA) and means were separated using Fisher's protected LSD ($P$=0.05). More detailed information regarding these trials can be found in the site description sections for each data set in the corresponding Appendix file (pages 1 to 32).

**Blueberries and blackberries:**

Both trials evaluated post-directed treatments of several herbicides for control of broadleaf weeds in comparison to the commercial standard simazine (Princep®). Herbicides evaluated included the following: 1) acetolactate synthase inhibitors (ALS)- halosulfuron (Sandea®) at 52.5 and 105 g ai/ha, trifloxysulfuron (Envoke®) at 6.6 and 13.1 g ai/ha, and the experimental herbicide V10142 at 560 and 1120 g ai/ha; 2) *p*-hydroxyphenylpyruvate dioxygenase inhibitor (HPPD)- mesotrione (Callisto®) at 140 and 280 g ai/ha; 3) protoporphyrinogen IX oxidase inhibitor (PPO or Protox)- flumioxazin (Chateau®) at 430 and 860 g ai/ha; 4) auxin mimic herbicide- the experimental herbicide DPX-KJM44 (proposed common name aminocyclopyrachlor-methyl) at 17.5, 35, 70, and 140 g ai/ha. A combination of mesotrione at 140 g ai/ha plus simazine at 4500 g ai/ha was also included in these studies to determine if any synergistic responses would lead to broad-spectrum broadleaf weed control. In both trials, most treatments included glufosinate (Liberty®) + oryzalin (Surflan®) (in the blackberry trial all treatments included this mixture including the treated check while the blueberry site had enough space for both a treated and untreated check) to aid in the control of emerged weeds (glufosinate) and to prevent subsequent grass flushes (oryzalin). Even though these POST-directed applications were made to mature blackberry vines and blueberry bushes, the manner in which we made these applications allowed for an accurate recording of foliar damage to blackberry variety 'Apache' (post-directed treatment contacted the leaf surface of several branches approximately 12 inches from the ground) and blueberry variety 'Rabbiteye' (no visual symptoms were observed from any treatments on the main shrubs, however several roots suckers that were emerged at the time of application are what was evaluated when it came to crop response). The primary findings from the blackberry and blueberry trials are summarized below.

***Blueberry (more detailed information on this study can be found on pages 1 to 12 of Appendix file):***

- Of those systemic herbicides evaluated, DPX-KJM44 (any rate), mesotrione (any rate), halosulfuron (any rate), and trifloxysulfuron (any rate) were the most selective to the 'Rabbiteye' blueberry and the injury afforded by these herbicides did not differ from the glufosinate + oryzalin treated check. Remember that these visual observations were recorded on the root suckers that were emerged at the time of application and not the primary shrubs.
- The best treatments for control of common pokeweed were DPX-KJM44 (140 g ai/ha), simazine (4500 g ai/ha), and V10142 (1120 g ai/ha) although these data were somewhat variable.

- The best treatments for control of wild strawberry were DPX-KJM44 (140 g ai/ha), trifloxysulfuron (13.1 g ai/ha), flumioxazin (any rate), V10142 (1120 g ai/ha), and a combination treatment of mesotrione plus simazine (140 g ai/ha + 4500 g ai/ha).
- The best treatments for control of Virginia creeper were DPX-KJM44 (higher rates were more consistent), trifloxysulfuron (13.1 g ai/ha), flumioxazin (any rate), and V10142 (1120 g ai/ha) although there was a great deal of variability in these data.
- Overall plot burndown was achieved best with DPX-KJM44 (140 g ai/ha), halosulfuron (105 g ai/ha), trifloxysulfuron (13.1 g ai/ha), flumioxazin (any rate), and V10142 (any rate).
- Unfortunately we were not able to collect any yields from this trial.

***Blackberry (more detailed information on this study can be found on pages 13 to 29 of the Appendix file):***

- Of those systemic herbicides evaluated, mesotrione (140 and 280 g ai/ha), halosulfuron (52.5 g ai/ha), and trifloxysulfuron (6.6 and 13.1 g ai/ha) were the most selective to the 'Apache' blackberries and the injury afforded by these herbicides did not differ from the glufosinate + oryzalin treated check.
- The best treatments for dandelion control were DPX-KJM44 at (70 and 140 g ai/ha) and V10142 (1120 g ai/ha)
- The best treatments for aiding in the suppression of grasses were DPX-KJM44 at (140 g ai/ha), trifloxysulfuron (6.6 and 13.1 g ai/ha), flumioxazin (860 g ai/ha), and V10142 (560 and 1120 g ai/ha)
- The best treatments for control of white clover were DPX-KJM44 (any rate) and trifloxysulfuron (any rate)
- The best treatments for control of spotted spurge were DPX-KJM44 (70 and 140 g ai/ha), trifloxysulfuron (6.6 g ai/ha), and flumioxazin (any rate)
- The best treatments for control of Virginia pepperweed appeared to be trifloxysulfuron and V10142 although these data were somewhat variable.
- There were no significant differences in yields over treatments.

***Strawberries grown under plastic (more detailed information on this study can be found on pages 29 to 32 of the Appendix file):***

This study evaluated pre-transplant incorporated applications of several herbicides alone and in combinations with mustard meal at 2240 g ai/ha (containing herbicidal isothiocyanates) compared with mustard meal alone at 2240 g ai/ha alone (samples of mustard meal with and without herbicidal isothiocyanates) and the standard fumigant Basamid G at 390 kg ai/ha. Herbicide treatments included the following: 1) ALS-inhibitors- halosulfuron (Sandea®) at 26.3 and 52.5 g ai/ha, trifloxysulfuron (Envoke®) at 5.25 and 10.5 g ai/ha, and the experimental herbicide V10142 at 560 and 1120 g ai/ha; 2) PPO inhibitor- sulfentrazone (Spartan®) at 140 and 280 g ai/ha. These treatments were applied and immediately incorporated in the bed prior to covering with black plastic mulch. Herbicides were chosen based on their potential for control of the perennial weed yellow nutsedge (*Cyperus esculentus*). In order to ensure an adequate stand of yellow nutsedge for these evaluations, 5 quarts of yellow nutsedge tubers were evenly

distributed throughout the trial prior to herbicide applications. Initial findings from the strawberry trial are summarized below.

- All treatments injured strawberry between 14 to 30% and there were few significant differences among treatments.
- All treatments containing herbicides except for the lowest rate of sulfentrazone provided 67 to 99% control of yellow nutsedge which was similar to Basamid G (82%).
- Plots treated with trifloxysulfuron (both rates), V10142 (both rates), halosulfuron at 26.3 g ai/ha plus mustard meal at 2240 g ai/ha, or Basamid G at 390 kg ai/ha contained fewer nutsedge plants (puncturing the plastic) than the untreated check.
- Visual weed control and crop response will continue to be evaluated next year. Strawberries will also be harvested.

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