Proposal Category: Research

Proposal Status: New Proposal

Title: Over the Top Herbicide Trials in Strawberry

Principal Investigators:
Dr. Jackie Lee
Horticulture IPM Specialist
University of Arkansas Cooperative Extension Service
2301 S. University
Little Rock, AR 72204
479-530-8163
jalee@uaex.edu

Dr. Amanda McWhirt
Horticulture Production Specialist
University of Arkansas Cooperative Extension Service
2301 S. University
Little Rock, AR 72204
501-400-6374
amcwhirt@uaex.edu

Objectives:

1) To evaluate the efficacy of new and labeled herbicides for use in strawberry as an over the top application in established plasticulture strawberry production to manage common weed pests such as vetch, nut sedge, Carolina geranium, and morning glory.
2) Determine the plant safety of herbicides used in over the top applications to established plasticulture strawberries.

Justification and Description:

Project Relevancy and Need

Currently there are only 3 herbicides registered for over the top application in plasticulture strawberry production for weed management: sethoxydim (Poast®), clethodim (SelectMax®), and clopyralid (Stinger®). Clopyralid is used to control some broadleaf weeds such as clover and vetch. Sethoxydim and clethodim both are used to control annual and perennial grasses and belong to the same chemical group, thus having the same mode of action. Currently, 42 weed species have been found to develop resistance to this herbicide group (Heap 2014). This means if used repeatedly, a high probability exists for weed resistance to develop rendering the only two products labeled for this use pattern ineffective. There is a need to find additional options for growers that can increase sustainability of current chemical practices by introducing additional modes of action to current weed management practices.

Besides resistance, there are other issues to consider. With only three herbicides to choose from, there is a gap in the management of important weed pests. For example, these three herbicides do not effectively control one of the major groups of weeds that are commonly found in production systems, the sedges, such as yellow and purple nutsedge. Nutsedge is especially troublesome since it can penetrate through the plastic mulch barrier along with planting holes. A herbicide that can control sedges is needed desperately in an over the top application pattern. It is also important to find other options for broadleaf weed control, since clopyralid currently is the only herbicide labeled for this use pattern.

Currently growers utilize pre-emergent herbicides to gain some control of nutsedge and other weeds including both broadleaves and grasses. It is difficult to solely rely on this method due to residual activity of pre-emergent herbicides failing to last as long as the crop is in the field. Over the top herbicide applications should complement pre-emergent herbicide applications to develop a robust weed management program. Many growers currently rely on hand weeding, which is economically inefficient and often times impossible due to labor constraints. Research to enhance weed management and help lay the groundwork to increase the amount of herbicide options for strawberry growers would greatly benefit the southeastern strawberry producing regions.

Project Methods

Objective 1

To evaluate herbicide efficacy, treatments will be applied over the top of 10 established strawberry plants in plasticulture beds when weeds are 2-3 inches tall. The trial will be conducted in a randomized complete block design with four repetitions (Figure 1). Treatments will be evaluated 7, 14, and 21 days after treatment for percent weed control in the plant hole of the plastic. Herbicides evaluated will be: formesafen (Reflex®), halosulfuron (Sandea®), Flumioxazin (Chateau®), Sulfentrazone (Spartan®), Trifloxysulfuron (Envoke®) 2, imazethapyr (Pursuit®), compared to the standards Stinger®, Select®, and Poast®. This will be a split plot design where one set of treatments will be located in a large plot area that has been treated with a commonly used pre-emergent herbicide (Prowl) and an identical set in an area adjacent with no pre-emergent herbicide treatment (Figure 1).

Objective 2

Plant safety will be evaluated at 7, 14, and 21d after application. Plant vigor will be calculated by comparison of treated plots to control plots. Plant biomass will be taken by harvesting 3 plants / plot before fruit set in the spring and yield data will be collected at the conclusion of the trial by collecting fruit twice per week from four plants per plot for three weeks in the harvest season.

All data will be subjected to Proc GLM in SAS for analysis. The variable means found to be significantly different will undergo tukey means separation at the 0.05 level of probability.

The data from this research will be used to promote addition of strawberry to herbicide labels, promote funding for tolerance work, and promote new use patterns for herbicides with strawberry currently on the label. This data will be shared at scientific meetings and used to help secure funding in the future for multi-state work to help expand herbicide labels to include strawberry and used to help secure future funding from the IR-4 program. This work will have regional significance and positively impact strawberry growers throughout the southeast.

Results Winter 2017

A total of 8 rows were established for plots in September 2017 per Figure 1. Plastic and dripline were laid and Chandler strawberry plants established at the Southwest Regional Research station in Hope, Arkansas. Prowl was applied at the labeled rate before plastic was laid on one side of the field, 4 rows. Plants have established nicely and are in the dormant period. The planting has been checked weekly to pinch buds and check overall health.

All herbicides have been purchased for the trial and applications will be made over the top of plants in early spring when weeds begin to appear. The final report with the data from this trial will be sent late summer or fall 2018.

Final Results Spring 2018

- Poast, Stinger, Reflex and Spartan had the least negative effect on plant biomass (10-30g loss) (Figure 2).
- Loyant, Chateau, Sandea, Pursuit and Envoke caused a weight loss of 50-80g (Figure 2)
    - Yield was half that of the untreated or less in all of these treatments (Figure 3)
- Best yielding treatments were Stinger and Poast with a pre-emergent herbicide (Figure 3)
- Good potential for Reflex! It is not currently labeled but more research will be conducted this season with different rates in a continuation of this trial.
- There were no significant differences in treatments by addition of pre-emergent. (Figure 2 & 3)There were numerical differences.
- Stinger and Spartan had numerically greater yield when a pre-emergent herbicide was used (Figure 3)
- Reflex had numerically less yield when a pre-emergent herbicide was used (Figure 3)

Discussion: Loyant, Chateau, Sandea, Pursuit, and Envoke negatively impacted yield and should not be pursued for further investigation as a post directed herbicide application in strawberry. Reflex showed potential and should be included in future trials. Stinger, Post and Spartan did not affect plant health or significantly differ in yield compared to the untreated. Spartan may have potential as a post directed pre-emerge treatment, which is currently not on the label. More research is needed to support this use pattern. There were little interactions detected when looking at yield by treatment for pre-emergent vs no pre-emergence suggesting that pre-emergence application does not affect plant health negatively when other treatments are applied except in the case of Reflex which should be investigated further (Figure 4).

Figure 1. Treatment list and plot map for herbicide trial in plasticulture strawberry.

Trt:	Chemical name:	Common name:	Rate:
1	formesafen 22.8%	Reflex	1pt/A
2	halosulfuron 75%	Sandea	1oz/A
3	florpyrauxifen	Loyant	1pt/A
4	sulfentrazone 39.6%	Spartan	8oz/A
5	trioxysulfuron 75%	Envoke	0.53oz/A (15g)
6	imazethapyr 22.87%	Pursuit	6oz/A
7	sethoxydim 18%	Poast	1.5pt/A
8	clethodim 26.4%	Select	8 fl oz/A
9	clopyralid 40.9%	Stinger	(2/3) pt/A
10	flumioxazin 51%	Chateau	3oz/A
11	untreated	untreated	
	labeled		
	not labeled		

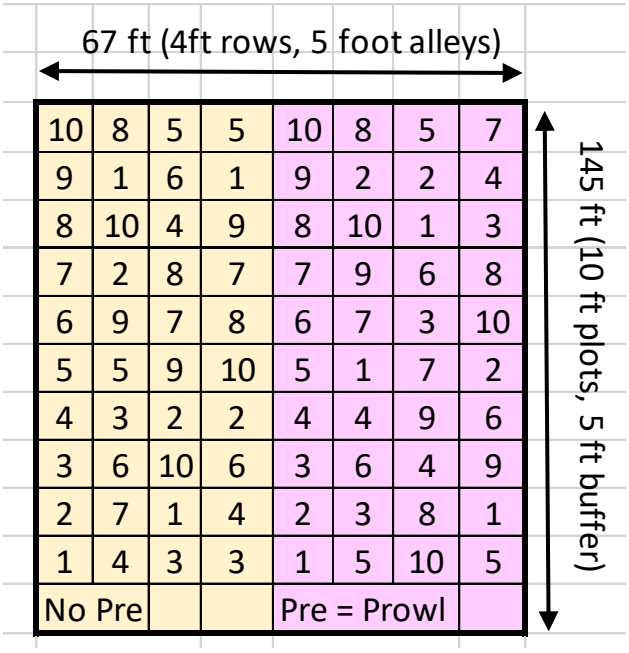


Figure 2. Graph of plant biomass

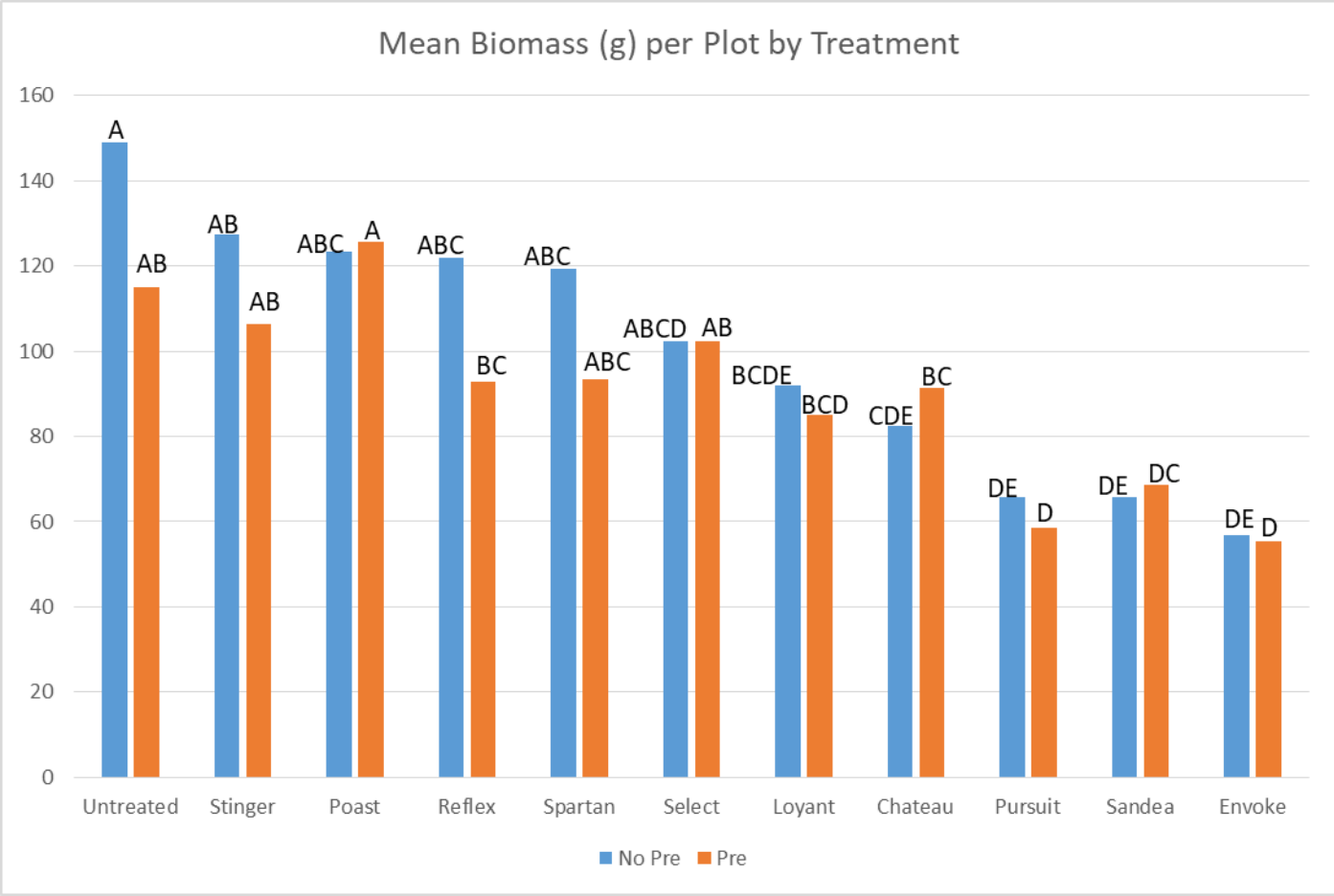


Figure 3. Yield across treatments

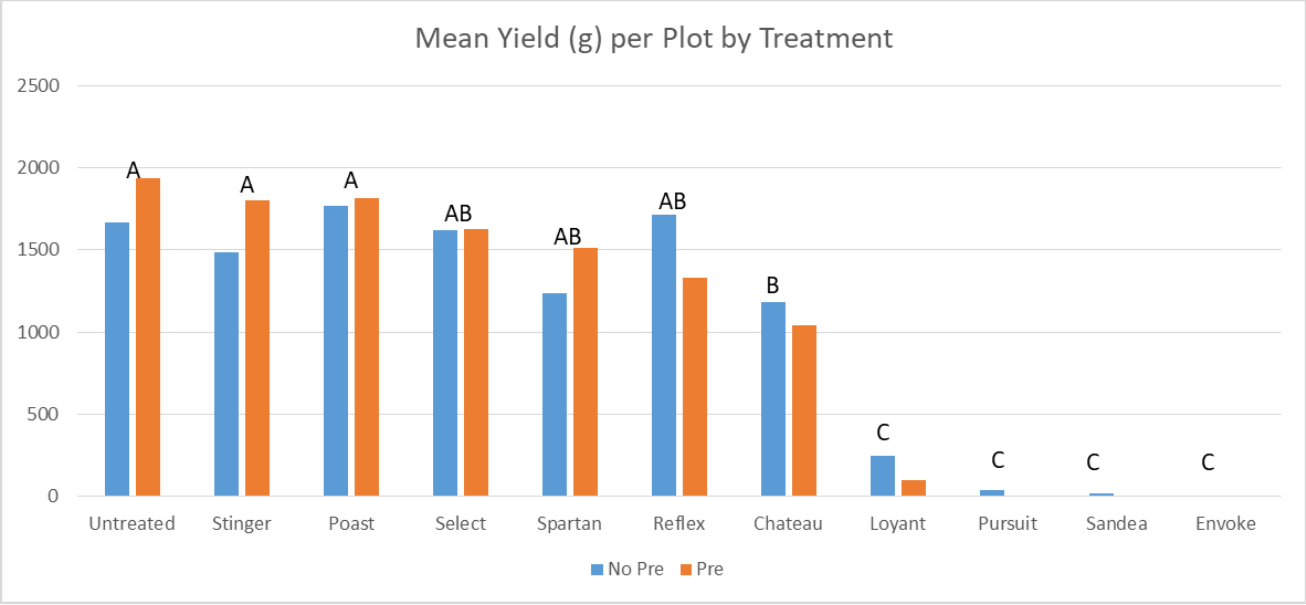
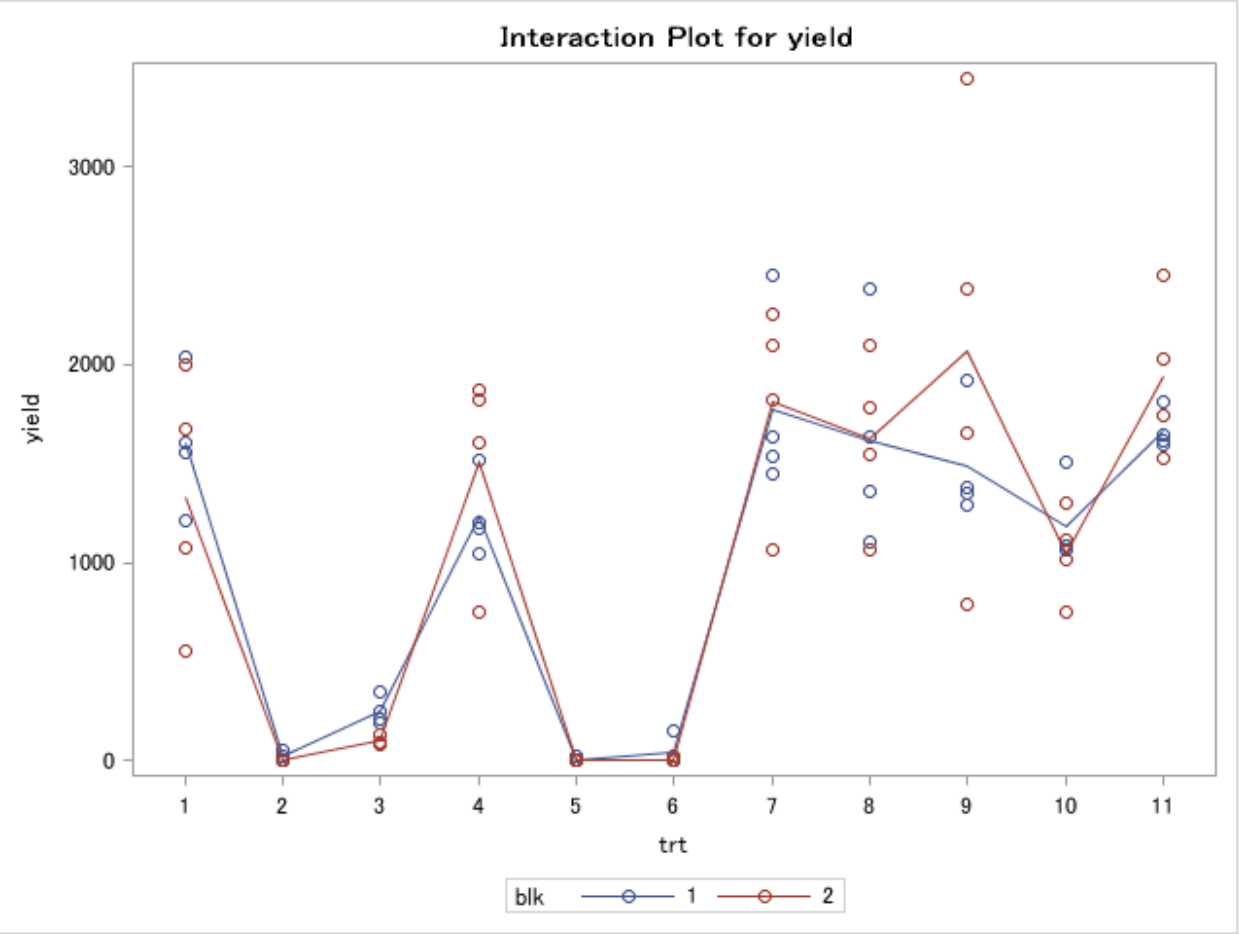


Figure 4. Interaction of blk (blk 1 no pre or blk 2 with pre) on yield. See figure one for treatment key.



Results Fall 2018

The trial will be repeated and has been established. Strawberries were planted Sept. 2018. Herbicide applications will go out March 2019.

Outputs:

Presented at Arkansas Strawberry Growers Association Meeting. Spring 2018. Fayetteville, AR

Presented at NASGA. Feb. 2019.

Budget: Total $5,000

Personnel (Salary, Wages, and Fringes) **Amount: $1,219**

The project will be managed by two co-directors who will devote 0.5% of their time to managing and directing project activities. Fringe benefits are included at the rate of 33.52% and a 3% salary adjustment has been calculated to be effective July 1, 2017.

Travel **Amount: $1,200**

Travel costs include traveling to the Southwest Regional Extension Center in Hope, AR to carry out research activities. Travel at 225 miles round trip x 13 trips at 0.42 cents per mile.

All faculty/staff travel will comply with University of Arkansas Cooperative Extension Service travel policies and regulations. Currently, Arkansas' state mileage reimbursement is $0.42/mile.

Materials & Supplies **Amount: $500**

Funds are requested to defray costs of materials and supplies associated with the project including irrigation line, plastic mulch, plants, and fertilizer.

Plot Establishment and Maintenance **Amount: $1000**

Funds are requested to defray costs associated with plot establishment and plot maintenance at the Southwest Regional Extension Center in Hope, AR.

Hourly labor **Amount: $1081**

Funds are requested for hourly labor to help with sampling and data recording.

Indirect Costs **Amount: $0**

Not allowable per RFP.

Budget Total: 5,000

References

Heap, I. 2014. Herbicide Resistant Weeds. Ch. 12: Integrated Pest Management. Springer. 281-300.