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2014 Southeastern Peanut Research Initiative
Final Report

Title: Influence of close-interval sequential herbicide applications on Palmer amaranth control

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The impact of Palmer amaranth on southern crop production is undeniable. The rapid growth rate of that plant, coupled with the multiple herbicide-resistance schemes that exist, has made control efforts very difficult. In peanuts, only the PPO-inhibiting herbicides (such as Cobra or Ultra Blazer) can be considered effective with applied postemergence, with the almost ubiquitous presence of Cadre resistance. However, the PPO herbicides are only effective on small weeds (less than 3"). The purpose of this project was to examine two applications of PPO herbicides, in rapid succession, on large weeds (6"). It was questioned if one application could cause severe injury to the weeds, while the second resulted in complete desiccation before the plant had time to regrow.

Materials and Methods
Experiments were conducted in Citra and Jay, Florida. Both experiments were irrigated and replicated 4 times. In both locations, GA06G was planted at rate of 5 seeds per foot and all fertilizer and fungicides were applied according to local management practices.

The herbicides and use rates are listed in Table 1. If two herbicides are listed and connected with "+", that means the two products were mixed and sprayed together. If two or more herbicides are connected with fb, that means the first application was made, "followed by" a second application. The first application was made approximately 35 days after planting and the follow up application was made 5 days later. All herbicide applications contained crop oil concentrate at 1% v/v.

In Citra, FL, both peanut tolerance and Palmer amaranth control were observed, but were done so using two separate experiments. For Palmer amaranth, a fallow area with a dense natural infestation (>25 seedlings per square foot) was utilized. After weed emergence, the entire area was treated with 400 lb/A of 10-10-10 fertilizer to encourage consistent weed growth. The herbicides were applied when the weeds were 4-6" in height. In a separate experiment, peanuts were planted and immediately sprayed with pendimethalin + diclosulam. The plots were maintained weed free with imazapic and regular hand weeding. The purpose of this strategy was to determine if the close application strategy would cause yield reduction in peanut and we didn't want this effect confounded by weed competition. At the Jay, FL location, the experiments were conducted as one.

Peanut yield data were collected at the end of the season at the Citra, FL location as directed by the hull scrape method. The peanuts were dried after harvest and weighted to determine lb/A. No yield data were collected at Jay, FL due to late-season weed infestation that confounded harvest.

Results

In Citra, Palmer amaranth control ranged from 40-100% (Table 1). The least effective treatments were Storm + Dual Magnum and Storm fb Storm with 40 and 42% control, respectively, at 21 days after treatment (DAT). However, Gramoxone + Storm fb Storm provided 100% control at 21 DAT. Additionally, two applications of Ultra Blazer or Cobra resulted in 94 and 96% control, respectively. Previous research has shown that one application of Ultra Blazer or Cobra to 6" Palmer amaranth will provide excellent control (>85%) within one week of the application, but this control will quickly decline to less than 50% within 3 weeks (data not shown). Therefore, it is important to realize the value of the sequential application. In the field, we observed the initial application to cause severe necrosis in the contacted foliage. However, within 5 days Palmer amaranth plants began to sprout new leaves and continue growth. In this trial, the second application effectively controlled the regrowth and prevented additional resprouting from affected plants.

Similar results were observed at the Jay, FL location (Table 2). At 5 DAT, all treatments except Gramoxone + Strom provided between 66 and 72% control. However, the subsequent application of all herbicides resulted in 100% control. The reason for better results at the Jay location vs Citra may be due to height at the initial application. At Citra, weeds were an average of 6" in height, with the majority of individuals near 6". At the Jay location, many of the weeds were less than 6" at time of application, and likely resulted in superior herbicide activity.

All the herbicides used in this experiment cause foliar injury on peanut. It was unknown if two applications, so close together, would result in extreme injury that would impair yield. At the Citra location, injury at 3 DAT ranged between 40 and 50% for the Gramoxone treatments, but less than 35% for all others. Surprisingly, the second application resulted in little additional damage and by 14 DAT, most plants exhibited no signs of injury. This rapid recovery was further noted by the fact that no treatments negatively influence peanut yield. At the Jay location, a similar trend was observed, although injury was observed longer into the season. Regardless, by 21 DAT, less than 10% injury was observed in all treatments.

Summary and Conclusions

These data indicate that control of 4-6" Palmer amaranth can be achieved with close-interval sequential applications of PPO herbicides. Additionally, the peanuts appear to be tolerant to these two applications recovery from foliar injury was rapid and yield was not reduced. However, there are still many unknowns to this approach. 1. How long can we wait between sequential applications? Will waiting 10 days between applications provide better or worse control? 2. How large can Palmer amaranth become before this strategy isn't effective? Currently, we have tested 4-6" weeds and found excellent results. However, if weeds are 6-8" or 8-10", it is unknown if these trends will continue to be observed.

Table 1. Palmer amaranth control, peanut injury, and yield in Citra, FL resulting from close-interval sequential herbicide application.

Herbicide	Rate	timing	Peanut injury			Palmer control			Peanut yield
			%			%			
			3 DAT	7 DAT	14 DAT	7 DAT[b]	14 DAT	21 DAT	lb/A
Storm fb Storm	1.5 pt 1.5 pt	A[a] B	8 e	11 d	0 b	60 e	80c	65 d	4000 a
Storm + Gramoxone fb Storm	1.5 pt + 12 oz 1.5 pt	A A B	40 b	27 ab	4 a	100 a	100 a	100 a	4700 a
Storm + 2,4-DB fb Storm + 2,4-DB	1.5 pt + 1 pt fb 1.5 pt + 1 pt	A A B B	10 e	12 d	0 b	82 cd	83 c	71 cd	4100 a
Ultra Blazer fb Ultra Blazer	1.5 pt fb 1.5 pt	A B	20 d	20 c	5 a	94 ab	97 a	94 a	4300 a
Storm + Dual Magnum	1.5 pt + 1.3 pt	A A	27 cd	15 cd	0 b	77 d	47 d	40 e	4400 a
Gramoxone + Dual	12 oz + 1.3 pt	A A	50 a	32 a	5 a	92 ab	85 bc	75 c	4400 a
Cobra fb Cobra	12 oz 12 oz	A B	35 c	11 d	0 b	88 bc	96 a	96 a	4300 a
Ultra Blazer + Basagran fb Ultra Blazer + Basagran	1 pt + 1 pt 1 pt+ 1 pt	A A B B	7.5 e	11 d	0 b	92 b	92 ab	86 b	4600 a
Non-treated			-	-	-	-	-	-	4500 a

[a]The A timing refers to the initial application while the B timing occurred 5 days after A.

[b]DAT – days after treatment, refers to days after the A timing.

Table 2. Palmer amaranth control, peanut injury, and yield in Jay, FL resulting from close-interval sequential herbicide application.

Herbicide	Rate	timing	Peanut injury		Palmer control	
			%		%	
			10 DAT[b]	21 DAT	5 DAT	21 DAT
Storm fb Storm	1.5 pt 1.5 pt	A[a] B	2 d	0 b	72 b	100 a
Storm + Gramoxone fb Storm	1.5 pt + 12 oz 1.5 pt	A A B	35 a	10 a	100 a	100 a
Storm + 2,4-DB fb Storm + 2,4-DB	1.5 pt + 1 pt fb 1.5 pt + 1 pt	A A B B	7 d	0 b	70 b	100 a
Ultra Blazer fb Ultra Blazer	1.5 pt fb 1.5 pt	A B	5 d	0 b	71 b	100 a
Storm + Dual Magnum	1.5 pt + 1.3 pt	A A	25 b	10 a	68 b	55 b
Cobra fb Cobra	12 oz 12 oz	A B	23 b	6 a	77 b	100 a
Ultra Blazer + Basagran fb Ultra Blazer + Basagran	1 pt + 1 pt 1 pt+ 1 pt	A A B B	15 c	5 a	66 b	100 a
Non-treated						

[a]The A timing refers to the initial application while the B timing occurred 5 days after A.
[b]DAT – days after treatment, refers to days after the A timing.