

# **COTTON RESPONSE TO PENDIMETHALIN FORMULATION, METHOD AND TIME OF APPLICATION**

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## **Introduction**

Over 50% of the cotton in Georgia is currently produced using either no-tillage or strip-tillage techniques. With the elimination of cultivation as a control tactic in conservation tillage systems, herbicides are now the primary and often only method used for weed control. When glyphosate-resistant varieties were first introduced, glyphosate was applied two to four times on most fields and may have been the only herbicide used. In Georgia, 93% of the cotton acres received at least one glyphosate application in 2005. Glyphosate is a highly effective herbicide that controls a broad spectrum of annual and perennial grass and broadleaf weeds. However, the incidence of glyphosate-tolerant or resistant weeds emerging in the southeast has increased the need for multiple herbicide modes of action in weed management systems.

Pendimethalin, a dinitroaniline herbicide which inhibits cell growth, is applied preemergence or preplant incorporated to approximately 30% of Georgia cotton for control of grasses and small-seeded broadleaf weed species. Pendimethalin is often used in combination with glyphosate-resistant cotton. There are two different formulations of pendimethalin registered for cotton. Both are liquids: Prowl 3.3 EC contains 3.3 lb active ingredient (ai)/gallon as an emulsifiable concentrate (EC); and Prowl H<sub>2</sub>O contains 3.8 lb ai/gallon pendimethalin formulated as a microencapsulated (ASC) aqueous capsule suspension. One potential method of obtaining extended weed control may be to apply pendimethalin as an in season application, i.e. postemergence to the cotton crop. However, injury to cotton from Prowl 3.3 EC has prevented over-the-top postemergence application labels. Cotton response to Prowl H<sub>2</sub>O ASC is unknown and may be less injurious to cotton because of its formulation. Additionally, an alternative method of application may be to impregnate pendimethalin onto fertilizer for in season application to save a trip across the field. Comparisons for pendimethalin EC to ASC for in crop application have not been evaluated. Therefore, studies were conducted in cotton to evaluate cotton response to Prowl 3.3 EC and Prowl H<sub>2</sub>O ASC when spray applied or impregnated on cotton.

## **Materials and Methods**

Field trials were conducted in 2005, 2006, and 2007 at the University of Georgia Ponder Research Station near Ty Ty, Georgia. Delta and Pineland 555 BG/RR was planted in 2005 and Delta and Pineland Flex 445 BG/RR in 2006 and 2007 using a Monosem precision vacuum planter set to deliver 4.3 seed per foot of row. The experimental design was a randomized complete block with treatments replicated four times. Plots were two rows by 25 feet.

Four different methods of pendimethalin application were made at 4 different times during the growing season. All herbicide treatments consisted of 1.0 lb ai/acre of pendimethalin. Only the method or time of application varied. Treatments were Prowl EC or Prowl H<sub>2</sub>O with method of application as either 1) spray applied in water at 15 gallons/acre or 2) impregnated on fertilizer (10-10-10) that was spread at a rate of 250 lb/ha applied with a Gandy fertilizer applicator. All plots were fertilized equally.

The 4 different herbicide application timings were 1) preemergence (PRE), 2) at cotton emergence (AC) from the soil, 3) at 3-leaf (3LF) cotton, and 4) 6-leaf or greater (POST) cotton. A non-treated control was included for comparison for a total of 17 treatments. All plots were maintained weed free by hand pulling weed escapes and treatments with glyphosate.

Cotton injury ratings were evaluated after applications using a scale of 0 (no injury) to 100 % (complete death). Cotton height measures were made 3 times in 2005 and 5 times in 2006 and 2007. Yield was determined by mechanical harvesting each plot.

## **Results and Discussion**

There were no differences for cotton injury for PRE spray and fertilizer applications of Prowl 3.3 EC or Prowl H<sub>2</sub>O ASC (Table 1) and were less than 4%. However, AC and 3-LF Prowl 3.3 EC spray applications caused 37 to 48% injury. Prowl H<sub>2</sub>O PRE and 3-LF spray applications were less injurious with 22 and 12%, respectively. When impregnated on fertilizers at the AC timing, Prowl 3.3 EC injured cotton 30% compared to Prowl H<sub>2</sub>O with 15%. Therefore, if farmers wanted to impregnate pendimethalin and apply it with fertilizer for the AC timing, they should use Prowl H<sub>2</sub>O. When impregnated on fertilizers for the 3-LF application, injury was less than 4% for Prowl 3.3 EC and Prowl H<sub>2</sub>O. For the POST applications, there were no injury differences.

Cotton height was reflected in the injury for the formulation, method and timing of application (Figure 1). There were no differences between any treatment for the PRE applications (Figure 1 A). But when Prowl 3.3 and H<sub>2</sub>O were spray applied AC (Figure 1 B) or 3-LF (Figure 1 C) timings, cotton height was reduced at 45, 60, and 75 DAP by as much as 10 to 15 cm. Conversely, height was not different than the nontreated check for these same DAP measures when either pendimethalin formulation was impregnated on fertilizer. No differences were noted in height for the POST treatment timings (Figure 1 D).

Data indicated significant seed cotton yield reductions for the spray applications of Prowl 3.3 EC as an AC and 3-LF treatment with 2490 and 2360 lb/acre, respectively (Table 1). All other pendimethalin treatment combinations for Prowl 3.3 EC, Prowl H<sub>2</sub>O either spray or fertilizer impregnated, did not significantly reduce yield. Thus, while injury and height may have been reduced by Prowl H<sub>2</sub>O spray applications, this did not translate into yield reduction.

Table 1. Cotton injury and yield as influenced by pendimethalin formulation, method and timing of application.

Herbicide	Application method	Timing <sup>a</sup>	Injury	Cotton yield
			—%—	—lb/acre—
Prowl 3.3	Spray	PRE	4 a	3350 a
Prowl H <sub>2</sub> O	Spray	PRE	4 a	3360 a
Prowl 3.3	Fertilizer <sup>b</sup>	PRE	3 a	3320 a
Prowl H <sub>2</sub> O	Fertilizer	PRE	2 a	3630 a
Prowl 3.3	Spray	AC	48 e	2490 b
Prowl H <sub>2</sub> O	Spray	AC	22 bc	3080 a
Prowl 3.3	Fertilizer	AC	30 c	3170 a
Prowl H <sub>2</sub> O	Fertilizer	AC	15 b	3280 a
Prowl 3.3	Spray	3-leaf	37 de	2360 b
Prowl H <sub>2</sub> O	Spray	3-leaf	12 ab	3050 a
Prowl 3.3	Fertilizer	3-leaf	4 a	3200 a
Prowl H <sub>2</sub> O	Fertilizer	3-leaf	2 a	3430 a
Prowl 3.3	Spray	POST	4 a	3160 a
Prowl H <sub>2</sub> O	Spray	POST	1 a	3500 a
Prowl 3.3	Fertilizer	POST	0 a	3410 a
Prowl H <sub>2</sub> O	Fertilizer	POST	0 a	3380 a
Nontreated			0 a	3290 a

<sup>a</sup>Abbreviations: PRE, preemergence; AC, at cotton emergence; 3-LF, 3-leaf cotton; POST, postemergence to 6 leaf cotton.

<sup>b</sup>Fertilizer was 10-10-10 and all plots were supplemented to have equal amounts applied. Prowl 3.3 and H<sub>2</sub>O were impregnated onto the fertilizer by continuous rotation with drip application during rotation.

Figure 1. Affect of pendimethalin formulation, method and time of application on cotton height.

