

Prevention and Control of Palmer Amaranth in Cotton

David Holshouser, Extension Agronomist

Henry Wilson, Extension Weed Scientist

Palmer amaranth (*Amaranthus palmeri*), a member of the "pigweed" family, is one of the most troublesome weeds in many southern row crops. Seed can germinate all season and plants can grow to over 6 feet in height. Plants have either male flowers that shed pollen or female flowers that can produce up to 600,000 seed per plant. One Palmer amaranth per 30 foot of row can reduce cotton yield by 6 to 12%.



In Virginia, the weed has only been documented in four southeastern counties, but will likely enlarge its territory. Its spread can be rapid because of custom harvesting, failing to clean cotton pickers and tillage implements after exiting infested fields, and spreading of gin trash containing the seed. More troublesome is that extensive use of herbicides has led to resistance to glyphosate and ALS-inhibiting herbicides. We currently have populations of ALS-resistant Palmer amaranth in Virginia and glyphosate resistance was observed as close as Gates County, North Carolina.

Palmer amaranth is threatening Virginia's cotton cropping systems. Aggressive steps are necessary to minimize its spread and delay the development of herbicide resistance. No longer can Virginia cotton growers settle for the easiest, least expensive, or short-term (single-season) control strategies. Cotton weed management must quickly become a carefully planned and integrated control program that preserves herbicide and genetic technologies. For effective and long-lasting Palmer amaranth control, one needs to look 3 to 5 years into the future and not focus solely on herbicides and varieties. Long-term management of Palmer amaranth requires a multiple strategy approach that includes: integrating crop and herbicide rotation, diversifying in-season herbicides, closely monitoring fields, completely controlling the weed in rotational crops, cleaning harvest and tillage equipment, and removing escapes before seed production.

Of those strategies listed, integrating herbicides of different mechanism of actions will have the greatest benefit within the cotton growing season. This can be accomplished by including a soil residual herbicide with the burndown application, using soil-applied residual herbicides at planting, tank-mixing postemergence herbicides, and making a late-season layby application. The following are suggestions for controlling Palmer amaranth in Roundup Ready® and Liberty-Link® cotton.

Table 1. Herbicide programs for Palmer amaranth control in Roundup Ready® or Roundup Ready Flex® cotton varieties¹.

Glyphosate Resistant	ALS Resistant	Infestation Level	Burndown ²	Preemergence ³	Postemergence or Post-directed ⁴	Layby Directed ⁵
No	No	Light	Glyphosate or Gramoxone Inteon + 2,4-D or Clarity	Prowl or Treflan Cotoran Reflex Staple	Glyphosate + Dual Magnum (Sequence) Glyphosate + Staple Glyphosate + Envoke	Suprend + MSMA Suprend + glyphosate Valor + MSMA Valor + glyphosate Layby Pro + MSMA Layby Pro + glyphosate Aim + MSMA Aim + glyphosate
			Glyphosate or Gramoxone Inteon + 2,4-D or Clarity	Prowl + Cotoran Prowl + Reflex Prowl + Staple	Glyphosate as needed	
		Heavy	Glyphosate or Gramoxone Inteon + 2,4-D or Clarity + Valor	Prowl + Cotoran Prowl + Reflex Prowl + Staple	Glyphosate + Dual Magnum (Sequence) Glyphosate + Staple Glyphosate + Envoke	
No	Yes	Light	Glyphosate or Gramoxone Inteon + 2,4-D or Clarity	Prowl or Treflan Cotoran Reflex	Glyphosate + Dual Magnum (Sequence)	Valor + MSMA Valor + glyphosate Layby Pro + MSMA Layby Pro + glyphosate Aim + MSMA Aim + glyphosate
			Glyphosate or Gramoxone Inteon + 2,4-D or Clarity	Prowl + Cotoran Prowl + Reflex	Glyphosate as needed	
		Heavy	Glyphosate or Gramoxone Inteon + 2,4-D or Clarity + Valor	Prowl + Cotoran Prowl + Reflex	Glyphosate + Dual Magnum (Sequence)	
Yes	No	Light or Heavy	Glyphosate or Gramoxone Inteon + 2,4-D or Clarity + Valor	Prowl + Cotoran Prowl + Reflex Prowl + Staple	Glyphosate + Dual Magnum (Sequence) Glyphosate + Staple Glyphosate + Envoke	Suprend + MSMA Valor + MSMA Layby Pro + MSMA Aim + MSMA
Yes	Yes	Light or Heavy	Glyphosate or Gramoxone Inteon + 2,4-D or Clarity + Valor	Prowl + Cotoran Prowl + Reflex	<u>No emerged Palmer:</u> Glyphosate + Dual Magnum (Sequence) <u>Palmer <2"</u> Cotoran + MSMA Caparol/Cotton Pro + MSMA Linex + MSMA Cobra + MSMA Goal + MSMA	Valor + MSMA Layby Pro + MSMA Aim + MSMA

¹ Make postemergence herbicide applications before Palmer amaranth reaches 3 inches. Following label instructions for rates, adjuvants, timing, and rotational restrictions. Make only one application of ALS-inhibiting herbicide (Staple, Envoke, Suprend) per season. Make no more than two applications of PPO-inhibiting herbicides (Valor, Reflex, Cobra, Goal, Aim) per season.

² 2,4-D: 1.5 pt/A, 30-45 days prior to planting; Clarity: 8 oz/A, 1 inch of rainfall + 14 days prior to planting; Valor: 2 oz/A, 14 days prior to strip-tilling or 30 days + 1 inch of rainfall/irrigation prior to planting for conventional tillage.

³ Treflan must be incorporated. For preemergence applications, include Gramoxone Inteon if weeds are present. For heavy populations, conservation tillage with heavy residue cover has shown to improve control of Palmer amaranth.

⁴ Do not apply glyphosate to Roundup Ready® cotton varieties after the 4-leaf stage. Glyphosate can be applied to Roundup Ready Flex® varieties throughout the season, but applications may need to be post-directed later in the season for adequate coverage of weeds. Apply Envoke after cotton has a minimum of 5 true leaves. Cotoran + MSMA can be applied as a directed spray to 3-8 inch cotton. Linex and Cobra must be applied as directed sprays to cotton 6-8 inches tall. Goal must be applied as a directed spray, preferably to 8-10 inch cotton.

⁵ Apply post-directed with precision-directed spray equipment or hooded sprayer to cotton, but over-the-top to weeds. Aim and Valor can only be applied to cotton that is 16 inches tall with sufficient bark development.

Table 2. Herbicide programs for Palmer amaranth control in Liberty-Link® cotton varieties¹.

Glyphosate Resistant	ALS Resistant	Infestation Level	Burndown²	Preemergence³	Postemergence or Post-directed⁴	Layby Directed⁵
Yes or No	No	Light	Glyphosate or Gramoxone Inteon + 2,4-D or Clarity	Prowl or Treflan Cotoran Reflex Staple	<u>Palmer < 2 inches</u> Ignite as needed Ignite + Dual Magnum <u>Palmer < 4 inches</u> Ignite + Staple	Suprend + MSMA Valor + MSMA Layby Pro + MSMA Aim + MSMA
			Glyphosate or Gramoxone Inteon + 2,4-D or Clarity	Prowl + Cotoran Prowl + Reflex Prowl + Staple	<u>Palmer < 2 inches</u> Ignite as needed <u>Palmer < 4 inches</u> Ignite + Staple	
		Heavy	Glyphosate or Gramoxone Inteon + 2,4-D or Clarity + Valor	Prowl + Cotoran Prowl + Reflex Prowl + Staple	<u>Palmer < 2 inches</u> Ignite as needed Ignite + Dual Magnum <u>Palmer < 4 inches</u> Ignite + Staple	
Yes or No	Yes	Light	Glyphosate or Gramoxone Inteon + 2,4-D or Clarity	Prowl or Treflan Cotoran Reflex	<u>Palmer < 2 inches</u> Ignite as needed Ignite + Dual Magnum	Valor + MSMA Layby Pro + MSMA Aim + MSMA
			Glyphosate or Gramoxone Inteon + 2,4-D or Clarity	Prowl + Cotoran Prowl + Reflex	<u>Palmer < 2 inches</u> Ignite as needed	
		Heavy	Glyphosate or Gramoxone Inteon + 2,4-D or Clarity + Valor	Prowl + Cotoran Prowl + Reflex	<u>Palmer < 2 inches</u> Ignite as needed Ignite + Dual Magnum	

¹ Apply before Palmer amaranth reaches 2 inches. Following label instructions for rates, adjuvants, timing, and rotational restrictions. Make only one application of ALS-inhibiting herbicide (Staple, Envoke, Suprend) per season. Make no more than two applications of PPO-inhibiting herbicides (Valor, Reflex, Cobra, Goal, Aim) per season.

² 2,4-D: 1.5 pt/A, 30-45 days prior to planting; Clarity: 8 oz/A, 7-21 days prior to planting; Valor: 2 oz/A, 14 days prior to strip-tilling or 30 days + 1 inch of rainfall/irrigation prior to planting for conventional tillage.

³ Treflan must be incorporated. For preemergence applications, include Gramoxone Inteon if weeds are present.

⁴ Ignite can be applied to Liberty-Link® cotton varieties as an over-the-top foliar spray or as a directed spray to the lower 1/3 of the cotton stand from emergence up to the early bloom stage. It may need to be post-directed later in the season for adequate coverage of weeds. Do not apply more than 58 oz/acre of Ignite per season. A single application of Ignite will provide no more than 85-90% control of emerged Palmer amaranth.

⁵ Apply post-directed with precision-directed spray equipment or hooded sprayer to cotton, but over-the-top to weeds. Aim and Valor can only be applied to cotton that is 16 inches tall with sufficient bark development.