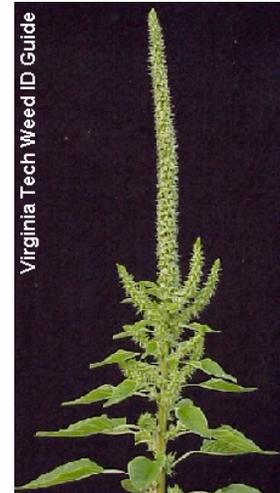
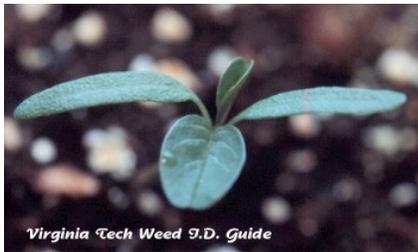


## Prevention and Control of Palmer Amaranth in Soybean

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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. Four Palmer amaranth plants per 100 ft<sup>2</sup> of row can reduce soybean yield by 12 to 17%.



In Virginia, the weed has been documented in seven southeastern counties, but will likely enlarge its territory. Its spread can be rapid because of custom harvesting, failing to clean vehicles and equipment after exiting infested fields, and failing to hand remove escapes. 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; glyphosate resistance to the weed was observed as close as Gates County, North Carolina.

Palmer amaranth is threatening Virginia's cropping systems. Aggressive steps are necessary to minimize its spread and delay the development of herbicide resistance. No longer can Virginia growers settle for the easiest, least expensive, or short-term (single-season) control strategies. Soybean 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 tactic 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 the tactics listed, integrating herbicides of different mechanism of actions will have the greatest benefit within the soybean growing season (see table 1). This can be accomplished by including a soil residual herbicide with the burndown application, using soil-applied residual herbicides at planting, and/or tank-mixing postemergence herbicides. Suggestions for controlling Palmer amaranth in Roundup Ready® and conventional soybean are listed in Tables 1 and 2, respectively.

Table 1. Herbicide programs for Palmer amaranth control in Roundup Ready® soybean varieties<sup>1</sup>

Glyphosate Resistant	ALS Resistant	Infestation Level	Preplant Burndown <sup>2</sup>	Preemergence <sup>3</sup>	Postemergence Application #1 <sup>4</sup>	Postemergence Application #2 <sup>4</sup>
No		Light	Glyphosate or Gramoxone Inteon + 2,4-D or Clarity		Glyphosate + Dual Magnum or Intro Glyphosate + Synchrony XP (1/2 rate), Classic, Pursuit, Raptor, or Scepter Glyphosate + Cobra, Reflex, Flexstar, Ultra Blazer, or Storm Sequence (glyphosate + Dual Magnum) Extreme (glyphosate + Pursuit)	Glyphosate
				<u>Single MOA</u> Cinch, Dual Magnum, Intro, Outlook, or Prowl Linex or Sencor FirstRate, Pursuit, Scepter, or Synchrony XP Spartan or Valor SX <u>Multiple MOA</u> Authority MTZ, Authority Assist, Authority First, or Sonic Canopy Prefix Squadron Valor XLT or Envive	Glyphosate	
		Heavy	Glyphosate or Gramoxone Inteon + 2,4-D or Clarity	<u>Single MOA</u> Cinch, Dual Magnum, Intro, Outlook, or Prowl <u>Multiple MOA</u> Prefix	Glyphosate + Synchrony XP (1/2 rate), Classic, Pursuit, Raptor, or Scepter Glyphosate + Cobra, Reflex, Flexstar, Ultra Blazer, or Storm Extreme (glyphosate + Pursuit)	
				<u>Single MOA</u> Prowl Linex or Sencor FirstRate, Pursuit, Scepter, or Synchrony XP Spartan or Valor SX <u>Multiple MOA</u> Authority MTZ, Authority Assist, Authority First, or Sonic Canopy Squadron Valor XLT or Envive	Glyphosate + Dual Magnum or Intro Sequence (glyphosate + Dual Magnum)	
No	Yes	Light	Glyphosate or Gramoxone Inteon + 2,4-D or Clarity		Glyphosate + Dual Magnum or Intro Glyphosate + Cobra, Reflex/Flexstar, Ultra Blazer, or Storm Sequence (glyphosate + Dual Magnum)	Glyphosate

Table 1. Herbicide programs for Palmer amaranth control in Roundup Ready® soybean varieties<sup>1</sup>

Glyphosate Resistant	ALS Resistant	Infestation Level	Preplant Burndown <sup>2</sup>	Preemergence <sup>3</sup>	Postemergence Application #1 <sup>4</sup>	Postemergence Application #2 <sup>4</sup>
				<u>Single MOA</u> Cinch, Dual Magnum, Intro, Outlook, or Prowl Linex or Sencor Spartan or Valor SX <u>Multiple MOA</u> Authority MTZ Prefix	Glyphosate	
		Heavy	Glyphosate or Gramoxone Inteon + 2,4-D or Clarity	<u>Single MOA</u> Cinch, Dual Magnum, Intro, Outlook, or Prowl <u>Multiple MOA</u> Prefix	Glyphosate + Cobra, Reflex, Flexstar, Ultra Blazer, or Storm	
				<u>Single MOA</u> Prowl Linex or Sencor Spartan or Valor SX <u>Multiple MOA</u> Authority MTZ	Glyphosate + Dual Magnum or Intro Sequence (glyphosate + Dual Magnum)	
Yes	No	Light or Heavy	Glyphosate or Gramoxone Inteon + 2,4-D or Clarity	<u>Single MOA</u> Cinch, Dual Magnum, Intro, Outlook, or Prowl Linex or Sencor Spartan or Valor SX <u>Multiple MOA</u> Authority MTZ Prefix	Glyphosate + Cobra, Reflex/Flexstar, Ultra Blazer, or Storm	Classic, Pursuit, Raptor, Scepter, or Synchrony (STS varieties only)
					Glyphosate + Synchrony XP (1/2 rate) , Classic, Pursuit, Raptor, or Scepter Extreme (glyphosate + Pursuit)	Reflex, Flexstar, Ultra Blazer, or Storm
Yes	Yes	Light or Heavy	Glyphosate or Gramoxone Inteon + 2,4-D or Clarity	Cinch, Dual Magnum, Intro, Outlook, or Prowl + Linex or Sencor	Glyphosate + Cobra, Reflex/Flexstar, Ultra Blazer, or Storm	Reflex, Flexstar, Ultra Blazer, or Storm
				Prowl + Linex, Sencor, Spartan, Valor SX, or Authority MTZ	<u>No emerged Palmer</u> Glyphosate + Dual Magnum or Intro Sequence (glyphosate + Dual Magnum)	Reflex, Flexstar, Ultra Blazer, or Storm

<sup>1</sup> Following label instructions for rates, adjuvants, timing, and rotational restrictions. Choice of herbicide program may depend on other weeds present in the field. Herbicide options are generally grouped by mechanism of action. Make only one application of ALS-inhibiting containing herbicide and no more than two applications of PPO-inhibiting herbicides per season. For heavy infestation levels, conservation tillage with heavy residue cover crop has shown to improve control of Palmer amaranth.

<sup>2</sup> For full-season plantings; 2,4-D 1.0 pt/A, 15 days prior to planting or 1 qt/A, 30 days prior to planting; Clarity 8 oz/A, 1 inch of rainfall + 14 days prior to planting; Valor may be added under heavy infestation levels and substituted for a preemergence PPO herbicide.

<sup>3</sup> MOA – mechanism of action. Include glyphosate or Gramoxone Inteon if weeds are present.

<sup>4</sup> Make postemergence herbicide applications before Palmer amaranth reaches 3 inches. Make a 2nd postemergence application only if Palmer amaranth continues to emerge.

Table 2. Herbicide programs for Palmer amaranth control in conventional (non-Roundup Ready) varieties<sup>1</sup>.

Glyphosate Resistant	ALS Resistant	Infestation Level	Preplant Burndown <sup>2</sup>	Preemergence <sup>3</sup>	Postemergence Application #1 <sup>4</sup>	Postemergence Application #2 <sup>4</sup>
Yes or No	No	Light	Glyphosate or Gramoxone Inteon + 2,4-D or Clarity	<u>Single MOA</u> Cinch, Dual Magnum, Intro, Outlook, or Prowl Linex or Sencor Spartan or Valor SX <u>Multiple MOA</u> Authority MTZ	Cobra, Flexstar, Reflex, Ultra Blazer, or Storm	Classic, Pursuit, Raptor, Scepter, or Synchrony (STS varieties only)
				<u>Single MOA</u> FirstRate, Pursuit, Scepter, or Synchrony XP <u>Multiple MOA</u> Authority First, Authority Assist, Envive, or Sonic Canopy	Cobra, Flexstar, Reflex, Ultra Blazer, or Storm	Flexstar, Reflex, Ultra Blazer, or Storm
		Heavy	Glyphosate or Gramoxone Inteon + 2,4-D or Clarity	Cinch, Dual Magnum, Intro, Outlook, or Prowl + Linex, Sencor, Spartan, Valor SX, or Authority MTZ Prefix	Cobra, Flexstar, Reflex, Ultra Blazer, or Storm	Classic, Pursuit, Raptor, Scepter, or Synchrony (STS varieties only)
				Cinch, Dual Magnum, Intro, Outlook, or Prowl + FirstRate, Pursuit, Scepter, Synchrony XP, or Canopy Squadron	Cobra, Flexstar, Reflex, Ultra Blazer, or Storm	Flexstar, Reflex, Ultra Blazer, or Storm
Yes or No	Yes	Light	Glyphosate or Gramoxone Inteon + 2,4-D or Clarity	<u>Single MOA</u> Cinch, Dual Magnum, Intro, Outlook, or Prowl Linex or Sencor	Cobra, Flexstar, Reflex, Ultra Blazer, or Storm	Reflex, Flexstar, Ultra Blazer, or Storm
				<u>Single MOA</u> Spartan <u>Multiple MOA</u> Authority MTZ	Cobra, Flexstar, Reflex, Ultra Blazer, or Storm	
		Heavy	Glyphosate or Gramoxone Inteon + 2,4-D or Clarity	Cinch, Dual Magnum, Intro, Outlook, or Prowl + Linex, Sencor	Cobra, Flexstar, Reflex, Ultra Blazer, or Storm	Flexstar, Reflex, Ultra Blazer, or Storm
				Prowl + Linex, Sencor, Spartan, Valor SX, or Authority MTZ	<u>Before Palmer emerges</u> Dual Magnum or Intro	Flexstar, Reflex, Ultra Blazer, or Storm

<sup>1</sup> Following label instructions for rates, adjuvants, timing, and rotational restrictions. Choice of herbicide program may depend on other weeds present in the field. Herbicide options are generally grouped by mechanism of action. Make only one application of ALS-inhibiting containing herbicide and no more than two applications of PPO-inhibiting herbicides per season. For heavy infestation levels, conservation tillage with heavy residue cover crop has shown to improve control of Palmer amaranth.

<sup>2</sup> For full-season plantings; 2,4-D 1.0 pt/A, 15 days prior to planting or 1 qt/A, 30 days prior to planting; Clarity 8 oz/A, 1 inch of rainfall + 14 days prior to planting; Valor SX may be included with the preplant burndown application under heavy infestation levels and substituted for a preemergence PPO herbicide.

<sup>3</sup> MOA – mechanism of action. Include glyphosate or Gramoxone Inteon if weeds are present.

<sup>4</sup> Make postemergence herbicide applications before Palmer amaranth reaches 3 inches. Make a 2nd postemergence application only if Palmer amaranth continues to emerge. If grass weeds are present, add a postemergence grass herbicide. If other weeds not controlled by the listed herbicides, tank-mix with the appropriate labeled herbicide.