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Control of Palmer Amaranth in Agronomic Crops[1]

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Palmer amaranth continues to increase in severity across the crop production regions of the Southeast. Though all populations of this weed are not resistant to commonly used herbicides, some populations are. Because resistant pollen and seed move so easily by wind and farm machinery, it is important to consider all Palmer amaranth populations to be resistant until proven otherwise. Below are some Palmer amaranth control programs for corn, cotton, peanut, and soybeans that can effectively manage this weedy pest. But regardless of which system is adopted for Palmer amaranth management, a "program" approach is essential to success. This means that simply adopting Roundup Ready or Liberty Link technology, for example, is not sufficient by itself. The technology must be used in combination with a well-planned burndown, preemergence, postemergence, and layby program. Additionally, it is important to time postemergence applications to small (1–3 inch) weeds. Targeting large weeds, regardless of herbicide resistance, can easily lead to lack of control and lost crop productivity. If there are palmer escapes later in the season, then it is critical to remove them (hand-weeding might be the only option) and prevent seed production. Deep tillage and turning of soil every 4–5 years could be implemented for depleting viable seed in the soil.

Corn

Although some atrazine-resistant populations have been found, it is our understanding that atrazine resistance is not as widespread in Florida as ALS (acetolactate synthase inhibitor; Cadre, Staple, Pursuit, etc.) or glyphosate resistance. Therefore, atrazine is the key component to a Palmer amaranth control strategy. Atrazine can be applied at a maximum rate of 2.5 lb ai/A/yr if applied at two timings (PRE + POST). No single application of atrazine can exceed 2 lb ai/A. The newer formulation of dicamba (Xtendimax, Engenia, Faxapan) and 2,4-D (Enlist Duo and Enlist One) could be applied on the corn varieties with the respective technologies. See Tables 1 and 2 for more information.

Cotton

A cotton program should start with a good preplant program that includes Valor, Reflex, Direx, or Banvel/Clarity. These herbicides should provide up to 15–30 days of effective control but should still be followed by Prowl, Staple, Cotoran, or Direx at planting. Additionally, Direx + MSMA or Valor + MSMA should be used at layby to effectively control Palmer amaranth with both postemergence and soil residual activity. It must be noted that all preemergence herbicides require activation by either rainfall or irrigation. If these materials are applied and activation does not occur, no control will be realized—particularly if these herbicides

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were initially applied to dry soil. The newer formulation of dicamba (Xtendimax, Engenia, Faxapan) and 2,4-D (Enlist Duo and Enlist One) could be applied on the cotton varieties with the respective technologies. See Table 3 for more information.

Salvage Treatments. If Palmer amaranth has reached heights of 6" or greater, it is not likely that any postemergence herbicide option (Staple Liberty 280, Xtendimax, Engenia, or Faxapan) will be effective. Depending on cotton size, a directed application may also fail to be effective. If this is the case, a hooded application may be necessary. See Table 4 for more information.

Peanut

The burndown program should contain 2,4-D to ensure that no Palmer amaranth has emerged prior to planting. Additionally, planting in twin rows will shade the soil earlier than wide rows, helping to suppress Palmer amaranth germination. Applying Prowl or Sonalan will have some, but not great, impact on Palmer amaranth control. But incorporating these herbicides with tillage will provide more control than when applications are made to the soil surface. See Table 5 for more information.

If herbicide failure occurs, a wick-bar application of paraquat can be used. This application will be most effective if a 50% herbicide solution is used and if at least 50% of the plant is wiped. Additionally, roller-type applicators are generally more effective than gravity-fed applicators. Increased roller speed generally translates to greater weed control and increased crop injury. A significant amount of time will likely be required to adjust the implement so peak performance can be achieved.

Soybean

If possible, soybeans should be planted in narrow rows (15 to 7.5 inches). Narrow row spacing allows shading of the soil surface to occur faster and helps prevent Palmer amaranth seed germination. Although Valor is labeled for use in soybeans, it is suggested that a metribuzin-containing product be used. This will allow other chemistry to be rotated into your production system (for resistance management) and will preserve Valor for cotton and peanut production. See Table 6 for more information. Similar to corn and cotton, the newer formulation of dicamba (Xtendimax, Engenia, Faxapan) and 2,4-D (Enlist Duo and Enlist One) could be applied on the soybean varieties with the respective technologies.

There are many ways to manage herbicide-resistant Palmer amaranth and what we have provided in this publication is not an exhaustive list of all possible programs. However, the key to being successful with Palmer amaranth is to develop a diverse program approach. It may be necessary to attempt conventional tillage with herbicide incorporation on one site or rotate into corn on another. But having a plan prior to planting that incorporates many herbicides or other techniques to control Palmer amaranth will give the crop producer the best opportunity to maximize production and minimize Palmer amaranth interference.

Table 1. Palmer amaranth control programs for corn.

Corn Type	Preemergence	Early Postemergence	Late Post (if needed)
Conventional	Atrazine or Atrazine + Outlook or Dual II Magnum	Atrazine + Prowl or Atrazine + Laudis, Callisto, Aim, Status, or 2,4-D	2,4-D or Banvel/Clarity -directed, or Status over-the-top
Roundup Ready	Atrazine or Atrazine + Outlook or Dual II Magnum	Glyphosate + Atrazine, Dual II Magnum, Status, Laudis, Callisto, or Aim	2,4-D or Banvel/Clarity -directed, or Status over-the-top
Liberty Link	Atrazine or Atrazine + Outlook or Dual II Magnum	Liberty 280 + Atrazine	2,4-D or Banvel/Clarity -directed, or Status over-the-top

Table 2. Plant back restrictions in Palmer amaranth control programs for corn.

	Sorghum	Millet	Small Grains	Cotton	Peanut
	Months				
Laudis	10	18	4	10	18
Callisto	0	0*	4	10	10
Aim	0	0	0	0	0
Status	1	4	1	1	4

*Pearl millet only.

Table 3. Palmer amaranth control programs for cotton.

Cotton Type	Preplant/PPI*	At Planting	Early Postemergence	Layby
Roundup Ready	Valor or Reflex (Preplant)	Prowl + Staple or Direx	Glyphosate + Dual Magnum (if seedlings have not emerged)	Direx + MSMA
	Banvel/Clarity or Direx (Preplant)	Cotoran or Reflex + Prowl	Glyphosate + Staple + Dual Magnum (Dual should not be applied with glyphosate + Staple. Dual should be applied 5 days or more before or after the glyphosate + Staple.)	Valor † + MSMA
	Treflan or Prowl PPI	Cotoran or Reflex + Staple	Glyphosate + Dual Magnum (if seedlings have not emerged.)	Valor + MSMA
Liberty Link	Valor or Reflex (Preplant)	Prowl + Staple or Direx	Liberty 280 + Dual Magnum (Ignite will control emerged seedlings.)	Direx + MSMA
	Banvel/Clarity or Direx (Preplant)	Cotoran + Prowl	Liberty 280 + Dual Magnum (Ignite will control emerged seedlings.)	Valor + MSMA
	Treflan or Prowl PPI	Cotoran + Staple	Liberty 280 + Dual Magnum (Ignite will control emerged seedlings.)	Valor + MSMA

* Preplant incorporated.
† In the interest of resistance management, if Valor or Reflex is applied near planting, it is not recommended to use Valor at layby. Likewise, Direx should not be used on the same acre twice in the same growing season.

Table 4. Hooded applications in Palmer amaranth control programs for cotton.

Cotton	Hooded application
Any cultivar	Paraquat
	Paraquat + Caparol

Table 5. Palmer amaranth control programs for peanut.

Peanut	Incorporated	Preemergence	Early Postemergence	Layby
Any cultivar	Prowl or Sonalan	Valor	Paraquat + Dual Magnum ± Basagran	Cobra + crop oil or Cadre + 2,4-DB
		Valor + Prowl	Paraquat + Dual Magnum ± Basagran	Cobra + crop oil or Cadre + 2,4-DB

Table 6. Palmer amaranth control programs for soybean.

Soybean Type	Preplant/PPI	Preemergence**	Postemergence
Roundup Ready	2,4-D (Preplant)	Prowl or Dual Magnum + TriCor, Canopy, Authority MTZ, Boundary	Glyphosate + Reflex, Cobra, Ultra Blazer, or Pursuit
	2,4-D (Preplant) + Prowl or Treflan (PPI)	TriCor, Canopy, Authority MTZ, Boundary	Glyphosate + Reflex, Cobra, Ultra Blazer, or Pursuit
	2,4-D (Preplant) + Prowl or Treflan (PPI)	Valor or Sulfentrazone (Spartan, others)	Dual Magnum +Reflex, Cobra, Ultra Blazer, or Pursuit
Liberty Link	2,4-D (Preplant)	Prowl or Dual Magnum + TriCor, Canopy, Authority MTZ	Liberty 280
	2,4-D (Preplant) + Prowl or Treflan (PPI)	TriCor, Canopy, Authority MTZ, Boundary	Liberty 280 ± Dual Magnum
	2,4-D (Preplant) + Prowl or Treflan (PPI)	Valor or Sulfentrazone (Spartan, others)	Liberty 280 ± Dual Magnum

** All metribuzin-containing herbicides (TriCor, Canopy, Authority MTZ, Boundary, etc) have restrictions for use based on soil texture and organic matter content. Before using a metribuzin product, make sure you read the product label and follow the directions. If not, unacceptable soybean injury could result.