

WEED CONTROL IN FLUE-CURED TOBACCO

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Good weed control uses crop rotation, early root and stalk destruction, cultivation, and appropriate use of herbicides. Application of a herbicide before transplanting (PRE, PPI) or over-the-top at transplanting (OT) will reduce reliance on tillage and cultivation for early season weed control. Some herbicides may also be applied to the row middle just after the last cultivation to obtain full season weed control. Herbicide use should be based upon the specific weeds present in each field, the weed control program that integrates best with overall farm management practices, herbicide cost in relation to performance and crop safety, and anticipated rotational crops. Herbicide performance and safety are dependent upon the use of correct application methods. Special effort should be made to apply all herbicides exactly as stated on the product label.

IMPORTANT CONSIDERATIONS IN HERBICIDE USE

Selecting the Proper Herbicide

Weed Identification - Identifying the problem weeds in each field should be the first step in any weed control program. Check herbicide labels to ensure that the products are active against the desired weeds. Using herbicides in rotation crops may reduce populations of hard-to-control weeds in tobacco fields. The table on page 68 is a relative summary of herbicide performance for the majority of weeds found in flue-cured tobacco fields in Virginia.

Soil Texture and Organic Matter Content - Herbicide rates should increase as percent organic matter increases and as soil texture changes from coarse to fine. However, the lowest recommended rate should always be used when percent organic matter is less than 1%, regardless of soil texture. The soil textures listed in herbicide labels and recommendations are as follows: Coarse Soils - sands, loamy sands, and sandy loams; Medium Soils - sandy clay loams, loams, silt loams, and silts; Fine Soils - clay loams, silty clay loams, and clays. The percent organic matter of your soils can be determined by taking a soil sample and submitting it to a soils laboratory for analysis.

Proper Herbicide Application

Soil Preparation – All weed growth and crop stubble should be thoroughly worked into the soil prior to application of most tobacco herbicides. Soil should be moist and loose, with all clods broken up, before a herbicide is applied.

Spray Equipment - A standard low-pressure (25 to 50 psi) boom sprayer should be used to apply herbicides. Use in 20 to 40 gallons of water per

acre. Check for clogged nozzles and screens frequently while spraying. Use 50-mesh screens in strainers, nozzles, and suction units. Clean or replace dirty or worn out sprayer, boom, and nozzle parts to ensure uniform application. Be sure to calibrate the sprayer before use to avoid crop injury and/or poor herbicide performance from improper spray volume or a non-uniform spray pattern. Ensure that the spray solution is continuously agitated. Do not apply a herbicide in strong wind, since wind can cause uneven coverage and potential spray drift damage to surrounding areas. Poast should be applied at 5 to 20 gallons of water per acre. Never leave a spray mixture in a sprayer overnight!

Herbicide Incorporation - Herbicides that require incorporation should generally be incorporated as soon after application as possible. Use a field cultivator or a combination, double disc, or disc harrow set to cut 4 to 6 inches deep, or a rotary tiller set to cut 2 inches deep. Avoid using a large field disc to incorporate PPI herbicides. Discs should be no more than 24 inches in diameter and 8 inches apart. Shallow incorporation with implements set to cut less than 2 inches deep can result in erratic weed control. **A single cultivation does not adequately incorporate herbicides, and may increase crop injury and decrease weed control.** Incorporating equipment should be operated in two different directions, at right angles to each other, at 4 to 6 mph. P.T.O.-driven equipment (tillers, cultivators, hoes) performs best on coarse soil types. P.T.O.-driven equipment should be set to cut 3 to 4 inches deep and should not be operated at a speed greater than 4 mph. Tillage is often required with herbicide use over-the-top (OT) after transplanting. Irrigation is also often required to incorporate tobacco herbicides applied at layby. Using incorporation equipment and/or tractor speeds not listed on the product label may result in poor or erratic weed control and/or crop injury.

Undesired Effects of Herbicide Use

Effect of Preplant Applications on Early Season Tobacco Growth - Herbicides applied before transplanting sometimes inhibit root development of transplants, delaying plant growth during the first month after transplanting. Full season weed control can be obtained, and possible early season growth reductions avoided, by applying herbicides at transplanting and layby.

Effects of Herbicides on Rotation Crops - Residues from some tobacco herbicides may reduce growth of crops following tobacco. These effects are discussed in the labels for the particular herbicides involved. Potential carry-over can be reduced by: 1) using the minimum labeled rates for the chemical, for your weed problems, on your soils; 2) applying herbicides in a band at transplanting and/or layby rather than broadcast PPI; 3) fall tillage for early root and stalk destruction; and, 4) by deep plowing after the final harvest and before seeding the cover or rotation crop.

FLUE-CURED TOBACCO HERBICIDES

Preplant Herbicides (PRE, PPI) Apply the herbicide in an even broadcast application. Avoid spray overlap! Use even, fan-type, flood-jet, or raindrop nozzles. Formulations of Spartan and Command are designed for surface application before transplanting and do not require incorporation. Apply these to the soil surface at least 12 hours before transplanting. Prowl and Devrinol require incorporation (PPI). Preplant tobacco herbicides should be incorporated no deeper than 2 inches.

Spartan Charge contains the same active ingredient (sulfentrazone) as Spartan 4F, but also contains carfentrazone, the active ingredient in Aim. Spartan Charge may be surface-applied or incorporated before transplanting, but not afterwards. *Be aware that tobacco leaves will burn if contacted by sprays containing Spartan Charge.* The following table presents rates of Spartan Charge, Spartan 4F, and Aim that deliver equivalent amounts of active ingredient:

SPARTAN CHARGE CONVERSION TABLE		
Rate of Spartan Charge	Equivalent Rate of Spartan 4F	Equivalent Rate of Aim EC
3.8 fl oz/A	3.0 fl oz/A	0.65 oz/A
4.5 fl oz/A	3.5 fl oz/A	0.75 oz/A
5.7 fl oz/A	4.5 fl oz/A	1.00 oz/A
7.6 fl oz/A	6.0 fl oz/A	1.3 oz/A
10.2 fl oz/A	8.0 fl oz/A	1.8 oz/A
12.8 fl oz/A	10.1 fl oz/A	2.2 oz/A
15.2 fl oz/A	12.0 fl oz/A	2.7 oz/A

An on-farm yellow nutsedge control test conducted in Halifax County in 2009 found the following in terms of weed control from equivalent rates of Spartan Charge versus Spartan 4F:

Herbicide Treatment	% Nutsedge Control		
	4 June	7 July	9 Sept
No herbicide	0	0.2	4
Spartan 4F, 4.6 fl oz/A	50	50	56
Spartan Charge, 5.8 fl oz/A	48	54	32
Spartan 4F, 6 fl oz/A	36	61	44
Spartan Charge, 8.0 fl oz/A	61	76	71
Spartan 4F, 7.9 fl oz/A	72	82	72
Spartan Charge, 9.0 fl oz/A	68	85	74
Spartan 4F, 10.1 fl oz/A	60	80	86

A 2010 field experiment found the following in terms of relative weed control with the two Spartan formulations. In reviewing these results, you should be aware that conditions were extremely dry, and these conditions may have reduced the weed control that could be expected under more common weather in Southside Virginia:

Herbicide, Rate/A	% Weed Control		Herbicide, Rate/A	% Weed Control	
	June 22	Aug 9		June 22	Aug 9
Untreated Control	68	3	Untreated Control	68	3
Spartan 4F, 8 floz	83	8	Spartan Charge, 10 floz	73	8
Spartan 4F, 10 floz	83	7	Spartan Charge, 13 floz	87	10
Spartan 4F, 12 floz	82	0	Spartan Charge, 15 floz	88	3

Over-the-Top After Transplanting (OT) and Layby Herbicides

An OT application of Command 3ME can be made as either a band or broadcast application within 7 days of transplanting. An OT application of Devrinol 50DF can also be made immediately after transplanting. Devrinol should be shallowly incorporated, or irrigated in, if rainfall doesn't occur within 5 days of application.

1. Band Application - Apply the herbicide in a 14 to 24 inch band over the row using fan-type, even-spray nozzles (8004E, etc.). The amount of herbicide per acre of crop is reduced with band application and can be determined by the following formula:

$$\text{Lbs of Product/Acre} = \frac{\text{Band Width (inches)}}{\text{Row Spacing (inches)}} \times \text{Broadcast Rate per/A}$$

2. Broadcast Application - Apply the herbicide in an even broadcast application using a sprayer equipped with fan-type nozzles (8004, etc.).

Apply layby herbicides as directed sprays to row middles immediately after the last normal cultivation. Use drops equipped with flat, flood-jet (TK2, TK4, etc.) or even, flat-fan (8004, etc.) nozzles to apply the herbicide solution in a 16 to 30 inch band in the row middles. Use nozzles which apply one-half (½) the normal number of gallons per acre where spray nozzles on the end of the boom pass over the same row middle twice (to prevent over-application). Use the formula above to determine the amount of product to use for a band application. Irrigation will be required if 0.5 to 1 inch of rain does not fall within 7 to 10 days after application (to ensure herbicide activation).

Grasses and Nutsedge

RELATIVE EFFECTIVENESS OF HERBICIDES FOR TOBACCO*

Herbicide	Barnyard- grass	Bermuda- grass	Broadleaf Signalgrass	Crab- grass	Crowfoot grass	Fall Panicum	Fox- tails	Goose- grass	Johnsongrass (seedling)	Texas Panicum	Nut- sedge
Aim	N	N	N	N	N	N	N	N	N	N	N
Command	E	P-F	E	E	E	E	E	E	G	G	P
Devrinol	G	P	F	E	E	G	E	E	F	-	N
Poast	F-G	G	E	G	F	E	E	G	E	E	N
Prowl or Pendimax	G	P	G	E	E	G	E	E	F	G	N
Spartan	F	P	F	F	F	F	F	F	F	F	E

Broadleaf Weeds

Herbicide	Carpet- weed	Cockle- bur	Galinsoga	Jimson- weed	Lambs- quarters	Morning- glory	Pig- weed	Purs- lane	Prickly sida	Rag- weed	Sickle- pod	Smart- weed
Aim	-	G	P	G	G	E	E	G	P	N	P	G
Command	P	F	P-F	G	G	P	P	G	E	F	P	G
Devrinol	G	P	P-F	P	G	P	G	E	P	F	P	P
Poast	N	N	N	N	N	N	N	N	N	N	N	N
Prowl or Pendimax	G	P	P	P	G	P	G	P	P	P	P	P
Spartan	G	F-G	F	F-G	G	G	G	G	G	P	P	G

*E = 90 to 100% control; G = 76 to 90%; F = 50 to 75%; P = 20 to 50%; N = Less than 20%; - = no data. This table gives general ratings of relative herbicidal activity. Activity varies with weather conditions, soil type and application method. Under non-optimal conditions, activity may be less than indicated.

WEED CONTROL IN FLUE-CURED TOBACCO FIELDS

Weed Problems	Soil ¹ Texture	Chemical Lbs Active Ingredient/A	Product per Acre	Applic. ² Method
Pigweed, lambsquarters, nightshade, purslane, smartweed, velvetleaf, spurred anoda, carpetweed, cocklebur, cotton, groundcherry, morninggory, common ragweed		Carfentrazone 0.012-0.024 0.013-0.023	Aim 0.5-1.0 oz. Aim EC or Aim EW 0.8-1.5 fl. oz.	Pretransplant burndown; shielded or hooded spray before layby; directed spray after 1 st harvest
Remarks: <i>Spray solution will cause extensive burn to broadleaf plants (and tobacco leaves) on contact.</i> Pre-transplant interval = 1 day; pre-harvest interval = 6 days. Do not apply more than 2.0 oz. Aim or 3.0 fl oz. Aim EC or EW per care per season..				
Barnyardgrass, broadleaf signalgrass, crabgrass, field sandbur (suppression), foxtails, seedling Johnsongrass, fall panicum, velvetleaf, jimsonweed, lambsquarter, prickly sida, purslane, spurred anoda, venice mallow, common ragweed, smartweed, cocklebur (suppression), shattercane	Coarse Fine	Clomazone 0.75 1.0	Command 3ME 2.0 pt 2.7 pt	OT
Remarks: Use the higher rate for heavy weed pressure or heavy soils. Transplants should be placed below the treated area. Do not use in plant beds. Stands of grass cover crops may be reduced if planted within 9 months of Command 3ME application. Do not graze or feed cover crops planted less than 9 months after Command 3ME application.				
Barnyardgrass, carpetweed, crabgrass, fall panicum, foxtails, goosegrass, johnsongrass from seed, lambsquarters, pigweed, common purslane, ragweed (suppression), ryegrass; check label for uncommon weeds.	Coarse Medium Fine Coarse Medium Fine	napropamide 1.0 1.0-1.5 2.0 1.0 1.0-1.5 2.0	Devrinol DF 2.0 lb 2.0-3.0 lb 4.0 lb Devrinol 2E 2 qt 2-3 qt 4 qt	PPI, OT, Layby PPI only
Remarks: For PPI application, incorporate the same day as applied. Small grain injury may result from PPI application method.				

WEED CONTROL IN FLUE-CURED TOBACCO FIELDS (continued)

Weed Problems	Soil ¹ Texture	Chemical Lbs Active Ingredient/A	Product per Acre	Applic. ² Method
Grass weeds and volunteer small grain	All types	sethoxydim	Poast	Postemergence
	Single use:	0.28	1.5 pt + 2 pt oil concentrate	
	Sequential use:	0.19	1 pt + 2 pt oil concentrate	
Remarks: Apply to actively growing grasses in 5-20 gal/A. May be banded or applied broadcast. Do not apply more than 4 pt/A per season or within 42 days of harvest.				
Annual spurge, barnyardgrass, carpetweed, crabgrass, crowfoot grass, Florida pusley, foxtails, goosegrass, johnsongrass from seed, lambsquarters, panicums, pigweed, purslane, signalgrass.	Coarse Medium Fine	Pendime- thalin 0.74-0.99 0.74-1.24 0.99-1.24	Prowl 3.3 EC or Pendimax 3.3 1.8 – 2.4pt 1.8 - 3.0 pt 2.4 - 3.0 pt	PPI only
	Coarse Medium Fine	0.50 – 0.74 0.74 – 0.99 0.74 – 0.99	1.2 – 1.8 pt 1.8 – 2.4 pt 1.8 – 2.4 pt	Layby only
	Coarse Medium Fine	0.95 0.95 – 1.19 1.19	Prowl H ₂ O 3.8EC 2.0 pt 2.0 – 2.5 pt 2.5 pt	PPI only
	Coarse Medium Fine	0.71 0.95 0.95	1.5 pt 2.0 pt 2.0 pt	Layby only
Remarks: For silt and silt loam soils, use 2.4 – 3.0 pt/A of Prowl 3.3EC or 2.5 pt/A of Prowl H ₂ O for PPI applications. Rates are for broadcast application and must be adjusted for banded sprays based on the width of the intended spray band and soil texture. Applied according to directions and under normal growing conditions, Prowl should not harm transplanted tobacco, but can temporarily retard growth under stressful conditions (cold/wet to hot/dry weather). Layby applications should be made as a directed spray in a 16 to 24 inch band centered between rows. Spray contacting tobacco leaves may cause deformations. Crop injury may result if winter wheat and winter barley are no-till planted in the fall after spring application of Prowl. Don't feed forage or graze livestock for 75 days after planting wheat or barley in Prowl-treated land.				

WEED CONTROL IN FLUE-CURED TOBACCO FIELDS (continued)

Weed Problems	Soil ¹ Texture	Chemical Lbs Active Ingredient/A	Product per Acre	Applic. ² Method
Groundcherry, hairy galinsoga, jimsonweed, lambsquarters, morningglory (except pitted), nutsedge, pigweed, prickly sida, Pennsylvania smartweed. Suppresses most grasses, foxtail, panicums, cocklebur, signalgrass, spurges. Check label for uncommon weeds.	Coarse <1.5%OM 1.5-3%OM >3%OM Medium <1.5%OM 1.5-3%OM >3%OM Fine <1.5%OM 1.5-3%OM >3%OM	sulfentrazone 0.14-0.19 0.19-0.25 0.25-0.32 0.19-0.25 0.25-0.32 0.32-0.38 0.25 0.32 0.38	Spartan 4F 4.5-6.0 6.0-8.0 8.0-10.1 6.0-8.0 8.0-10.1 10.1-12.0 8.0 10.1 12.	After bedding, before transplanting

Remarks: %OM = % organic matter. Apply this product only as specified on the label. Do not apply to soils classified as sands with less than 1% O.M. and shallow ground-water. *Most tobacco fields in Virginia contain coarse to medium textured soils.* Do not impregnate on fertilizer. Apply to soil surface after field has been prepared for planting. Apply within 14 days of transplanting, **after** beds are knocked down for planting. **Do not** apply at or after transplanting. Do not disturb treated soil below a 2 inch depth. *Crop injury can occur when incorporation is poor, transplants are set too shallow, or heavy rain falls near transplanting.* **Do not** apply Spartan more than once per season. Do not seed small grains within 4 months of application. Do not plant cotton or canola within 18 months of use.

WEED CONTROL IN FLUE-CURED TOBACCO FIELDS (continued)

Weed Problems	Soil ¹ Texture	Chemical Lbs Active Ingredient/A	Product per Acre	Applic. ² Method
Hairy galinsoga, goosegrass, groundcherry, jimsonweed, lambsquarters, morning-glory, wild mustard, nightshade, nutsedge, orchardgrass, pigweed, prickly sida, broadleaf signalgrass, Pennsylvania smartweed.	<u>Coarse</u> <1.5%OM 1.5-3%OM >3%OM <u>Medium</u> <1.5%OM 1.5-3%OM >3%OM <u>Fine</u> <1.5%OM 1.5-3%OM >3%OM	sulfentrazone + carfentrazone 0.14 – 0.19 + 0.016 – 0.021 0.19 – 0.25 + 0.021 – 0.028 0.25 – 0.32 + 0.028 – 0.035 0.19 – 0.25 + 0.021 – 0.028 0.25 – 0.32 + 0.028 – 0.035 0.32 – 0.38 + 0.035 – 0.042 0.25 + 0.028 0.32 + 0.035 0.38 + 0.042	Spartan Charge 5.7 – 7.6 7.6 – 10.2 10.2 – 12.8 7.6 – 10.2 10.2 – 12.8 12.8 – 15.2 10.2 12.8 15.2	Burndown, preplant surface application, PPI

Remarks: May be surface applied or preplant incorporated (less than 2 inches) from 14 days to 12 hr before transplanting. Beds must be knocked down before applying the product. If no incorporation, timely cultivation after transplanting is required for acceptable weed control. Tobacco may be re-planted in treated soil, but DO NOT retreat or re-bed field. *Do not use in tobacco greenhouses.* May be tank-mixed with liquid fertilizer and other registered herbicides, but a jar test prior to mixing is recommended to ensure compatibility. See label for instructions. Do not apply to soils classified as sands with less than 1 percent organic matter. *Splashing of treated soil onto young tobacco may cause localized burning.* Do not apply more than once per site per season. Do not seed small grains within 4 months of application, or plant cotton within 18 months or canola within 24 months. See label for other crop rotational restrictions.

¹When the soil has less than 1% organic matter, use the rate for the coarse soil texture recommendations. Coarse - sands, loamy sands, sandy loams; Medium - sandy clay loams, silts; Fine - clay loams, silty clay loams, clays.

²PPI --Preplant incorporated. Delay in growth may result under adverse conditions and/or when poor application practices have been used. OT = Over-the top after ransplanting as a band or broadcast application. Layby = Application of herbicide in row middle after last cultivation. Preplant burndown = broadcast spray before transplanting in conservation tillage production system. Shielded or hooded spray = application to row-middles only using sprayer with shields or hoods to prevent spray contact to tobacco leaves. Directed spray = spray directed toward row-middles and surface of row-beds after sequential harvesting has removed sufficient leaves that spray will not contact remaining crop leaves.

PRECAUTIONARY AND RESTRICTION STATEMENTS

Read and follow all directions, cautions, precautions, and restrictions on each product label. Take labels seriously. This publication must not be used as the sole source of precautionary and restriction statements.