10. Topping And Sucker Management

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Topping

Topping in the button stage gives tobacco the desired chemical and physical characteristics that lead to high yields of high-quality leaf. Delayed topping beyond the button- to first-flower stages can reduce yields (Table 10-1). Topping stimulates root growth, the source of nicotine, which also improves drought tolerance and nutrient absorption. Early topping also makes the plants less "top-heavy," which, along with better root growth, helps prevent plants from blowing over. Early topping increases yield (if suckers are controlled) by increasing growth of upper leaves. It also stimulates production of secondary plant products that accumulate in the leaves and improves their quality and smoking characteristics. In addition, early topping lowers the population of several insects that are attracted by the flowers. However, early topping does stimulate sucker growth, so a good sucker control program is necessary to ensure high yields of acceptable quality. Suckers longer than 1 inch should be removed at topping before sucker control chemicals are applied.

Topping height should be at a leaf number that will satisfy buyer preferences. Upper leaves are usually smaller at harvest time when plants are topped relatively high, late, or both. At least one contract

Table 10-1. Effect of topping time on yield of burley tobacco in North Carolina, 1974 and 1975*

Topping Stage	*Yield (lb/a)*
Early Button	*2,820*
Late Button	*2,776*
Early Flower	*2,676*
Late Flower	*2,645*

**Average of 13 experiments conducted by Bob Davis and Gerald Peedin (Crop Science Extension Specialist Emeritus).*

buyer has expressed a need for more ripe, mature tip grade (T) tobacco and may request its growers to top higher than traditionally recommended.

Sucker Control

Four types of chemicals are available for sucker control:

- Contacts (fatty alcohols), which kill small suckers by touching and burning them.
- Contact-local systemics (Prime+, Flupro or Butralin), which must touch the suckers to be effective, although they also retard sucker growth by inhibiting cell division.
- A systemic (maleic hydrazide [MH]), which moves from sprayed leaves to small sucker buds and retards their growth by inhibiting cell division.
- Mixtures of two of these chemical types.

You can make these mixtures on the farm or buy some of them as prepackaged products. Except for MH applied alone, all of these chemical types or their tank mixes must run down the stalks and touch the sucker buds to be most effective. Consequently, the stalk must stand straight so the solution will flow down all sides of the stalk. The applicator can direct the solution down the stalk in a plant-to-plant (by-hand) operation. This technique requires more labor than an overall spray application, but more plants can be treated with the same spray volume. When you use MH in tank mixes with the other chemicals, you must wet the leaves on the upper third of the plant as well as direct just enough solution down the stalk to reach the soil. Proper use and application methods for all types of sucker control products and their tank mixes, when appropriate, are discussed below.

Contacts or Fatty Alcohols

The fatty alcohols, when mixed with water to the proper dilution, form a milky-white emulsion. Avoid using cold water because the product may not totally disperse. Within a few hours after application, the sucker buds turn brown and gradually dry up. The proportion of fatty alcohol to water is critical. If the concentration is too weak, sucker control will be poor; if it is too strong, the leaves as well as the suckers will be "burned." If the burning is too great in leaf

axils, leaf drop may also occur. Bacterial soft rot is usually associated with leaf drop. Frequent rain and humid conditions, along with excess nitrogen, aggravate the situation.

A 3 to 4 percent solution is suggested on the contact label. To prepare a large amount of spray solution, mix 1.5 to 2 gallons of the product with 48 gallons of water. This will treat 7,500 to 8,000 plants per acre. To prepare a smaller amount, use 1 pint of the product and 3 gallons of water. This will treat 470 to 490 plants. Mix thoroughly! Occasional agitation is suggested because the fatty alcohols, which are lighter than water, tend to float on the water. Therefore, you should pour fatty alcohols into the spray tank while adding water. This will provide some agitation. If the fatty alcohols are added after the tank is full of water, proper mixing is more difficult. Also, if the water is too cold, the mixture may have small curds and look like sour milk. Thorough mixing and some warming are necessary before application.

Contact-Local Systemics

Flumetralin (Prime+ and Flupro). When properly diluted in water, flumetralin makes a yellow emulsion. It controls sucker growth by stopping cell division in sucker buds that are touched or wetted. Consequently, the suckers do not grow, but remain present as living, greenish-yellow tissue for several weeks after application. One application at topping will give good sucker control until harvest unless rain occurs within two hours after application. If you make a plant-to-plant, down-stalk application, mix 1 gallon of flumetralin in 49 gallons of water; this will treat 7,500 to 8,000 plants per acre. For a smaller amount, use 0.5 pint of the product in 3 gallons of water; this will treat 460 to 480 plants. Use only enough solution per plant to wet the stalk and suckers without any excess accumulation on the soil at the base of the plant. With careful application, you should be able to treat about twice as many plants with the down-stalk method as you would with the over-top, overall spray method.

Flumetralin may be tank mixed with products containing MH. Mix 2 quarts of flumetralin with ½ to the full rate of MH. The ¾ rate of MH (1.5 gallons per acre for most MH products containing 1.5 pounds active ingredient per gallon) tank mixed with flumetralin has given satisfactory sucker control on vigorous crops and on crops harvested more than three weeks after application.

Butralin. Butralin is a dinitroaniline and chemically similar to flumetralin. Generally, all of the suggestions and precautions

regarding application procedure, activity, and the like for Butralin are the same as those for flumetralin. However, application rates may differ. Like flumetralin, Butralin may be used alone or mixed with products containing MH. However, mixing Butralin with less than 1.5 to 2 gallons per acre of MH is not currently labeled. Check the label for proper application and mixing of this product. Contact your county Extension agent about the availability of Butralin for the 2007 season.

Maleic Hydrazide (MH)

MH is a true systemic; that is, when sprayed on the leaves, it is absorbed and moved to growing sucker buds. It stops cells from dividing in these buds. Therefore, MH does not have to wet the suckers to be effective, but does require good soil moisture for adequate absorption by leaves. Most MH-containing products make a light, straw-colored solution. If the MH-containing product also contains fatty alcohol (FST-7 or Leven-38), the spray mixture is milky-white. Such a product will have the characteristics of both the fatty alcohols and the MH-containing products. MH will not control large suckers, so you should remove them at application.

The suggested rate of MH is no more than 2 gallons of product in 48 gallons of water per acre. For a smaller amount, use 1 pint of product in 3 gallons of water. The former should treat approximately 7,500 to 8,000 plants per acre, and the latter about 460 to 480 plants. MH should be applied as an overall spray, wetting the upper leaf surfaces on the upper third of the plants. Applying MH to lower leaves will not improve sucker control but may increase MH residues. When MH is applied alone, use a nozzle tip and pressure that give a fine spray. When MH is tank mixed with products requiring stalk rundown, use a larger nozzle tip and lower pressure that give a coarse spray to improve stalk rundown. Applying MH alone down-stalk will not provide adequate sucker control.

Mixtures of Two Chemical Types

MH plus Fatty Alcohol (FST-7 or Leven-38). The suggested concentration of an MH product that also contains a C10 fatty alcohol is no more than 3 gallons of the product in 47 gallons of water.

For a smaller amount, use 1.5 pints of the product in 3 gallons of water. The former should treat approximately 7,500 to 8,000 plants

per acre, and the latter about 480 to 500 plants. Use a coarse nozzle tip that promotes stalk run-down but also wets the upper leaves. The fatty alcohols in these products are more active than those in most other contact products, and excessive rates may cause substantial leaf burn, leaf drop, or both.

MH and Flumetralin (Prime+ or Flupro) Tank Mix. The suggested concentration of flumetralin in a tank mix with MH is 2 quarts per acre of flumetralin with ½ to the full rate of MH. After removing suckers larger than 1 inch, apply the tank mix as a coarse spray in 50 gallons per acre of total spray mixture at 20 to 25 pounds per square inch at the recommended time for MH application. For a smaller amount, mix 0.25 pint of flumetralin and 1 pint of MH in 3 gallons of water. Use a coarse spray that promotes stalk run-down but also wets the upper leaves. A fine spray such as used for MH alone may reduce stalk run-down and therefore reduce sucker control by flumetralin.

MH and Butralin Tank Mix. Generally, all of the suggestions regarding tank mixing MH and flumetralin, such as application procedure, timing, and the like, are the same as for tank mixing MH and Butralin. You should treat immediately after topping, at least 30 days before anticipated harvest. The tank mix should contain 1.5 to 2 gallons of MH plus 2 quarts of Butralin mixed in 50 gallons of water per acre. For a smaller amount, mix 0.25 pint of Butralin and 0.75 pint of MH in 3 gallons of water. Use a coarse spray that promotes stalk run-down but also wets the upper leaves.

Spray Equipment

Keep equipment clean, free of other pesticides, and in good working condition. When you plan to spray over-top, always calibrate the sprayer first. If using a hand sprayer, 1 gallon of spray solution should cover approximately 150 plants (0.75 ounce per plant). This amount approximates 50 gallons per acre using high-clearance equipment. Apply fatty alcohols and tank mixes of MH with flumetralin or Butralin with relatively low pressure (20 pounds per square inch), keeping the nozzle tips away from the leaves. Low pressure forms larger droplets and promotes stalk run-down. Some leaf injury occasionally occurs with contacts if the spray solution puddles or hangs on the leaf edges. When applying flumetralin or Butralin alone or in tank mixes with MH, adjust spray volume so that the solution

does not accumulate on the soil at the base of the plants. This will reduce the chance of soil residue carryover and possible stunting of following crops.

MH used alone should be applied as a fine spray. Cover the leaves well for maximum absorption. However, FST-7 or Leven-38 should be applied like tank mixes of MH with flumetralin or Butralin.

Suggested Practices

These practices are based on registered instructions given on product labels, research, experience from on-farm tests, and practical information from growers. Always follow instructions provided on the product label.

Option I

Apply fatty alcohols down-stalk or over-top at the button stage, then top the plants 24 hours later. See Chapter 13 for restricted field entry intervals for other tobacco pesticides. Approximately one week later, apply MH, Stifle, Prime+, Flupro, Butralin, or a tank mix of MH with Prime+, Flupro or Butralin. Using a 3 percent contact before applying systemic products substantially reduced sucker number and weight per acre in most previous tests, including the 2006 on-farm tests (Table 10-2).

Option II

Wait until all plants are in the elongated-button to early-flower stage, and apply MH, Stifle, FST-7 or Leven-38, Prime+, Flupro, Butralin, or a tank mix of MH with Prime+, Flupro or Butralin. Top and remove all suckers longer than 1 inch before spraying. Top down to a 10- to 12-inch leaf because all of the products have systemic activity and may stunt or distort shorter leaves, or both, particularly when they are very tender and succulent at application time.

Option III (for uneven crops)

Top as individual plants reach the elongated-button to early-flower stage, and apply Prime+, Flupro, or Butralin down-stalk to the topped plants. Repeat the procedure as later plants reach this flower stage, being careful not to re-treat previously treated plants.

General Comments

Sucker-controlling agents work best when applied under good soil moisture conditions. Do not apply them on wilted plants. For best results, make applications on dry plants in the morning. Try to choose a day when the possibility of afternoon rainfall is small. The fatty alcohols, flumetralin, and Butralin will be effective if no rain falls for two hours after application. However, reapplication of these products generally is not suggested; reapplication of fatty alcohol may contribute to leaf drop, and reapplication of flumetralin or Butralin on light soils may cause stunting of the next crop, particularly if a dinitroaniline product was also used for weed control. MH products are most effective if no rain occurs for 10 to 12 hours after application. If rain should fall three to six hours after MH application, reapply one-half the labeled rate of MH the following day to maintain control. If the first application was a tank mix of MH with flumetralin or Butralin, reapply only the ½ rate of MH; reapplication of flumetralin or Butralin may increase the chance of stunting following crops.

2005 On-farm Test Results

Table 10-2 shows the average results of on-farm tests conducted in Ashe County in 2006. Suckers 1 inch or longer were removed just before the first treatment, with no other hand suckering until sucker number and weights were recorded just before harvesting three to four weeks later. All treatments were applied as a coarse spray in 50 gallons of spray volume per acre (gpa). The lower the number and pounds of suckers per acre for a given treatment, the better the sucker control.

Based on sucker weight per acre, all treatments provided acceptable sucker control. No treatment resulted in more than 122 pounds of suckers per acre. Growers who harvest tobacco within four weeks of topping and use flumetralin or Butralin should be able to consistently control suckers with reduced rates of MH, like those in Table 10-2 (1.0 gpa RMH-30). Higher rates of MH (up to 1.5 gallons gpa of RMH-30) should only be needed if harvest is extended more than four weeks after topping.

A Precautionary Statement on Pesticides

Pesticides must be used carefully to protect against human injury and harm to the environment. Diagnose your pest problem, and select the proper pesticide if one is needed. Follow label use directions, and obey all federal, state, and local pesticide laws and regulations.

Table 10-2. Results of on-farm sucker control test in Ashe County in 2006

			Suckers		
*Treatment**	*Type of Spray*	*Rate/Acre*	*Number/ Acre*	*Weight/ Acre (lb)*	*Weight/ Sucker (lb)*
Fair 85/PP	*Coarse Spray*	*3%/(0.5 gpa)*	*936*	*29*	*0.03*
Fair 85/(RMH-30 & PP)	*Coarse Spray*	*3%/(1.5 gpa & 0.5 gpa)*	*0*	*0*	*0*
Fair 85(RMH-30 & PP)	*Coarse Spray*	*3%/(1.0 gpa & 0.5 gpa)*	*0*	*0*	*0*
Fair 85/(RMH-30 & Butralin)	*Coarse Spray*	*3%/(1.5 gpa & 0.75 gpa)*	*0*	*0*	*0*
Fair 85/(RMH-30 & Butralin)	*Coarse Spray*	*3%/(1.0 gpa & 0.75 gpa)*	*0*	*0*	*0*
(RMH-30 & PP)	*Coarse Spray*	*(1.5 gpa & 0.5 gpa)*	*0*	*0*	*0*
(RMH-30 & PP)	*Coarse Spray*	*(1.0 gpa & 0.5 gpa)*	*0*	*0*	*0*
(RMH-30 & Butralin)	*Coarse Spray*	*(1.5 gpa & 0.75 gpa)*	*0*	*0*	*0*
(RMH-30 & Butralin)	*Coarse Spray*	*(1.0 gpa & 0.75 gpa)*	*1,656*	*43*	*0.03*
PP	*Coarse Spray*	*0.5 gpa*	*1,440*	*122*	*0.08*

Fair 85 was applied in the early-button stage. All other treatments were applied five to seven days later, immediately after topping when 50 to 60 percent of the plants were in the early flower stage.
(Parentheses) = tank-mixed.
Abbreviations: PP = Prime+; RMH-30 = Royal MH-30.

Table 10-3. A summary of the most current sucker control recommendations for burley tobacco

Chemicals and Formulations	*Amount of Formulation Per Acre*	*Precautions and Remarks*
CONTACT TYPE		*Apply in button-to-early-flower stage as coarse, low-pressure (20-25 psi) spray directed downward on plant tops. Leaf burn may occur with high application rates and pressure, especially on tender or wilted plants when the temperature exceeds 90oF. Application before dew dries may reduce effectiveness.*
C8 - C10 fatty alcohol 6.01 lb/gal	*1.5 to 2 gal* (3 to 4%)*	
SYSTEMIC TYPE		*For all systemic products, apply to upper $^1/_3$ of plant in 20-50 gal water per acre after topping to 10- to 12-inch leaf. Effectiveness is reduced when the product is applied to drought-stressed or wilted plants or before dew has dried. Apply a single repeat application only if wash-off occurs within 6 hours. For water-soluble products, see rate information below and read labels carefully for mixing instructions.*
maleic hydrazide (MH) Liquids, various brands		
1.5 lb/gal	*1.5 to 2 gal*	
2.25 lb/gal	*1 to 1.33 gal*	
60% water-soluble products		*Rate for 6,000 plants per acre. Adjust rate accordingly for other plant populations.*
Fair 80 SP or Sucker Stuff 80 (WS)	*3.75 lb*	
Royal MH-30 SG	*4 to 5 lb*	
CONTACT + SYSTEMIC MIXTURE		*Apply downward on plant tops as coarse, low-pressure (20-25 psi) spray after topping down to 10- to 12-inch leaf. Follow precautions given above and label restrictions for both contact and systemic-type chemicals. Applying high rates or reapplying after wash-off may contribute to leaf drop.*
C10 fatty alcohol + maleic hydrazide (MH) (FST-7 or Leven-38)	*9 qt**	

Table 10-3. (continued)

Chemicals and Formulations	*Amount of Formulation Per Acre*	*Precautions and Remarks*
CONTACT, LOCAL-SYSTEMIC TYPE		*Apply downward on plant tops as coarse, low-pressure (20-25 psi) spray after topping down to 8- to 10-inch leaf. Remove suckers longer than 1 inch immediately before application and missed suckers when seen. Apply only once per plant per season. Excessive volume that causes downstalk runoff on soil increases the chance of soil residue carryover that may harm the growth of small grains and corn or cause early-season stunting of the next tobacco crop when a dinitroanaline herbicide is also used. Rainfall within two hours may reduce effectiveness.*
flumetralin (Prime+or Flupro)	*1 gal**	
butralin (Butralin)	*3 to 4 qt**	
SYSTEMIC + CONTACT, LOCAL SYSTEMIC		*Apply as tank mix downward on topped plants as coarse, low-pressure (20-25 psi) spray at time recommended for MH application. Follow precautions given above and label restrictions for both systemic and contact, local-systemic chemicals. The ¾ rate of MH (1.5 gal/a for most products) tank-mixed with Prime+, Flupro or Butralin has given satisfactory sucker control on vigorous crops and on those harvested more than three weeks after application.*
maleic hydrazide (MH) + flumetralin (Prime + or Flupro)	*½ to full rate MH + 2 qt Prime+ or Flupro**	
maleic hydrazide (MH) + Butralin	*Full rate MH + 2 qt Butralin**	
SYSTEMIC + CONTACT, LOCAL SYSTEMIC		*Apply downward on topped plants as coarse, low-pressure (20-25 psi) spray at time recommended for MH application. Use higher rate on heavy suckering varieties or when sucker pressure is heavier. Follow precautions given above and label restrictions for both systemic and contact, local-systemic type chemicals.*
(Stifle)	*1.5 to 2 gal**	

** Mix in sufficient water to total 50 gallons of spray per acre.*