Carolina Cotton Notes

Calibration of a Wick Delivery System for Mepiquat Chloride

Alexander Stewart, Assistant Professor
LSU Ag Center, Dean Lee Research Station

Keith L. Edmisten, Cotton Extension Specialist
North Carolina State University

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As with any crop protection chemical, the performance of mepiquat chloride (PIX) is dependant on many factors, including the calibration of the application equipment. One method of applying Pix is through a wick delivery system. Wick applicators for Pix that are currently available differ from traditional rope wicks for herbicides in that they have controllable flow rates and can be calibrated at constant ground speeds. Proper calibration of the wick applicator is crucial to obtaining the desired results of a Pix application.

Overview

The wick applicator delivers Pix through a gravity-feed system. The flow rate is governed by an air intake orifice. With a conventional sprayer, the output of each nozzle can be determined by collecting the solution flowing through the nozzle at a constant pressure for a known period of time. The wick applicator has no nozzles or pumps, therefore the flow rate must be determined by measuring the output over a known area when driven at a constant speed. Calibration basically involves determining this flow rate and converting it to an acre basis.

Orifice Size

The air-intake orifice determines the amount of air allowed into the wick applicator, allowing a solution to wick onto the canvas on the outside. A larger orifice size allows more air and therefore more solution to be delivered per acre. Conversely, a smaller orifice restricts air flow and reduces the output per acre. Research with the wick applicator conducted at NC State has used various sizes of orifices, ranging from a #18 to a #46. Orifice size, down to a #18 has not shown any effect on the efficacy of mepiquat chloride. A small orifice size is recommended as it will allow a smaller output and therefore more acres to be covered without re-filling.

Step 1: Ground Speed

Ground speed should be determined after mounting the wick applicator to a sprayer or implement. It is important that speed be determined using any equipment that will be used and/or engaged during application. Choose the RPMs and gear that will be driven in the field. As opposed to sprayer calibration where speed can be calculated and entered in an equation, the speed of the equipment for a wick application must simply be constant. Therefore, a speed which is

acceptable for any other operation that is being performed and is comfortable for the driver should be chosen and remain constant during calibration and application.

Step 2: Determining Flow Rate

The wick applicator should be filled with water to the point of overflowing. Air pockets can sometimes form inside the wick when filling. These can be avoided by filling the wick with a water hose fed completely into the wick and withdrawing slowly. If a surfactant is to applied with mepiquat chloride, it is recommended that the surfactant be added for calibration on a volume per volume basis. If adding a surfactant, the volume of the wick applicator can be determined by the formulas:

$$Volume(cubic\ inches) = (radius\ of\ pipe\ in\ inches)^2 \times (3.14) \times (length\ of\ pipe\ in\ inches)$$

$$Volume(gallons) = cubic\ inches \times 0.00433$$

Once the wick applicator has been filled to overflowing, the cap should be immediately replaced and the air-intake valve shut off. The wick applicator, mounted to an implement or sprayer at the desired height, should then be driven over a known area of cotton at the speed it will be operated. The amount of cotton to be driven over can vary, but it is recommended to be at least one-half acre. Be sure to open the air-intake valve before entering the field.

After driving over the area, remove the cap and measure the amount of water required to re-fill the wick to overflowing. It is important that this be done on level ground. The process can be repeated to obtain an average. The flow rate of the wick can then be calculated by using the known area and the amount of water required to refill the wick in the following formulas:

$$oz\ per\ acre = [(oz\ required\ to\ re\text{-}fill) \times 43{,}560] \div (area\ covered\ in\ square\ feet)$$

$$Gallons\ per\ acre = (oz\ per\ acre \div 128)$$

Step 3: Amount to add to wick

Determine how many acres a specified volume of Pix solution will cover using the following formula:

$$Acres\ per\ tank = gallons\ of\ solution \div gallons\ per\ acre$$

Note that a nurse tank can be used with the wick applicator. If no nurse tank is used, then the gallons of solution is simply the volume of the applicator.

Step 4: Determine how much Pix to add to the tank

$$Amount\ to\ add\ to\ tank = (acres\ per\ tank) \times (Pix\ rate\ per\ acre)$$

CALIBRATION EXAMPLE

Want to apply 8 oz per acre of Pix using a four-row wick applicator with a 15 gallon nurse tank in 36-inch cotton.

Area to be covered for one-half acre:

(43,560 feet^2 in one acre) ÷ 2 = **21,780 feet^2 in one-half acre**

(36 inches) x (4 rows) = 144 inches

(144 inches) ÷ 12 = 12 feet

21,780 ÷ 12 = **1,815 feet to be covered by four-row applicator**

Amount to refill wick applicator : Assume 20 oz

oz per acre = [(20 oz) x 43,560] ÷ 21,780 feet^2
= **40 oz/acre**

Gallons per acre = 40 oz ÷ 128
= **0.3125 gallons per acre**

Acres covered by one tank:

(15 gallons) ÷ (0.3125 gallons per acre) **= 48 acres**

Amount of Pix to add to tank:

(48 acres) x (8 oz Pix per acre) = **384 oz of Pix**
= **3 gallons of Pix**

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