The ABC of TRV - Tree Row Volume is not rocket science
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Effective use of pesticide to prevent or reduce pest damage in apple orchards requires choosing the right material and applying it at the right time. It also requires knowing how much water and how much pesticide to apply to each acre of trees.

Pesticide application guidelines originated in a time when apple trees were much larger than those found in most orchards today. Apple orchards are a three dimensional target, and the target area volume varies tremendously between orchards with small versus large trees. The use of "acre" as the basis for stating pesticide dosage and spray volume is inadequate because acre is a two dimensional measure of flat area. Acre based recommendations do not specify how spray volume and pesticide dose should be adjusted for the size of the trees and the volume of tree canopy on that acre.

The Tree Row Volume (TRV) concept was devised as a simple formula to adjust spray volume and pesticide dosage for smaller trees, using the larger trees of the past as the "standard" reference point. It should be simple to scale from a known standard for big trees down to today's smaller trees. And mathematically, it is simple for growers to use the tree height x width x row length per acre formula described in the New England Tree Fruit Management Guide to calculate the TRV dilute gallons per acre for different blocks with different size trees.

But unfortunately it is not that simple in practice. This presentation will begin with a review the justification and procedures for using TRV adjustments. It will then discuss some of the different assumptions and complications involved in using TRV, constraints on concentrate spray application, and complications in translating pesticide dosages stated as amount per acre into rates per 100 gallons dilute spray per acre based on a TRV calculation.

The formula for estimating TRV gallons of water for a dilute spray application for a block of apple trees is:
Tree height X Canopy diameter X Row length per acre X 0.0007* gallons

For tree height use the average of the tallest trees in the block measured as feet.

For canopy diameter use the average width of trees looking along the row, i.e. how far do the canopies extend into the alley on each side, measured as feet.

Row length per acre is the 43,560 feet per acre divided by the distance between trunks across the alley. For example for a 20 foot row spacing, the row length per acre is 43,560 / 20 = 2178 feet row length per acre.

0.0007 is a conversion factor of 0.07 gallon of water dilute spray per 1,000 cubic feet of tree canopy volume. This is based on canopy density at Petal Fall. Many growers use this value throughout the season for calculating spray concentration.

An adjustment can be made for reduced canopy density in early season sprays (Green Tip to Tight Cluster) by using 0.05 gallon per 1,000 cubic feet of canopy density, i.e. 0.0005.

As canopies reach maximum density in July and August, a conversion factor of 1.0 gallon per 1,000 cubic feet of canopy density (i.e. 0.0010) is recommended.

Changing the gallons per minute output of the sprayer to adjust for change in TRV dilute gallons per acre through the season to achieve a desired spray concentration would be too difficult. It is easier to use the different estimates of TRV dilute gallons per acre to adjust the concentration of pesticide in the tankmix. For example if the sprayer is set to deliver 66 gallons per acre as a 3X spray at Petal Fall, then most pesticides would be added to the spray tank at 3 times the dilute rate per 100 gallons. At Green Tip, that same 66 gallons per acre could be considered at 2.2X spray, and in late July and August it could be considered at 4.2X spray.

This is one of the areas where TRV becomes controversial. Are you confident that this adjustment to the amount of captan per tank will be fully effective?

Another question and controversy is about the basic assumption of how a pesticide works. Using a concentration factor based on TRV assumes that it is the total amount of pesticide applied per acre that matters. That may not be true for all pesticides. For some pesticides, such as oil applied to smother mite eggs, it is the concentration of active ingredient in solution directly contacting the pest that matters. In that case, there is less reason to adjust the amount of product added per 100 gallons of tankmix based on that number of gallons of spray solution applied per acre.

Yet another complication is that many pesticide labels only state the dose on a per acre basis. Unless stated otherwise, the standard assumption is that you divide this amount by 4 to get a dose per 100 gallons of TRV dilute spray because the standard orchard used to be defined as requiring 400 gallons for a dilute spray. But some labels assume a 300 gallon per acre basis. And some labels require a fixed amount per acre regardless of the estimated TRV dilute gallons per acre.

So while it's not rocket science, using TRV it not always as simple as we would like. But knowing the TRV dilute gallon per acre for each block is important for effective and efficient pest management.