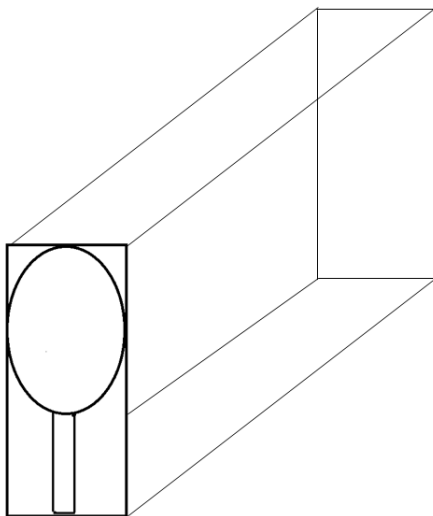
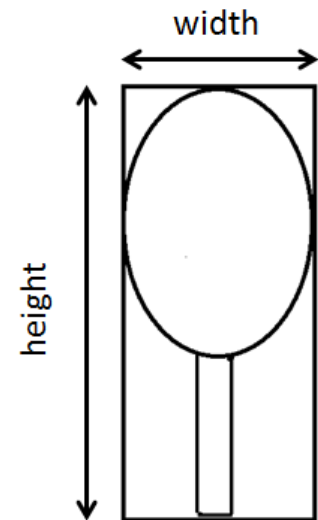


## Tree row volume

Tree row volume is a method for calculating the amount of water “carrier” needed to spray orchards based on row spacing and tree size.

In the 1970s Lyons and Byers of the Winchester Fruit Research Laboratory studied a traditional standard orchard with row spacing of 35 feet, in row spacing of 35 feet, tree height 19.5 feet and width of 23.5 feet. They calculated 400 gallons of water was adequate to spray one acre of these trees to the drip point (so-called dilute spraying).

An orchard with a tree row spacing of 35 feet has  $43,560 \div 35 = 1,742.4$  total lineal feet of orchard row per acre. The tree row volume approach assumes that this standard reference orchard can be represented by a box of width 23.5 feet by height 23.5 feet for each tree row. The tree canopy volume per acre = tree height  $\times$  tree width  $\times$  lineal feet. For the standard



reference orchard this calculates to  $19.5 \times 23.5 \times 1742.4 = 798,455$  cubic feet of canopy volume covered by 400 gallons of water. Each gallon of spray covers approximately 2000 cubic feet of orchard volume.

The tree row volume approach can be used to roughly estimate the amount of water needed to spray dilute in orchards with other row spacing

and/or tree heights and widths.

The number of gallons needed to spray an orchard dilute = tree height  $\times$  tree width  $\times 43,560 \div$  row spacing  $\div 2000$ .

Simplified, the calculation is:

Gallons of spray per acre for dilute =  $21.8 \times$  tree height  $\times$  tree width  $\div$  tree spacing.

This approach can be used to adjust the amount of material needed per acre with the idea that orchards with smaller canopy volume need less material (Example 2).

Example 1. Calculate gallon of spray needed for trees that are 16 feet high and 10 feet wide with 25-foot row spacing.

$21.8 \times 16 \times 10 \div 25 = 139$  gallons of spray per acre for dilute, or 0.348 (34.8 %) of standard orchard

Example 2. Convert chemical use rate for traditional standard orchard to amount needed for orchard with less canopy.

If 5 lbs of chemical is needed for a full size standard orchard requiring 400 gallons for dilute, then an orchard (see example 1) requiring only 139 gallons (0.348 of standard) for dilute will require  $5 \times 0.348 = 1.74$  lb per acre.

For concentrate spraying this is  $1.74 \times 0.82 = 1.43$  lb chemical per acre.

Most growers spray less water per acre (so-called concentrate spraying) than dilute. With concentrate spraying, less spray is lost to the orchard floor. The rough estimate is that approximately 18% less chemical is needed with concentrate spraying, compared to dilute (Example 2).

Important considerations:

- As the amount of water and chemical applied per acre is reduced, errors become more critical. Some pesticide labels often state a fixed rate of materials is needed per acre, regardless of tree size and row spacing. Some applicators adopt a self-imposed rule to apply no lower than 50% of the labeled material rate per acre, regardless of the tree row volume calculation.

- Higher spray volumes are generally recommended for applying growth regulators and for control of pests like scale and wooly aphid.

As with any other production procedure, grower judgment must be used with this method. Where tree size is quite variable, calibration should be done for the average of the largest trees. Spray volume needed for good coverage of trees with scant foliage in the early spring is not adequate for full canopies in mid-summer. A well pruned tree generally requires less spray volume than a tree with dense foliage.