Pest Management Transition Project
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Sprayer Technology

The fundamental theory of orchard spraying is to displace 100% of the clean orchard air with pesticide-laden air. Sprayer fan capacity and the time spent by a tree (tractor speed) have direct influence on air displacement. Air velocity and volume displacement vary widely between sprayers. New sprayer technologies try to address the issue of air displacement, while incorporating the physics of droplet size and air speed, to improve on the 60-yr-old technology of airblast sprayers. However, airblast sprayers have a proven history of being robust applicators – they are reliable and simple to maintain. It may not be necessary to replace your airblast sprayer in order to control insects with new pesticides; however, management practices that optimize sprayer coverage can improve the performance of traditional sprayers in new orchard environments.

Ground Speed and Your Orchard

The PMTP web site (pmtp.wsu.edu/SprayTech.php) offers a resource tool that allows growers to match the ground speed and air displacement of their traditional airblast technology to optimize pesticide applications. Growers are asked to input specific tree size and planting information along with data from their airblast sprayer. The worksheet then calculates the maximum speed the sprayer can travel in order to displace 100% of the clean air in the tree canopy with pesticide laden air. Growers are likely to find, after inputting data from their sprayer and orchard, that they have been driving too fast – especially in older plantings. Under most conditions tractor speeds must be kept below 2.5 mph.

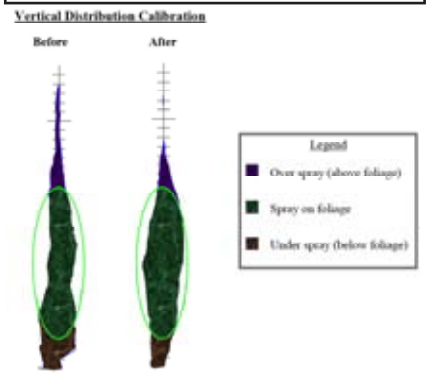
Calibrating Your Sprayer

Efficient pesticide applications improve economic efficiency and reduce offsite movement of pesticides. Sprayer efficiency can be improved by replacing worn nozzles and cleaning clogged screens. Worn nozzles and clogged screens affect spray flow and can result in excess pesticide use and/or poor pest control. There are also techniques (see patternator next page) that can be used to measure the vertical distribution of spray, which will help growers adjust nozzle configuration and orientation to improve uniformity and distribution of spray throughout the canopy. Improving nozzle configuration can reduce over and under canopy spray thereby reducing pesticide drift. Precise spray deposition will increase coverage on the intended target and result in more effective and longer lasting pest control.

Deposition and Your Orchard

Andew Landers, pesticide application technology specialist, Cornell University, provides the plans to build a simple patternator (see picture to right and link below). The patternator allows growers to map the vertical distribution of sprayer output in comparison to the target canopy. After analyzing spray distribution, growers can adjust nozzles on the left and right side of the sprayer to maximize deposition in the canopy thereby minimizing under and over tree spraying. Improving deposition within the canopy means reduced drift and more efficient spraying. Because of the counter-clockwise spin of the fan, air and pesticide movement to the right of the tractor tends to be upwards while on the left side of the tractor the general air movement is downward. The result is uneven distribution of pesticide, which can impact pesticide efficacy throughout the orchard.

http://www.nysaes.cornell.edu/ent/faculty/landers/pdf/Patternator.pdf



Airflow and Your Orchard

Sprayer manufacturers often use 'increased air velocity' as a selling point for their technology. While it is important to have high air velocity to deliver pesticide from a traditional airblast sprayer outward and upward through dense canopies to the tops of tall trees, the same may not be necessary in modern plantings. In fact, air speeds that often range between 100-200 mph are not needed to deliver pesticide to modern high-density plantings with relatively narrow rows and smaller canopies. Too much air speed can result in off target deposition as the pesticide blows through the tree. There are several options (see box to right) available to reduce air speed with traditional airblast sprayers and therby improve spray deposition within the canopy in modern orchard plantings.

Reducing Wind Speed

- **Reduce fan speed via the gearbox.**
- **Change blade pitch to reduce air.**
- **Reduce PTO speed (beware of loss of torque).**
- **Fit a control baffle, or doughnut, (see picture to left) to fan intake.**

Visit PMTP online at: http://pmtp.wsu.edu

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