Great Lakes Fruit, Vegetable & Farm Market EXPO
Michigan Greenhouse Growers EXPO

December 5-7, 2017

DeVos Place Convention Center, Grand Rapids, MI

Current Issues in Organic Fruit Production

Where: Grand Gallery (main level) Room D
MI Recertification credits: 1 (1C, COMM CORE, PRIV CORE)
CCA Credits: PM(1.0)
Moderator: Matt Grieshop, Entomology Dept., MSU

1:00 pm	Update on Organic Pest Management Tactics for the Brown Marmorated Stink Bug • Anne Nielsen, Entomology Dept., Rutgers Univ.
1:40 pm	Getting the Most Bang for Your Buck: Optimizing Airblast Sprayers for Organic Pest Management Products • Matt Grieshop, Entomology Dept., MSU • Jacob Emling, Organic Pest Management Lab, Entomology Dept., MSU
2:20 pm	Session Ends

Getting the Most Bang for Your Buck:
Optimizing Airblast Sprayers for Organic Pest Management Products

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Today's horticultural grower uses a wide variety of air assisted sprayers (radial fan, proptech, agtech, cannon etc.) to deliver pesticides and other foliar inputs to crops. Pesticides and foliar inputs constitute a major portion of the yearly input costs associated with these crops, and the performance characteristics are undergoing massive changes. Increased price, reduced residual and narrower target spectrums all mean that sprays need to be applied carefully and efficiently to ensure grower profitability.

This handout provides an overview of the three main concepts of airblast sprayer optimization (with a focus on radial airblast type sprayers): Speed, Fluid Flow and Airflow. These three concepts can be visualized as a "spray triangle" (Fig. 1). These three factors all impact each other and optimization of each is important if we are to achieve consistent performance –*i.e.* maximum canopy coverage and minimal spray drift. An optimized sprayer A thorough explanation of these concepts can be viewed at visit www.http://sprayers101.com.

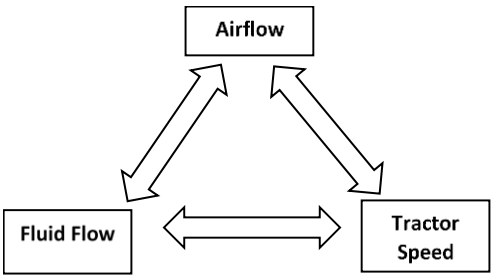

Figure 1. The Spray Triangle

Tractor Speed – Tractor Speed determines the amount of time the plume produced by the sprayer has to develop on the crop canopy. Air assisted sprayers use high velocity air to develop a product laden plume and carry it towards the intended target. The level of coverage on the target canopy depends on whether the product laden plume is dense enough and has enough time to replace the volume of air that is in the targeted canopy. When driving too fast, not enough air is replaced in the canopy and poor coverage will result. Driving too slow and over application will occur. The following steps will help the spray operator to know how fast the equipment is moving and can determine if the spray is setup in the ideal conditions.

1. Fill a recently cleaned spray tank half full with clean water.
2. Find an area that is at least 100 feet in length and has the similar ground cover as in the location that will be sprayed. Ideally a grassy field of an orchard would work. Do not use pavement or gravel path. These surfaces will not provide you with real world results and will reduce the accuracy of calibration.
3. Using a stop watch, measure the amount of time the tractor needs to pull the sprayer the known distance (*e.g.* 150 feet). Repeat this process at least three times to get an average amount of time. Also note what tractor setting are being used (gears and RPM).

4. Formula 1 calculates the speed in miles per hour.

   Speed = Distance / Time (answer will be in feet per second)

   Miles per hour = 0.68182 * Feet per second

Example

Tractor covered 150 feet in 33 seconds.

Speed = Distance / Time => 150 feet/ 33 seconds = 4.545 Feet per second

Miles per hour = (0.68182 * 4.545 Feet per second) = 3.098 Mph

Fluid Flow – The volume of spray material emitted by each nozzle on a sprayer is critical to determining the volume applied to a canopy and also can be used to determine nozzle faults well before they are visible to the naked eye. The key to collecting this information is to collect the volume of material applied over a known time period. The easiest way to do this is to slip a snug fitting hose on each nozzle and collect the material emitted over a known time period (e.g. 15 seconds) into a container. The material can then be measured using a graduated cylinder or measuring cup. This process is then repeated for each nozzle on the sprayer. Completing this with a measuring cup and stopwatch can be time consuming but is the cheapest option. Commercial built devices specialized for this purpose can be purchased.

Fluid Flow and Volume

1. Fill a recently cleaned spray tank half full with clean water. A clean sprayer will reduce pesticide exposure.
2. Attach a small amount of rubber or plastic hose (udder liners for milking work great!) securely over a nozzle. Run the hose into your measuring container and run the sprayer pump for 15 seconds.
3. Measure the fluid collected and record –multiply the result by 4 to convert to ounces per minute. Repeat this process for each nozzle on the sprayer keeping a separate measurement for each nozzle.
4. Check the volume of fluid from each nozzle compared to the manufacture's specifications and replace nozzles that > 5% higher or lower.

Air Flow– Airflow is the third optimizable aspect of all air assisted sprayers but is often times overlooked by applicators. Ideally, the airflow delivered by the fan should direct the spray laden air to displace the air within the tree canopy. This means that the direction of airflow should not exceed the canopy height and the velocity of air should be not too fast or slow. Fluttering leaves on the opposite side of the portion of canopy being sprayed are a good

indication of optimized airflow. Still leaves indicate that the sprayer is not producing enough air flow to replace the air in the canopy. Plant canopies are variable between plantings and over time so it is important to optimize airflow for specific plantings at different times of the year.

Air Flow and Direction

1. Clean the sprayer and empty the tank. Make sure that the fan and air system is free from all debris or spray residue. A clean sprayer will reduce incidental exposure to spray residues.
2. Attach a 10-12" inch long strip of flagging tape to each nozzle assembly (Figure 2).
3. Place the sprayer within a planting with the canopy you want to optimize against.
4. Attach 8-12' strips of flagging tape at top, middle, and bottom of the opposite side of the crop canopy.
5. Turn on the fan system (don't run the pump!) using your typical spray settings.
6. The flagging strips on the sprayer will point the direction of the airflow leaving the sprayer. Flagging that is pointing over or under the canopy indicate drift and soil deposition potential. Adjust the air deflectors at the top and bottom of the sprayer fan housing to minimize airflow to these regions.
7. The flagging strips on the canopy should be moving slightly to indicate proper air displacement in the canopy. If they are still, increase airflow by adjusting fan speed or fan pitch. If they are blown straight reduce airflow by adjusting fan speed, fan pitch or by restricting air intake by obstructing the fan grill.

Figure 2. Radial airblast sprayer with flagging