AGRICULTURAL BEET

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Fungicide Application Technology – Wind Tunnel Test Results

SMBSC has arranged a series of tests conducted in coordination with Dr. Kruger at the University of Nebraska Extension. The objective of these tests were to compare the droplet spectrum of fungicides applied with different nozzles at varying pressures and adjuvants.

This type of experiment is not commonly performed with fungicides, but is common with herbicides, where drift is especially problematic. Therefore, when interpreting the results of these tests, several assumptions had to be made with consultation of industry experts.

1) Droplets below 150 microns are susceptible to drift and evaporation. This may be especially true when spraying in unfavorable conditions.

2) Droplets above 410 microns are considered very coarse and not as effective for contact fungicides.

3) The higher percentage of droplets between 150 – 410 microns, the better the coverage and disease control.

Spray Quality*	Size of Droplets	VMD Range (Microns**)	Color Code	Retention on Difficult to Wet Leaves	Used for	Drift Potential
Extremely Fine	Small	<60	Purple	Excellent	Exceptions	High
Very Fine		61-105	Red	Excellent	Exceptions	
Fine		106-235	Orange	Very Good	Good Cover	
Medium		236-340	Yellow	Good	Most Products	
Coarse		341-403	Blue	Moderate	Systemic Herbicides	
Very Coarse		404-502	Green	Poor	Soil Herbicides	
Extremely Coarse		503-665	White	Very Poor	Liquid Fertilizer	
Ultra Coarse	Large	>665	Black	Very Poor	Liquid Fertilizer	Low

ASABE S572.1 Droplet Size Classification

Materials and Methods

Three nozzles and five spray solutions were analyzed with a Sympatec Helos Vario KR particle size analyzer in a low speed (15 mph air flow) wind tunnel. With the R7 lens installed, it is capable of detecting particle sizes in a range from 18 to 3500 microns. This system uses laser diffraction to determine particle size distribution. The width of the nozzle plume was analyzed by moving the nozzle across the laser by means of a linear actuator, and each treatment was replicated three times. The three nozzles tested were TT11005 (Turbo Tee-jet), TXR80049 (hollow cone) and XR11005 (flat fan). All three nozzles were run at 40, 60 and 90 psi, and the tests were run June 21, 2019.

Results

- The percent of spray volume below 150 microns was increased by the use of 90psi for all of the nozzles tested. The percent of volume above 410 microns was generally increased when using 40psi for all of the nozzles tested. At 60psi the droplet spectrum does not necessarily have the highest percent of spray volume in the optimal range (150-410 microns), but it was not significantly different than 90psi, while also reducing the potential loss to evaporation or drift by reducing the percent of volume below 150 microns.
- With each pressure tested the Turbo Teejet nozzle always had a lower percent of the spray volume in the optimal range compared to the flat fan or hollow cone. This nozzle also created higher amounts of driftable fines and ultra coarse droplets and is listed in the TeeJet book as only 'very good' for contact fungicides. The addition of a deposition aid to the solution increased the percent of volume below 150 microns when using Turbo Teejets.
- The hollow cone at 60psi had the highest percentage of spray volume in the optimal range with acceptable risk for loss to drift. However, the hollow cone requires that the nozzle be 30 inches above target to achieve proper overlap. This additional height, over the 20 inches required for the flat fan, increases the risk to lose spray volume to evaporation or drift. The performance of the flat fan at 60psi was not significantly different than the hollow cone and has less concerns with overlap.
- Adding a deposition aid to the spray solution was generally beneficial to increasing the percent of spray volume in the optimal range. However, there were differences in the deposition aids tested. The addition of a pinene adjuvant (examples are Reguard or Transfix) to the spray solution did not significantly alter the droplet spectrum.

Conclusion

There are many nozzle types and pressure combinations that could provide good coverage. This experiment tested a limited number of combinations. However, these results may suggest that fungicide applications could be improved by avoiding use of spray pressures in excess of nozzle specs or local recommendations to reduce potential loss to drift or evaporation. It would also suggest that caution be advised when using Turbo Teejets and when selecting deposition aids. Please consult your Agriculturist as you consider any changes to your fungicide program.

Information Credit:
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