Nova Scotia
Environmental Farm Plan Program

factsheet

Nozzle Selection for Blueberry Growers

Introduction

Nozzle selection is extremely important for pesticide performance. Volume alone, without considering the level of coverage, droplet size, and drift potential may give less than expected results. Factors that influence which nozzles are best suited include: timing and target (soil, pre-emergence, post emergence systemic or contact, broadleaf or grass leaves, etc), total solution, and weather conditions. These factors will determine the volume to be sprayed, droplet size, distribution, and pressure.

Spray Patterns

Spray patterns can be described generally as:

Flat fan - tapered pattern with overlap giving a uniform distribution across the boom for broadcast spraying. Many variations are available for special applications, drift reduction and banding applications (Air induction, extended range, flood type, even fan, twin fan, etc).

Hollow cone and full cone nozzles - circular patterns of very fine droplets which are generally used for air blast or directed spraying.

Spray Angle/Height

Spray coverage varies according to pressure, boom height and nozzle spacing. Spray heights are based on nozzle discharge angle and minimum overlap, approximately a 1:1 nozzle spacing to height ratio (refer to manufactures recommendations). Rough terrain and long boom lengths may make it difficult to adhere strictly to boom height recommendations as damage to the boom and other components may occur. Select a height which compromises between optimum nozzle height for overlap, field terrain and equipment safety.

Spray Pressure

Nozzle output varies with pressure. Increasing pressure increases spray angle, wear, and drift, while decreasing droplet size. A four times increase in pressure doubles nozzle output. Sizing a nozzle in the middle of its spray pressure range gives more flexibility for adjustments in speed. Air induction and extended range nozzles operate over a broader range of pressure settings providing flexibility in travel speed if using rate controllers.

Droplet Size

Droplet size is most important when product effectiveness is dependant on coverage, or when drift control is a priority. Droplet size is measured in microns (µm), 0.001 millimetre (1/25,000 inch). Nozzles will produce a variety of droplet sizes which are classified as an average output, so comparisons can be made between nozzles (Table 1). Wide angle nozzles (110º) will produce finer droplets than those with the same flow rate, but lesser output angle (80º).

Fine droplet nozzles are used where thorough coverage is required, such as post emergent contact pesticides. Nozzles with medium to

Table 1. American Society of Agricultural Engineers (ASAE) Droplet Spectrum categories

Droplet Size Class	VMD (µm)*
Very Fine (VF)	<150
Fine (F)	150-250
Medium (M)	250-350
Coarse (C)	350-450
Very Coarse (VC)	450-550
Extremely Coarse (XC)	>550

*VMD is the droplet size at which half the total spray volume coming out of the nozzle is in droplets larger than the VMD and half in smaller droplets.

course droplets are generally used when coverage is not as critical such as systemic and pre-emergence soil applied pesticides. Table 2 suggests droplet sizes for various blueberry pesticides.

Spray Drift

Spray drift is the movement of pesticide droplets away from the target area. Droplets which are most prone to drift are those less than 200 µm in diameter. A human hair is approximately 100 µm.

Practices to control drift include: reducing pressure, increased water volume, using nozzles that produce larger droplets, lower boom heights while maintaining proper overlap, reduced travel speeds, avoiding high temperature and low relative humidity, as well as temperature inversions.

Table 2. Blueberry pesticides and droplet sizes for optimum performance.

	Pesticide	Droplet Size*		
		Fine	Medium	Coarse
Herbicide	Velpar		■	■
	Venture	■		
	Callisto	■		
	Sinbar		■	■
	Kerb		■	■
Insecticide	Imidan	■	■	
	Cygon		■	■
	Sevin	■	■	
Fungicide	Bravo		■	
	Topas		■	
	Maestro	■	■	
	Pristine	■	■	

*Range suggested to give required coverage

Fine: standard flat fan, twin flat fan, small capacity extended range or larger at increased pressure
Medium: low drift nozzles, medium capacity extended range or smaller at low pressure, pre-orifice flat fan
Coarse: air induction, flood type

Some nozzle variations such as low drift and air induction are less sensitive to wind as they produce a narrower range of droplet sizes, therefore less fine droplets. While air induction nozzles reduce drift by producing larger more uniform droplets, they maintain relatively good coverage. Trapped air bubbles cause the droplet to shatter on impact providing better coverage than conventional nozzles with similar droplet size. Select nozzles that will give the desired coverage with the least drift potential.

Case scenario: A producers applies Velpar with an air induction nozzle 11002 at 40 psi and a travel speed of 4.5 km/hr. This produces a very coarse droplet size with a total output of 200 L/ha. With the same nozzles he wants to apply Topas, which recommends a medium droplet. Droplets produced by air induction nozzles will provide better coverage than standard nozzles. Air induction, although not the best choice, will be a compromise. He is going to apply Imidan which requires 1000 L/ha. The nozzle will not produce the optimum droplet size or the volume required at the present travel speed. It is suggested he use an extended range or a twin fan 11006 @40 psi and a speed of 2.3 km/hr to achieve the best results.

Resistance Management

Resistance management involves rotating pesticides from different chemical groups, as well using products effectively. Reduced water volumes and improper droplet size give poor coverage and can contribute to poor control and resistence development.

Records

Application rates can be changed by adjusting nozzle size and type, tractor speed, or boom pressure. If using multiple nozzle bodies and/or nozzle tips, keep results of your calibration in a crop record book for quick reference if changing nozzle configurations.

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