Influence of nozzle type and pressure on droplet size from Roundup PowerMax, Clarity, and Roundup PowerMax and Clarity tank-mixtures

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Introduction

- Drift is a major concern in agricultural production systems globally.
- Droplet size is important to the quality of application and the percentage of drift.
- Droplet size is modified by several application parameters, including the nozzle type, orifice size, application pressure, and spray solution.
- Understanding these interactions will enable applicators to select appropriate nozzles and pressure to optimize control of weeds and mitigate drift.

Objective

Identify the spray droplet distribution of two commonly used nozzle types when spraying Roundup PowerMax, Clarity and a tank-mixture of both.

Materials and Methods

- Conducted using the low-speed wind tunnel at the Pesticide Application Technology Lab
- Droplet measurements made using a Sympatec HELOS-VARIO/KR laser diffraction system
- Two different types of nozzles were used: XR(Figure 1A) and TTI(Figure 1B). (Orifice size rage from 015 to 06)
- Solutions sprayed were Roundup PowerMax (0.77 kg a.e ha^{-1}), Clarity (0.56 kg a.e ha^{-1}) and a tank-mixture.
- Each nozzle traversed through the laser beam three separate times to measure entire spray plume providing three repetitions (Figure 2)
- Data were subjected to ANOVA and means were separated using Fisher's Protected LSD test with the Tukey adjustment.

Speed	Nozzle	Pressure
kph		kPa
8	XR110025	207
16	XR11003	345
24	XR11005	276
8	TTI110025	207
16	TTI11003	345
24	TTI11005	276

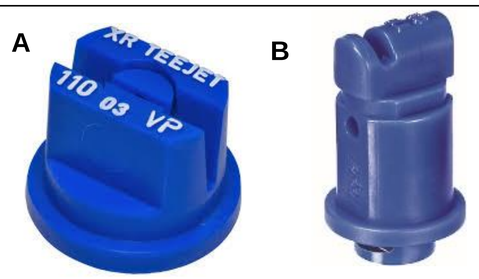

Figure 1. XR and TTI teejet nozzle

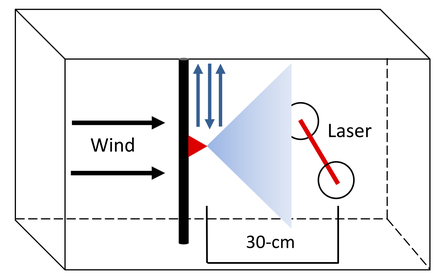

Figure 2. Illustration of the low-speed wind tunnel and laser diffraction system used for droplet spectrum analysis.

Results

Droplet size from:

		8Kph				16Kph				24Kph			
Nozzle	Solution	Dv10	VMD	Dv90	RS	Dv10	VMD	Dv90	RS	Dv10	VMD	Dv90	RS
XR	RU	87	197	348	1.32	92	211	361	1.27	113	261	447	1.28
	CL	95	210	354	1.23	93	213	365	1.28	118	270	463	1.27
	RU + CL	88	197	339	1.27	89	201	350	1.29	109	251	432	1.29
TTI	RU	371	746	1110	0.99	364	739	1120	1.02	400	838	1317	1.09
	CL	437	837	1193	0.90	371	774	1210	1.08	401	839	1309	1.08
	RU + CL	390	760	1122	0.96	350	725	1174	1.13	384	814	1303	1.12

Figure 3. Low-speed wind tunnel, laser view (left), full view (right).

Conclusions

- TTI had a larger droplet size than an XR
- Clarity generated the largest droplet size, followed by Roundup PowerMax and then the tank-mixture of both when pooled across nozzle
- Nozzle type and the solution to be sprayed both influence droplet size and affecting the potential of drift
- If tank-mixture are utilized, caution should be taken to avoid drift because droplet size is smaller than Clarity alone.