

Optimizing fungicide spray volume for improved management of *Ascochyta* blight of chickpeas

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THIS IS A RESEARCH UPDATE ON A CONTINUING PROJECT

- Funding is being sought from the Northern Pulse Growers Association to continue fungicide spray volume studies on chickpeas in 2020.

OBJECTIVE & RATIONALE

- Due to the limited systemic movement by fungicides within plants, large spray volumes are recommended for fungicides so as to optimize fungicide coverage.
- **The economic return to increasing fungicide spray volume is poorly documented and largely unknown for most crops and diseases.** In the absence of data that would permit rigorous assessment of the return on investment associated with the additional cost of applying a fungicide at a higher spray volume, practical considerations and expediency typically drive spray volume decisions for fungicides.

MAJOR FINDINGS

1. **Increased spray volume sharply improved *Ascochyta* control and chickpea yield** across both fungicides tested and both chickpea varieties (Figure 1, Table 1).
2. Increasing spray volume from 10 to 15 gal/ac improved chickpea yield by an average of 219 lbs/ac for Proline and 563 lbs/ac for Proline + Bravo WeatherStik.
3. Increasing spray volume from 10 to 20 gal/ac improved chickpea yield by an average of 374 lbs/ac for Proline and 848 lbs/ac for Proline + Bravo WeatherStik.

METHODS

- **Application methods:** Fungicides were applied with a tractor-mounted R&D sprayer equipped with a pulse-width modulation system (Capstan AG; Topeka, KS). Driving speed = 8.9 mph. Nozzles, pressure = TeeJet extended-range flat-fan XR11004 nozzles, 50 psi (fine droplets). Constant driving speed and the same nozzles and pressure were maintained across spray volume treatments by adjusting pulse width.
- Row spacing: 7.5 inches
- Plot size: 5 ft x 30 ft at planting.
- Experimental design: randomized complete block with a split-plot arrangement (main factor = fungicide, sub-factor = spray volume) and seven replicates.
- Two varieties were evaluated, with the varieties were planted back-to-back and sprayed concurrently. Because the varieties were not planted in a randomized pattern, data were analyzed separately for each variety.
- Disease establishment: Infested crop residues were spread in non-harvested buffer and guard plots adjacent to the treatment plots during early to mid-vegetative growth. For lentils, no supplemental pathogen inoculation was conducted.
- Disease assessment: The percent of the canopy diseased was estimated twice after fungicides were applied, including once shortly before crop maturity. Due to uneven senescence associated with good versus poor disease control in Carrington in 2019, the second disease assessment in chickpeas was conducted by assessing the percent of pods exhibiting *Ascochyta* symptoms. In each quarter of each plot, all of the pods on 2 to 4 plants, with the number of plants adjusted as needed such that a minimum of 50 pods assessed per quarter of the plot.
- Yields were calculated on the basis of the measured plot length and reported at a standard 13.5% moisture. Grain was cleaned prior to yield assessment.

FIGURE 1. Impact of fungicide spray volume, chickpeas – key results. TeeJet extended-range flat-fan tips; Carrington, 2019. Fungicides were applied with a tractor-mounted R&D sprayer equipped with a pulse-width modulation system. Driving speed = 8.9 mph. Applications were made with TeeJet extended-range flat-fan XR11004 nozzles, 50 psi (fine droplets), with pulse width modified as needed to achieve the desired spray volume. Five fungicide applications were made 10-14 days apart from the first appearance of disease symptoms at late vegetative growth until early senescence. Within-column means followed by different letters are significantly different ($P < 0.05$; Tukey multiple comparison procedure). The non-ionic surfactant 'Preference' (alkylphenol ethoxylate, sodium salts of soya fatty acids, isopropyl alcohol, 89.5%; Winfield United, River Falls, WI) was applied at 0.25% (v/v) with all fungicide applications.

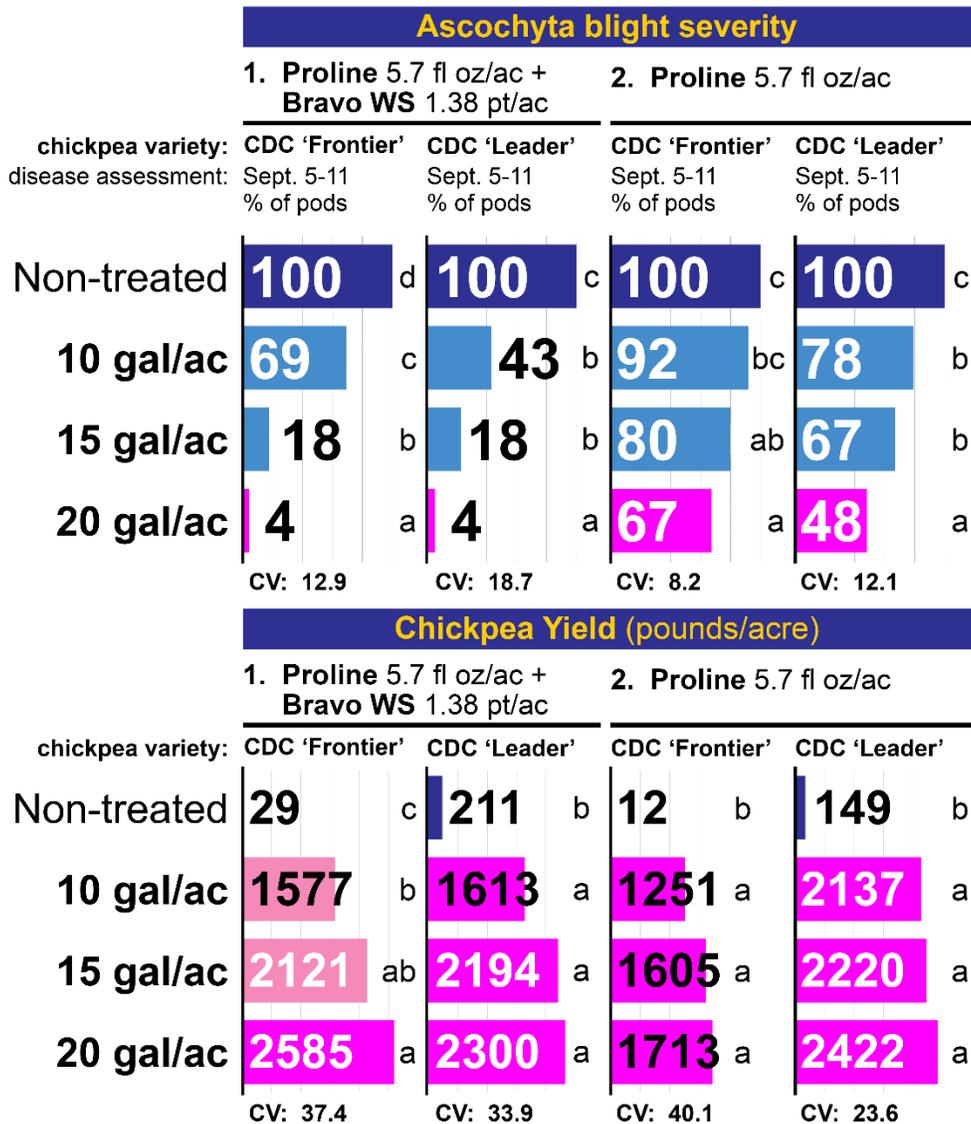


FIGURE 1. Impact of fungicide spray volume, chickpeas – full results. TeeJet extended-range flat-fan tips; Carrington, 2019. Fungicides were applied with a tractor-mounted R&D sprayer equipped with a pulse-width modulation system. Driving speed = 8.9 mph. Applications were made with TeeJet extended-range flat-fan XR11004 nozzles, 50 psi (fine droplets), with pulse width modified as needed to achieve the desired spray volume. Five fungicide applications were made 10-14 days apart from the first appearance of disease symptoms at late vegetative growth until early senescence. Within-column means followed by different letters are significantly different ($P < 0.05$; Tukey multiple comparison procedure).

'CDC Frontier' chickpeas					
	Ascochyta severity	Ascochyta severity	Ascochyta rAUDPC	Yield	
	July 25-26 % necrosis	Sept. 5-11 % of pods	June 19- Sept. 11 0 to 100	13.5% moisture lbs/ac	
Proline 480SC 5.7 fl oz/ac + Bravo WeatherStik 1.38 pt/ac + Preference 0.125% v/v					
1	Non-treated control	81 b*	100 d*	68 d*	29 c*
2	Spray volume: 20 gal/ac	6 a	4 a	4 a	2585 a
3	Spray volume: 15 gal/ac	11 a	18 b	10 b	2121 ab
4	Spray volume: 10 gal/ac	11 a	69 c	24 c	1577 b*
	<i>F</i> :	216.34	373.41	381.03	25.40
	<i>P>F</i> :	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	<i>CV</i> :	23.8	12.9	14.6	37.4
Proline 480SC 5.7 fl oz/ac + Preference 0.125% v/v					
1	Non-treated control	84 b*	100 c*	69 b*	12 b*
2	Spray volume: 20 gal/ac	14 a	69 a	26 a	1713 a
3	Spray volume: 15 gal/ac	11 a	80 ab	28 a	1605 a
4	Spray volume: 10 gal/ac	16 a	89 b	33 a	1251 a
	<i>F</i> :	126.38	21.53	131.43	20.29
	<i>P>F</i> :	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	<i>CV</i> :	26.2	8.8	12.1	40.1
'CDC Leader' chickpeas					
	Ascochyta severity	Ascochyta severity	Ascochyta rAUDPC	Yield	
	July 25-26 % necrosis	Sept. 5-11 % of pods	June 19- Sept. 11 0 to 100	13.5% moisture lbs/ac	
Proline 480SC 5.7 fl oz/ac + Bravo WeatherStik 1.38 pt/ac + Preference 0.125% v/v					
1	Non-treated control	66 b*	100 c*‡	60 c*	211 b*
2	Spray volume: 20 gal/ac	5 a	5 a	4 a	2300 a
3	Spray volume: 15 gal/ac	4 a	22 a	8 ab	2194 a
4	Spray volume: 10 gal/ac	7 a	43 b	16 b	1613 a
	<i>F</i> :	148.67	68.46	190.44	22.06
	<i>P>F</i> :	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	<i>CV</i> :	31.9	31.1	22.7	33.9
Proline 480SC 5.7 fl oz/ac + Preference 0.125% v/v					
1	Non-treated control	68 b*	100 b*	61 c*‡	149 b*
2	Spray volume: 20 gal/ac	3 a	53 a	16 a	2422 a
3	Spray volume: 15 gal/ac	6 a	67 a	21 b	2220 a
4	Spray volume: 10 gal/ac	8 a	70 a	23 b	2137 a
	<i>F</i> :	109.95	10.53	64.55	47.35
	<i>P>F</i> :	< 0.0001	0.0003	< 0.0001	< 0.0001
	<i>CV</i> :	36.9	22.1	6.0	23.6