AGRONOMY

Action Thresholds for Volunteer Canola in Soybeans

Action thresholds for volunteer canola in soybeans are low (2–3 plants/m^2). Early season image analysis shows promise as a potential decision-making tool for managing volunteer canola.

ACTION THRESHOLDS DEFINE the densities of pests at which control measures should be taken to preserve yield. To date, no studies have assessed volunteer canola competition in soybeans nor determined its action threshold. Although the approach is in its infancy, development of a yield loss model based on digital images of weed density at early crop stages would create a useful decision support tool for farmers.

The objectives for this study were two-fold. The first objective was to determine the effects of volunteer canola density in soybeans planted on narrow (7.5 inches) and wide (30 inches) rows on crop yield, growth and development. Results were used to pinpoint the volunteer canola density at which 5% soybean yield loss was incurred. The second objective was to characterize the relationship between early season total ground cover at increasing densities of volunteer canola and soybean yield loss in narrow or wide rows. Digital image analysis was investigated as a potential predictive tool to estimate yield loss in soybeans from volunteer canola interference.

Field studies were conducted in 2012 and 2013 at Howden, Carman, and Melita and repeated in 2015 at Carman and Portage. Experiments were seeded to achieve a population of 180,000 plants/ac for both narrow- (7.5–10 inches) and wide- (30 inches) row widths. Canola seed was broadcasted evenly over designated plots at six densities ranging from 0–320 seeds/m^2 in 2012, and in following years a density of 640 seeds/m^2 was added. Plots were assessed at V1, V3–V4, R8 and canola maturity. The rectangular hyperbola yield loss model was used to describe percent crop yield loss in response to increasing densities of canola, compared with yields in weed-free treatments. The action threshold was found by determining the density of volunteer canola that resulted in soybean yield loss of 5%, according to the model.

Volunteer canola is very competitive with soybean, which led to significant yield losses at five of six site-years in this study. The action threshold for 5% soybean yield loss in narrow-row soybeans was 3.2 plants/m^2, while the wide-row soybean action threshold was 2.5 plants/m^2. When differences between row widths were observed, narrow-row soybeans were more competitive and had higher action thresholds before 5% yield loss was observed. This study is the first to describe the relationship between yield loss in soybeans and volunteer canola density.

Early season digital images captured total ground cover over a range of volunteer canola densities during V3–V4. To evaluate the relationship between canola ground cover and soybean yield loss, ground cover for the weed-free treatments was subtracted from the ground cover obtained from each other treatment to provide an estimate of the percentage of ground cover occupied by volunteer canola alone.

Linear regression was used to relate ground cover to soybean yield loss. For every percent increase in total ground cover, soybean yield loss ranged from 0.26%–2.79% for both narrow- and wide-row soybean. A difference in slopes between narrow- and wide-row spacing suggested separate models would be required for different row widths. While still early, this method shows promise relating soybean yield loss to total ground cover and could be developed to serve as a decision-making tool for managing volunteer canola in soybeans in the future.

Table 1. Action threshold (density of volunteer canola causing 5% yield loss) in narrow- and wide-row soybeans.

Year	Location	Soybean Row Spacing	
		7.5 inches	30 inches
		Volunteer Canola plants/m^2	
2012	Carman	ns	ns
	Kelburn	5.9	4.1
	Melita*	2.6	1.1
2013	Carman	6.0	12.4
	Kelburn*	5.7	2.5
	Melita	1.2	12.3
2015	Carman	1.5	2.2
	Portage	3.5	2.9
	Combined	**3.2**	**2.5**

* Denotes locations where significant differences between row spacings was observed

ns – Indicates where the model was not significant

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