Progress in Non-Chemical Weed Management in Pulses in western Canada

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Weed management in pulse crops is challenging due to their poor competitive ability, limited herbicide options, and increasing incidence of herbicide resistant weeds. There is approximately 700,000 hectares of organic field crop production on the Canadian Prairies. Since the use of synthetic herbicides is prohibited in organic production, growers rely heavily on mechanical and cultural weed control methods. Results from two studies will be presented: 1) the effect of post-emergence tillage (rotary hoeing, harrowing and inter-row cultivation) integrated with crop seeding rate on weed control in field pea (*Pisum sativum* L.) and lentil (*Lens culinaris* L.) and, 2) the effect of clipping *Brassica* weeds above a lentil crop canopy on weed seed production. The first study was conducted in Saskatoon, SK, Canada in 2016 and 2017. Mechanical weed control methods including rotary hoeing, harrowing and inter-row cultivation were applied in a factorial arrangement with two seeding rates in organically grown field pea and lentil (targeted plant densities of 90 and 135, and 130 and 260 plants m^{-2}, respectively. All mechanical treatments resulted in similar field pea yield increases ranging from 38% to 50%. Paired and multiple treatments reduced weed biomass in field pea by 73% to 86%. Increasing the seeding rate of field pea did not improve weed control, but it increased field pea yield by 13%. The combination of post-emergence rotary hoeing followed by inter-row cultivation resulted in 40% higher lentil grain yield than the untreated check. Doubling the seeding rate of lentil resulted in a 23% increase in yield, while weed biomass was reduced by 16%. Sequential treatments of rotary hoeing and inter-row cultivation in lentil resulted in a 76% decrease in weed biomass. Treatments including rotary hoeing provided the greatest spectrum of weed control in both crops as they controlled more than 80%, 60%, and 86% of green foxtail (*Setaria viridis* L.), wild mustard (*Sinapis arvense* L.), and common lambsquarters (*Chenopodium album* L.), respectively. The second study was conducted at Lacombe, AB, and Saskatoon, SK, in 2017 and 2018 to determine the optimum timing, frequency, and height of weed clipping for reducing *Brassica* seed production in imidazolinone-tolerant lentil. All clipping treatments in lentil were conducted above the crop canopy to avoid crop damage, but included multiple timings of clipping (Weeks 1-5 after the initiation of *Brassica* flowering), and conducted at different frequencies ranging from 1 to 5 times. Clipping conducted in the first week of weed flowering reduced seed production by only 14%. A single, delayed clipping in the fourth week of flowering reduced seed production by 67%, however delaying clipping beyond the fourth week resulted in dispersal of viable weed seeds at the time of clipping. Performing multiple clippings resulted in the lowest weed seed production, with clipping two and three times resulting in reductions of 74 and 90%. Combining mechanical and cultural practices can reduce weed interference and improve crop yield in organic pulse production; however, some of these practices may have application in managing herbicide resistant weeds in conventional cropping systems.