

Agriculture Demonstration of Practices and Technologies (ADOPT) Program



Project Title: Fall 2, 4-D Preceding Canola, Lentil and Pea

Project Number: 20130303

Producer Group Sponsoring the Project: Western Applied Research Corporation (WARC)

Project Location(s): AAFC Scott Research Farm. Legal land description: NE 17-39-20 W3

Project start and end dates (month & year): The project commenced September 1 2013 and completed December 1 2014

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Objectives and Rationale

Project objectives: The main objective is to demonstrate the frequency and extent of crop damage sustained from fall applied 2, 4-D at high rates as used for control of dandelion or other perennial weed species.

Project Rationale: Recent wetter than normal seasons has delayed many agricultural practices, including fall weed control strategies. This has favored greater infestations of grain crops by perennial broadleaf weeds. One control strategy is to use fall applied 2, 4-D. However, delayed applications of high rates of 2, 4-D may increase the risks of crop damage to spring sensitive crops such as canola, lentils and peas due to residual effects of the herbicide. The purpose of this demonstration is to provide reliable and updated information about the risks of high rate residual herbicides on sensitive crops. This will allow growers to choose alternative control measures or management practices with less risk. The demonstrations will provide a forum for discussion and transfer of information at field days. Data, photos, and other materials generated will be used to discuss these issues at winter meetings and to provide information on websites.

Methodology and Results

Methodology: The demonstration was set up as a 4 replicate strip plot trial and 2,4-D amine applied at rates of 0, 3, 6, 12 and 24 active ounces per acre in the last week of September. Actual fall application of 2, 4-D in 2013 was Sept 28. In fall of 2013 soil was sampled at 4-5 locations per replicate at 0-12" depth and a composite sample submitted to ALS labs for texture, pH, organic matter and available N, P, K and S analysis. Results are summarized in Table 1 below.

Table 1: Soil Conditions at Scott in fall 2013.

Soil Factors	Description/values
Soil Texture	Loam
Soil OM (%)	2.4
Available N (lb/ac)	21
Available P2O5 (lb/ac)	97
Available K2O (lb/ac)	754
Available S (lb/ac)	15

In spring 2013, plots were treated with glyphosate herbicide for pre-seeding weed control at our site, and direct seeded to canola, lentil or pea on May 22. The crop varieties used were L130 (Canola), Maxim (Lentil) and Meadow (Pea) at seeding rates: 100 seeds/m², 105 seeds/m² and 80 seeds/m², respectively. Registered herbicides and fungicides were used to control weeds and diseases in each crop at recommended label rates.

Plant densities were determined by counting numbers of emerged crop plants on 5 half meter row lengths per plot at 10 days after first rows become visible, and repeated at 21 days. When counting emerged plants, we noted any plants that appeared deformed (abnormal coloring, abnormal bending or thickening of leaves or stems, plants that die shortly after emerging) and recorded numbers for each row length (this number was also included in the total for emerged plants for each row length).

Maturity of each plot was recorded as the date when the crop was due for swathing (physiological maturity) (canola when 30% of seed on the main raceme had turned from green to brown; pea when seed in bottom third of pods will ‘rattle’ in the pod; and lentil when 30% of seed has turned from green to brown). Grain yield was measured following typical protocols for each crop and reported on a standard moisture content basis for each crop.

Results: Snow left later than normal in spring 2013 due to heavier than normal snow cover across all sites and cooler than normal temperatures.

At WARC seeding conditions were near ideal, all crops emerged at early June. At 10 days after emergence was first noted and again at 21 days after emergence we were unable to detect any trend for plant densities to change with 2, 4-D rate.

Canola plant densities at 10 days after seeding were moderate. This trend remained similar at 21 days after seeding. There was no consistent trend for plant density to change as 2, 4-D rates increased at our site. Pea densities were in the 59-67 plants/ m² range, well below the threshold of 80 plants/m². Overall there was no trend for pea densities to decline as 2,4-D rates increased at either 10 or 21 days after emergence. Lentil plant densities at 2,4-D rates of 0,3,6,12 and 24 oz/ac were 92, 89, 82, 79 and 84 plants/ m² at 10 days after emergence and 86, 86, 83, 83, and 82 at 24 days after emergence respectively. These densities would be somewhat below what would be considered ideal for a lentil crop.

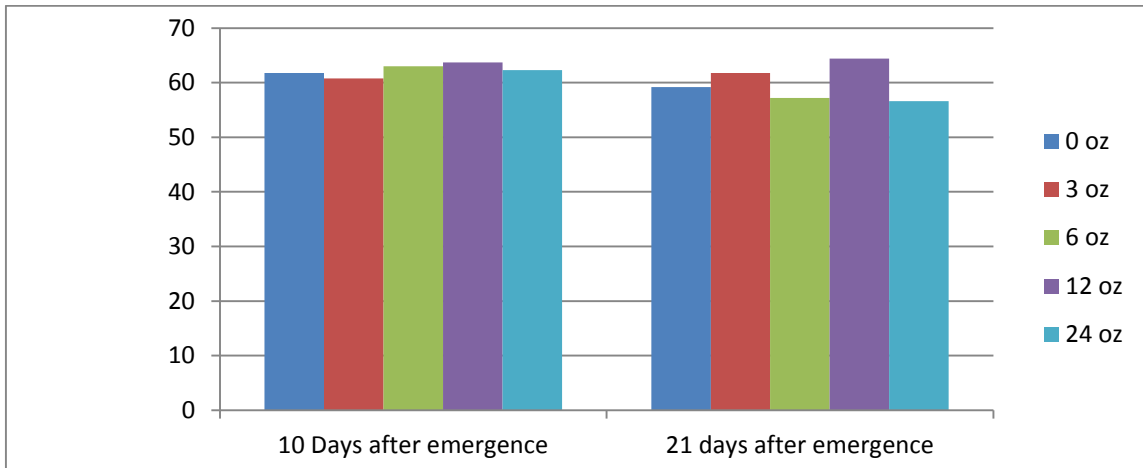


Figure 1: Influence of fall 2,4-D application rate (0-24 oz/ac) on canola plant density (plants/m²) averaged across 6 AgriARM location years during 2013-14.

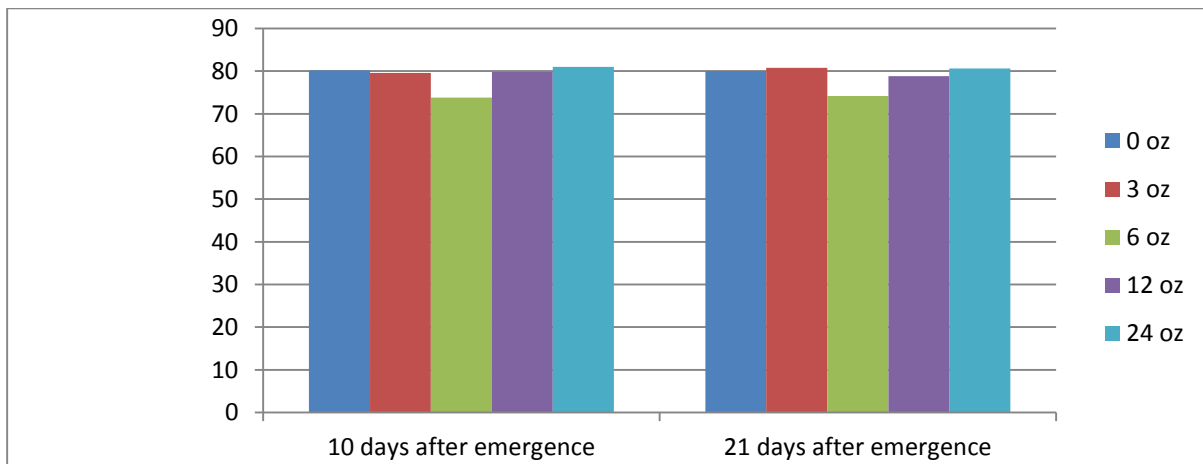


Figure 2: Influence of fall 2,4-D application rate (0-24 oz/ac) on pea plant density (plants/m²) averaged across 5 AgriARM location years during 2013-14.

We selected seed rates near the low end of what was recommended for these crops. This was done to increase the probability that yield effects would be evident if treatments reduced plant density. However, treatments did not reduce plant densities. Differences between treatments at were not statistically significant for any crop.

This project was displayed at the annual AAFC and WARC field day with attendance approximately 200. Results from this demonstration will be available in the 2014 WARC annual report (available online).

Conclusions and Recommendations:

The observed effects of fall applications of high rates of 2, 4-D amine during the growing period was unexpected. Based on previous research and anecdotal evidence, we expected to find some evidence of reduced plant stands and/or an increase in numbers of abnormal seedlings. There were no significant reductions in emergence, no increased seedling injury or negative impacts on seed yield observed for canola, lentil or field pea. However, these results should not mislead us to conclude that such applications are always safe. Previous research has shown that fall applications of 2, 4-D amine preceding these crops can cause significant injury and yield reduction, particularly at high rates required for effective perennial weed control. Previous research has shown that damage can be higher on heavy clay or clay soils than on coarser textured soils, and that risk of damage may be higher on low compared with high organic matter soils. The early snow cover in fall of 2012 may have provided sufficient insulation to allow microbial activity to persist longer, thereby breaking down residues. In addition, later seeding in spring 2013 due to wet conditions may also have allowed greater 2, 4-D breakdown. Results from 2014 suggested that even when snow cover is delayed, damage was not noted. To the best of our knowledge, previous studies have all been conducted under conventional tillage conditions. Having organic matter stratified at the soil surface and not mixing soil with tillage in a no-till system could promote greater losses or inactivation of the herbicide with no-till compared with conventional tillage. It would be of interest to compare 2,4-D rate effects under contrasting tillage systems.

Acknowledgements

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Abstract/Summary:

Use of 2,4-D amine as a fall treatment to control perennial weeds has increased in recent years. While such treatments are safe when used in advance of resistant crops, they can cause damage to susceptible crops like canola, lentil and pea. In fall 2013 a demonstration was conducted to provide updated information about the risks of using high rates of fall 2,4-D for perennial weed control preceding crops that are susceptible to this herbicide. The intent was to encourage growers to choose alternate control measures or management practices that pose less risk. The demonstration was replicated in small plot trials with rates of 0, 3, 6, 12 and 24 active ounces of 2,4-D amine applied during the last week of September of 2012. Each spring, canola, lentil and pea were seeded into the plots and evaluated for residual effects from the 2,4-D applied the preceding fall. We were unable to demonstrate any detrimental effect on crop emergence, crop development or yield of these susceptible crops. The period from fall 2013 through the 2014 growing season experienced more typical weather conditions, but there was no evidence that 2,4-D caused any damage to any of these crops. The demonstration was used to provide a forum for discussion and transfer of information at field days at each location and future plans are to discuss this issue at other technology transfer events.