Lentils: which agronomic inputs provide the best return?

Lentils are a main component of the Canadian pulse market and serve as an alternative to peas due to their profitability and rotational benefits. However, due to the high cost of inputs associated with lentil production, producers are increasingly interested in improving their profit margins. By examining the main agronomic inputs and their effect on yield, producers will be able to better understand what is required to produce higher yields with a greater return. This project provided a visual demonstration of the interactive role on grain yield and seed quality between large and small red lentil varieties with differing inoculants, increased seeding rates and the presence and absence of fungicide application. This trial also investigated the interactive effect among agronomic inputs, as well as provided an economic analysis that assisted producers in their decision-making processes.

This demonstration was established at Scott and Swift Current as a randomized complete block design with four replicates with 18 treatments with three factors: seeding rates: (130, 190 and 260 seeds /m^2), inoculants: (liquid, granular and none) and fungicide treatments: (fungicide and no fungicide) for both small and large red lentils.

The results from this trial have provided several interesting insights to improve lentil production. Although overall yield and seed quality differed between variety and sites, there are several underlying trends that can be concluded.

First, that seeding rates which exceeded the current recommend rate of 130 seeds m^{-2} resulted in greater yields and greater net profit returns. These results are relatively consistent with the findings of Shirtliffe (2015, unpublished) who reported preliminary results indicating that the optimal seeding rate for small red lentils was approximately 240 seeds m^{-2}. Furthermore, several studies (Silim et al. 1990; Paolini et al. 2003; Baird et al. 2009) have indicated that a higher lentil seeding rate resulted in greater yield due to reduced crop-weed competition.

When comparing the economics of 190 seeds /m2 with all agronomic factors included, the seeding rate of 130 and 260 seeds /m2 resulted in a net loss of $110 / acre and $82 / acre, respectively (Table 1). Therefore, the optimal seeding rate based on economics alone suggest a seeding rate of 190 seeds /m2. Therefore, the optimal seeding rate based on economics alone suggest a seeding rate of 190 seeds /m^2.

Secondly, the effect of inoculant consistently has a significant effect on lentil yield, however, the overall performance of each formulation varied between sites. At Scott, granular inoculant provided the best yields and the greatest net profit compared to liquid formulation and un-inoculated treatments. These results coincide with several published results (Clayton et al. 2004; Kyei-Boahen et al. 2002; Gan et al. 2005) which indicated that granular inoculant resulted in better nodule formation and overall greater yields.

In contrast, the effect of fungicide was highly non-significant for most of the parameters measured, with the exception of its effect on seed weight (TKW). When fungicide applications were analysed on an individual basis for an economic analysis, fungicide applications rarely result in a profit gain. However, when determining the best combination of agronomic practices, the use of fungicide with a seeding rate of 190 seeds /m^2 and granular inoculant consistently provided the best yield and overall profit margin at Scott. When fungicide is used in combination with 190 seeds /m^2 and granular inoculant, it resulted in a net profit of $72 ac^{-1} compared to the unsprayed, 190 seeds /m^2 and granular inoculant treatment (Table 1). These results suggest that although there was not a significant three-way interaction, a synergistic effect may occur under certain conditions.

Table 1. Economic analysis of seeding rate x inoculant x fungicide treatments based on the average yield of small and large red lentil at Scott, SK in 2016.

Seeding Rate (seeds m^{-2})	**Inoculant**	**Fungicide**	**Net Profit** ($ ac^{-1})
190 seeds /m^2	Granular	Sprayed	$1114.00
190 seeds /m^2	Granular	Unsprayed	$1042.00
130 seeds /m^2	Granular	Sprayed	$1005.00
260 seeds /m^2	Granular	Sprayed	$1032.00

Overall, this study supports the use of granular inoculant as well as an increased recommended seeding rate greater than 130 seeds /m^2 to reduce crop-weed competition and to improve overall profit gains.

For the full report, see https://www.westernappliedresearch.com/research/fact-sheets/. Project was supported by the ADOPT initiative under the Canada-Saskatchewan Growing Forward 2 bi-lateral agreement.