

Factsheet: Lentil Response to Fertilizer Applications and Rhizobial Inoculation



Objective:

The objective of this project was to show how lentils respond to different fertility management treatments, focusing on phosphorus rate, rhizobial inoculation, and nitrogen fertilization strategies.

Methodology:

This trial was conducted at Indian Head, Scott, and Swift Current. The different treatments consisted of a combination of P fertilizer rates, granular rhizobial inoculant and supplementary N fertilizer that was side-banded at time of seeding, or as in season broadcast prior to P flowering. Monoammonium phosphate (MAP; 11-52-0) was the phosphorus source used and was side-banded at seeding. P was applied at a rate ranging from 0 to 67 kg P₂O₅/ha. Nodulator Duo SCG was the granular inoculant applied. Urea (46-0-0) was the supplemental N provided. Total N applied was 55 kg N/ha and was adjusted for the N provided by the MAP.

Table 1. Fertilizer and inoculant treatments evaluated in lentil fertility demonstrations conducted at Indian Head, Scott, and Swift Current in 2021.

#	P rate (side-banded MAP)	Granular Inoculant (label rate)	Extra N Fertilizer (adjusted for N from MAP but not residual NO ₃ -N)
1	0 kg P ₂ O ₅ /ha	No	None
2	0 kg P ₂ O ₅ /ha	Yes	None
3	22 kg P ₂ O ₅ /ha	No	None
4	22 kg P ₂ O ₅ /ha	Yes	None
5	45 kg P ₂ O ₅ /ha	No	None
6	45 kg P ₂ O ₅ /ha	Yes	None
7	45 kg P ₂ O ₅ /ha	No	55 kg N/ha sideband
8	45 kg P ₂ O ₅ /ha	No	55 kg N/ha in-season broadcast
9	45 kg P ₂ O ₅ /ha	Yes	55 kg N/ha sideband
10	45 kg P ₂ O ₅ /ha	Yes	55 kg N/ha in-season broadcast
11	67 kg P ₂ O ₅ /ha	Yes	None
12	67 kg P ₂ O ₅ /ha	Yes	55 kg N/ha sideband

- N balanced at 9.5 kg N/ha for treatments 1-4 to separate P from N responses
 - Both in-crop and side-band urea rates are adjusted for N provided by MAP (i.e., the total quantity of N applied in each of treatments 7, 8, 9, 10, and 12 was 55 kg N/ha)

Key Findings:

- Fertilizer that was side-banded did not have an affect on establishment. Side-banding provided enough separation from the seed-row to avoid seedling toxicity.
- Indian head had the lowest residual P levels out of the three locations, and was the highest yielding location. Lentils are good at scavenging for nutrients in the soil, and will still respond to added P. Rates that match removal (20-40 kg/ha) are sufficient to ensure that yields are not limited. Scott and Swift Current had enough of residual P and did not see any yield increase form adding P, however, applying 22 kg P₂O₅/ha could be beneficial at keeping a sufficient amount of residual P. P fertilization did not have any impact on seed quality.

The full report is available at www.warc.ca. This project was funded through Saskatchewan Pulse Crop Development Board, Fertilizer Canada, and the Agricultural Demonstration of Practices and Technologies (ADOPT) initiative under the Canadian Agricultural Partnership bi-lateral agreement between the federal government and the Saskatchewan Ministry of Agriculture
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- All three sites did not see any benefit to the application of rhizobial inoculation. All treatments had good nodulation and yields and seed protein were similar. An application of inoculum is still beneficial due to the high importance of N₂ fixation, but dual application or exceeding recommended rates would not be necessary.
- The addition of N fertilizer did not see any results. A late application of N may reduce the possible negative impacts with reduced N fixation, but precipitation is still needed for the fertilizer to be beneficial. A late application could be beneficial if there is observed nodulation failure and N deficiencies observed early on in the growing season.

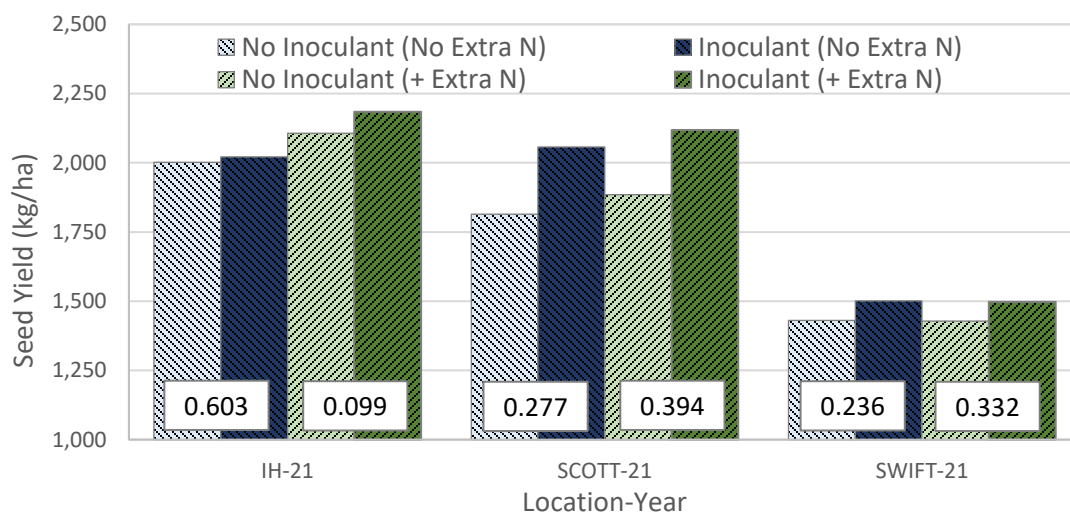


Figure 1. Group contrasts comparing granular inoculant effects on lentil seed yield, with and without the addition of extra nitrogen (N) fertilizer, at Indian Head, Scott, and Swift Current in 2021. P-values ≤ 0.05 are considered significant while P-values ≤ 0.10 may be considered marginally significant.

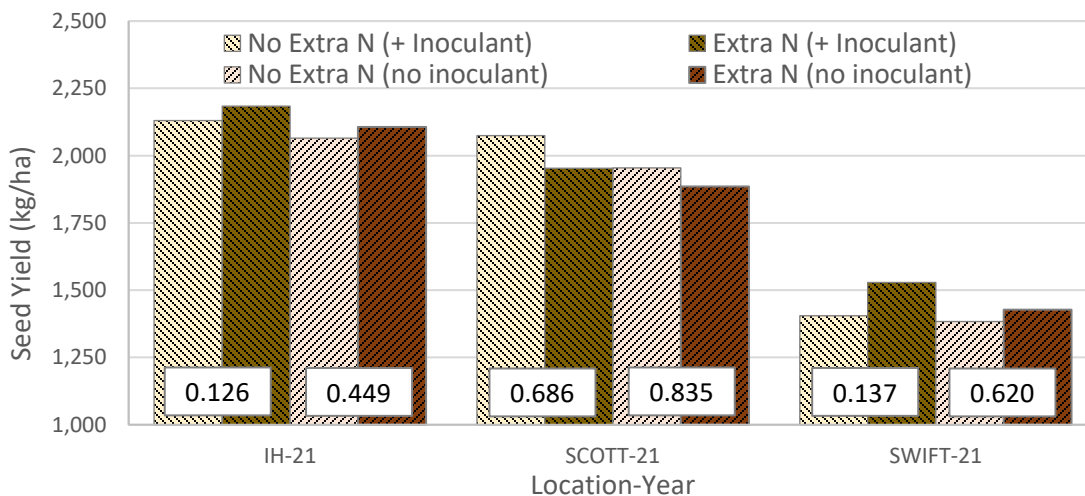


Figure 2. Group contrasts comparing extra nitrogen (N) fertilizer effects on lentil seed yield, with and without the addition of granular inoculant, at Indian Head, Scott, and Swift Current in 2021. P-values ≤ 0.05 are considered significant while P-values ≤ 0.10 may be considered marginally significant.

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