Effectiveness of Foliar Applications of Various Sulphate-S Fertilizers to Correct Sulphur Deficiency on Canola in the Growing Season

S. S. Malhi and D. Leach

Agriculture and Agri-Food Canada, P.O. Box 1240, Melfort, Saskatchewan, Canada S0E 1A0

BACKGROUND

- Canola is the major cash crop in Saskatchewan and most of it is grown in the Parkland region.
- Canola has high requirements for S and many soils in this area are deficient in S.
- S is immobile in plants.
- Deficiency of S at any stage can cause considerable reductions in seed yield.
- In order to prevent any seed yield loss due to S deficiency, a constant supply of available S to canola plants is needed throughout the growing season.
- On soils marginally deficient in S, the deficiency of S on canola can occur during the peak growing periods, depending on the levels of N and other fertilizers applied and high yielding canola cultivars.
- Higher rates of N fertilizer used to meet N requirements of high yielding canola cultivars can result in faster depletion of S from soil, and consequently increase the instances and severity of S deficiencies on canola, particularly during peak growing periods.
- Initial research at the Melfort Research Farm has indicated that S deficiency on canola during the growing season can be corrected and seed yields restored by foliar application of potassium sulphate (see seed yield results on average of six sites).
- Foliar application of potassium sulphate at 15 and 30 kg S/ha did not cause any leaf injury on canola.
- However, there are other sulphate-based-S fertilizers which may cost less per unit of S and also contain ammonium-N (e.g., ammonium sulphate, ammonium thiosulphate).
- Field research information is lacking on the effects of foliar-applied ammonium-based sulphate-S fertilizers on leaf damage, effectiveness to correct S deficiency and S-use efficiency for canola.

OBJECTIVE

- To compare the effects of various sulphate-S fertilizers in correcting S deficiency and on leaf damage of canola by foliar applications at late bolting.

MATERIALS AND METHODS

- Location: Archewill
- Soil: Gray Luvisol
- Mean Precipitation: 450 mm
• Growing Season: May to August
• Canola Cultivar: 45A71 (*B. napus*)
• Rates of S: 7.5 and 15 kg S/ha
• Spray Volumes: 100 and 200 L/ha
• Source of S:
  ➢ K₂SO₄ (potassium sulphate)
  ➢ ATS (ammonium thiosulphate)
  ➢ (NH₄)₂SO₄ (ammonium sulphate)
  ➢ K₂S₂O₃ (potassium thiosulphate)
• Other Fertilizers: Blanket Application of N, P and K Fertilizers
• Data Recorded: Seed Yield, Protein Content, Oil Content and Total S in Seed and Straw.

**SUMMARY AND CONCLUSION**

• Foliar application of S through K₂SO₄, ATS, (NH₄)₂SO₄ and K₂S₂O₃ at two S rates (7.5 and 15 kg S/ha), sprayed at late bolting using two spray volumes (100 and 200 L/ha), improved seed yield of canola.
• There was no leaf injury observed from any of the four sulphate-S fertilizers.
• The (NH₄)₂SO₄ was most effective to increase the seed yield.
• Increase of spray volume from 100 to 200 L/ha and S rate 7.5 to 15 kg/ha tended to enhance seed yield although the effect was not significant in most cases.
• The findings (based on one year and one site results) suggest that foliar application of these fertilizers can therefore be used to correct S deficiency occurring during the canola growing season without any leaf damage from any of the sulphate-S fertilizers used in this study.

**ACKNOWLEDGEMENTS**

• The authors would like to thank K. Fidyk, T. Donald, K. Hemstad-Falk and N. Evenson for technical help; and ENVIROTEST Laboratories Saskatoon for soil and plant analyses.
Relative effectiveness of sulphate-S fertilizer, along with 120 kg N/ha at seeding, applied at different growth stages on increase in seed yield of canola (average of six sites)

<table>
<thead>
<tr>
<th>Fertilizer</th>
<th>Seed yield (kg/ha) from sulphate-S rates at (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N + preseed incorporated</td>
<td>93</td>
</tr>
<tr>
<td>N + sidebanded S at</td>
<td>92</td>
</tr>
<tr>
<td>N + seedrow</td>
<td>94</td>
</tr>
<tr>
<td>N + topdress S at</td>
<td>68</td>
</tr>
<tr>
<td>N + foliar S at</td>
<td>77</td>
</tr>
<tr>
<td>N + topdress at</td>
<td>50</td>
</tr>
<tr>
<td>N + foliar at</td>
<td>64</td>
</tr>
</tbody>
</table>

Effectiveness of foliar S applications of various sulphate S fertilizers on seed yield increase of canola at Archerwill in 2000.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Seed yield increase (kg/ha) from</th>
<th>$\text{K}_2\text{SO}_3$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\text{S}_4\text{O}_6$</td>
<td>AT</td>
</tr>
<tr>
<td>7.5 kg S/ha (100)</td>
<td>148</td>
<td>137</td>
</tr>
<tr>
<td>7.5 kg S/ha (200)</td>
<td>106</td>
<td>137</td>
</tr>
<tr>
<td>15 kg S/ha (100)</td>
<td>61</td>
<td>268</td>
</tr>
<tr>
<td>15 kg S/ha (200)</td>
<td>104</td>
<td>284</td>
</tr>
</tbody>
</table>