
Effectiveness of Elemental S Fertilizers on Canola After Two Annual Applications

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 the Parkland zone, where many soils are deficient in plant-available S for high seed yields.
- Canola has high requirements for S. Deficiency of S at any growth stage can cause drastic reduction in seed yield.
- Plants feed only on sulphate-S ($\text{SO}_4\text{-S}$).
- Traditionally, S supplied in fertilizers was usually present in the sulphate form (which is readily available to plants).
- Now, there are a wide variety of commercial fertilizers that contain S in an unoxidized or elemental form.
- These elemental S fertilizers cost less per unit of S than the sulphate-S fertilizers, but the effectiveness of these fertilizers depends on how quickly the S is oxidized in soil for effective plant uptake.

OBJECTIVE

- To determine the relative effectiveness of elemental S and sulphate-S fertilizers on seed yield of canola.

MATERIALS AND METHODS

- Locations: Porcupine Plain and South Tisdale
- Soil: Gray Luvisol
- Mean Precipitation: 450 mm
- Growing Season: May to August
- Sulphur Sources:
 - ES-90 (Elemental S)
 - ES-95 (Elemental S)
 - Agrium Plus (Elemental S + Sulphate-S)
 - Ammonium Sulphate
- Rates of S: 10 and 20 (or 15) kg S/ha
- Times and Methods of Application: Fall (surface-broadcast in fall and incorporated into soil at seeding)
Spring (incorporated into soil at seeding)
- 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

1999:

- At both sites, canola showed severe S deficiency and seed yields increased substantially with ammonium sulphate (AS).
- Agrium Plus S fertilizer (containing both sulphate-S and elemental S) increased seed yields of canola considerably but were less than ammonium sulphate.
- With the elemental S fertilizers, there was little or no increase in seed yield of canola when applied in spring at seeding at both sites. But at one site, fall application of elemental S fertilizers increased canola seed yield moderately and was greater than spring application, but was still much less than ammonium sulphate.
- At one site, fall-applied AS was less effective in increasing canola seed yield than spring-applied AS. This indicates over-winter loss of sulphate-S from soil root zone.
- In conclusion, the elemental S fertilizers were not effective in correcting S deficiency on canola in the initial year of application.

2000:

- Elemental S fertilizers corrected S deficiency on canola and increased seed yields significantly over the zero-S control, but yields were still less than the sulphate-S fertilizers in most cases.
- Fall-applied elemental S had greater seed yield than the spring-applied elemental S at both sites.
- In conclusion, the results on seed yields of canola after two annual applications suggest that it would take more than two years for the elemental S fertilizers to be equally effective to sulphate-S fertilizers in increasing canola yields on S-deficient soils.

ACKNOWLEDGEMENTS

- The authors would like to thank Agrium, Sulfer Works and WESTCO for financial assistance; and C. Hutchison, T. Donald, K. Hemstad-Falk and N. Evenson for technical help; and ENVIROTEST Laboratories Saskatoon for soil and plant analyses.

Seed yield increase of canola from elemental S and sulphate-S fertilizers applied at 15 kg S/ha in spring or in previous fall at Porcupine Plain in 1999 (1.8 mg SO₄-S/kg in 0-15 cm soil).

Seed yield increase from applied S (kg/ha)				
Treatment	ES-90	ES-95	AgriumPlus	AS
Fall 15S	602	843	1643	1907
Spring 15S	6	12	1367	2087

Seed yield increase of canola with elemental S and sulphate-S fertilizers applied at 10 and 20 kg S/ha in spring or in previous fall at South Tisdale in 1999 (2.0 mg SO₄-S/kg in 0-15 cm soil).

Seed yield increase from applied S (kg/ha)				
Treatment	ES-90	ES-95	AgriumPlus	AS
Fall 10S	0	22	64	83
Spring 10S	0	0	54	346
Fall 20S	22	80	241	272
Spring 20S	0	0	473	828

Effectiveness of elemental S fertilizers in increasing seed yield of canola after two annual applications of 15 kg S/ha in spring or in previous fall at Porcupine Plain in 2000.

Treatment	Seed yield increase from applied S (kg/ha)			
	ES-90	ES-95	AgriumPlus	AS
Fall 15S	1405	865	1480	1612
Spring 15S	677	628	1578	1666

Effectiveness of elemental S fertilizers in increasing seed yield of canola after two annual applications of 10 and 20 kg S/ha in spring or in previous fall at South Tisdale in 2000.

Treatment	Seed yield increase from applied S (kg/ha)			
	ES-90	ES-95	AgriumPlus	AS
Fall 10S	286	233	542	667
Spring 10S	31	44	615	747
Fall 20S	572	612	885	728
Spring 20S	94	156	760	919
