Effectiveness of Elemental S Fertilizers on Wheat After Two Annual Applications

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BACKGROUND

- More than 4 million ha of agricultural soils are deficient in S and substantially greater areas are potentially deficient.
- There have been few studies comparing the relative effectiveness of elemental S versus sulphate-S fertilizers in increasing cereal crop yield in the Canadian Prairies.
- In those studies, the elemental S and sulphate-S fertilizers alone or in combinations were not applied continuously to the same plots over a number of years.
- Field research information is lacking on the time required for elemental S fertilizers to become equally effective as the sulphate-S fertilizers, and the number of years that combination of sulphate-S and elemental S fertilizers has to be used before switching completely to elemental S fertilizers without any risk of yield loss due to S deficiency in wheat on S-deficient soils.

OBJECTIVE

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

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:

- The sulphate-S containing fertlizers produced more wheat seed yield compared to elemental S containing fertilizers in most cases at both sites. The yield response to applied S was much less with wheat than canola grown adjacently at these sites.
- With the elemental S fertilizers, there was a tendency for higher seed yield of wheat with fall compared to spring applications in many cases, and there was little or no increase in seed yield when applied in spring at seeding at both sites.

2000:

- There was a marked increase in wheat seed yield from applied S and was much greater than in 1999.
- Elemental S fertilizers produced greater seed yield in many cases when applied in fall than applied in spring.
- Fall-applied elemental S fertilizers tended to produce yield increases similar to sulphate-S containing fertilizers after two annual applications, but spring-applied elemental S fertilizers at the South Tisdale site yielded much less than the sulphate-S fertilizers.
- When S fertilizers increased wheat seed yield, they also increased total S concentration and tended to decrease protein content in seed.
- In conclusion, the results suggest that it would take more than two years for the elemental S fertilizers to produce seed yields of wheat equal to those obtained with sulphate-S fertilizers, especially when applied in spring.

ACKNOWLEDGEMENTS

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

Seed yield increase of wheat 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 SO_4-S/kg in 0-15 cm soil).

	Seed yield increase from applied S (kg/ha)			
Treatment	**ES-90**	**ES-95**	**AgriumPlus**	**AS**
Fall 15S	**157**	**261**	**433**	**474**
Spring 15S	**0**	**0**	**445**	**383**

Seed yield increase of wheat 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 SO_4-S/kg in 0-15 cm soil).

	Seed yield increase from applied S (kg/ha)			
Treatment	**ES-90**	**ES-95**	**AgriumPlus**	**AS**
Fall 10S	**57**	**0**	**175**	**157**
Spring 10S	**0**	**0**	**167**	**262**
Fall 20S	**0**	**160**	**324**	**322**
Spring 20S	**54**	**0**	**285**	**1**

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

	Seed yield increase from applied S (kg/ha)			
Treatment	**ES-90**	**ES-95**	**AgriumPlus**	**AS**
Fall 15S	**942**	**705**	**568**	**831**
Spring 15S	**735**	**539**	**832**	**413**

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

	Seed yield increase from applied S (kg/ha)			
Treatment	**ES-90**	**ES-95**	**AgriumPlus**	**AS**
Fall 10S	**849**	**863**	**1069**	**994**
Spring 10S	**286**	**444**	**1215**	**1235**
Fall 20S	**1132**	**966**	**1147**	**1273**
Spring 20S	**431**	**811**	**1161**	**1157**