

Influence of formulation of elemental S fertilizer on yield, quality and S uptake of canola seed

S.S. Malhi^{1*}, E. D. Solberg² and M. Nyborg³

¹Agriculture and Agri-Food Canada, P.O. Box 1240, Melfort, Saskatchewan, Canada S0E 1A0
(Phone: 306-752-2776 Ext.230; Fax: 306-752-4911; E-mail: malhis@agr.gc.ca);

²Alberta Agriculture, Food and Rural Development, Edmonton, Alberta, Canada; and

³Department of Renewable Resources, University of Alberta, Edmonton, Alberta, Canada

Summary

Rate of S oxidation in elemental S fertilizers to plant available sulphate-S depends on factors that affect microbial activity such as soil moisture, temperature, aeration and size of fertilizer granules. Three field experiments were conducted on S-deficient Gray and Dark Gray Luvisol soils (Typic Cryoboralf) during 2000 and 2001 in Saskatchewan (Experiment 1 at Porcupine Plain, Experiment 3 at Canwood) and Alberta (Experiment 2 at Legal), Canada, to determine the effects of formulation of elemental S fertilizers on yield, oil, protein and S concentration, S uptake, percent recovery of applied S and N uptake in seed of canola (*Brassica napus* L. cv. A4573 at Porcupine Plain, and cv. Invigor 2663 at Legal and Canwood). In Experiments 1 (2000 and 2001) and 2 (2000), treatments included five elemental S fertilizers (granular ES-99, ES-95, ES-90 and Biosul-90; and Biosul-50 suspension), granular potassium sulphate and zero-S control. In Experiment 3, treatments included eight elemental S fertilizers (granular ES-99, ES-95, ES-90 and Biosul-90; powder Lab fine ES-99.5, ES Settle-47 and ES SPB571-85.8; and Biosul-50 suspension), 21.7 % elemental S plus 18.7% sulphate-S (Agrium Plus), blend of granular ES-90 and ammonium sulphate (1:1), granular ammonium sulphate and zero-S control. The S fertilizers were surface-broadcast or sprayed on surface at 15 and 30 kg S ha⁻¹ rates within 2-3 days after sowing in spring. Canola plants in the zero-S treatment showed S deficiency in the growing season, and seed yield increased with sulphate-S fertilizer by 21.8, 1.4, and 3.6 times in Experiment 1, 2, and 3, respectively. There was little effect of S fertilizer on protein concentration in seed. Biosul-50 suspension in all experiments and powder forms of elemental S fertilizers, used only in Experiment 3, were almost as effective as sulphate-S fertilizers. In all experiments, granular elemental S fertilizers had no or only very small effect on yield, S uptake, % recovery of applied S, N uptake, oil concentration, S concentration and protein concentration of canola seed in first year of application. In second year of Experiment 1, granular elemental S fertilizers tended to increase yield, S uptake, N uptake, oil concentration, and S concentration of canola seed, but none of them produced seed yield or improved other parameters of canola seed comparable to the sulphate-S and elemental S powder or suspension fertilizers. In summary, granular elemental S fertilizers were not effective in increasing canola seed yield and S uptake on S-deficient soils in the first year of application. After the second annual application, most granular elemental S fertilizers tended to correct deficiency of S in canola plants, but improvements in yield and other parameters of seed were still less than granular sulphate-S and suspension or powder forms of elemental S fertilizers.