RESTORE CANOLA YIELDS BY CORRECTING SULPHUR DEFICIENCY IN THE GROWING SEASON

S.S. Malhi and D. Leach

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

BACKGROUND

- **Canola is the principal cash crop in the Parkland zone, where many soils are deficient or potentially deficient in S.**
  Canola has high requirements for S.
- **High yielding cultivars of canola and increased use of N and P fertilizers result in faster depletion of S from soil.**
- **Consequently, this will increase instances of S deficiencies on canola during peak growth periods, flowering, fruiting and seed formation, and resulting in poor yield.**
- **S is immobile in plants. Therefore, a constant supply of S is required throughout the growing season.**
- **However, field research information is lacking on to what extent the S deficiencies on canola can be corrected, and canola yields restored to their normal levels by applying S fertilizer in the growing season.**

OBJECTIVE

- **To determine the extent to which canola yields on S-deficient soils can be restored by applying sulphate-S fertilizer at various growth stages in the growing season using different rates, times and methods of placement.**

MATERIALS AND METHODS

• **Locations:**	**Two sites in 1998 and Two Sites in 1999 in Northeastern Saskatchewan**
• **Soil:**	**Gray Luvisol**
• **Mean Precipitation:**	**About 450 mm**
• **Growing Season:**	**May to August**
• **Rates of S:**	**0, 15 and 30 kg S/ha**
• **Source of S:**	**Potassium Sulphate (0-0-50-17)**
• **Methods of S Application:**	**Topdress, Incorporation, Sideband, Seedrow and Foliar**
• **Times of S Application:**	**Seeding, Bolting and Flowering (10%)**
• **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 OF RESULTS

- **In all experiments, there was a marked seed yield increase from N + S fertilization. In the N alone treatment, there was a reduction in seed yield compared to no fertilizer treatment.**
- **At Porcupine Plain in 1998, increases in canola yield from S fertilizer were generally similar for various times and methods of S application.**
- **But in the other three experiments, topdressing increased seed yield less than foliar applied S at bolting and flowering. Yield increase was lower when S fertilizer was applied at flowering compared to that obtained at bolting or sowing. Applications of S fertilizer at sowing gave the greatest increase and topdress applications at flowering gave the lowest increase in seed yield.**
- **Application of S fertilizer also increased oil content in canola seed.**

CONCLUSIONS

- **Sulphur deficiency on canola can be corrected and seed yields restored with application of sulphate-S fertilizer in the growing season substantially until bolting stage and moderately as late as early flowering stage.**
- **Foliar application of S was more effective than topdressing in restoring seed yield in S-deficient canola if the S fertilizer had to be applied in the growing season.**
- **The findings also suggest that there is a need of adequate rainfall after topdress application to move the S fertilizer into the subsoil where roots can intercept it.**

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Table 1. Relative effectiveness of sulphate-S fertilizer applied at different growth stages on seed yield of canola at Porcupine Plain in 1998 (3.6 mg SO_4-S/kg in 0-15 cm soil).

Method of application and growth stage		Seed yield (kg/ha) with sulphate-S at rates (kg S/ha) 15	30
No fertilizer	192 kg/ha		
N alone at 120 kg N/ha	28 kg/ha		
N + pre-seed incorporated S		1059	1335
N + sidebanded S at seeding		1025	1340
N + seedrow S		1300	1188
N + topdress S at bolting		1084	1162
N + foliar S at bolting		1134	1205
N + topdress S at flowering		1062	1203
N + foliar S at flowering		1085	1168

Table 2. Relative effectiveness of sulphate-S fertilizer applied at different growth stages on seed yield of canola near Star City in 1998 (3.6 mg SO_4-S/kg in 0-15 cm soil).

Method of application and growth stage		Seed yield (kg/ha) with sulphate-S at rates (kg S/ha) 15	30
No fertilizer	355 kg/ha		
N alone at 120 kg N/ha	511 kg/ha		
N + pre-seed incorporated S		1059	1131
N + sidebanded S at seeding		868	1078
N + seedrow S		926	1069
N + topdress S at bolting		744	1068
N + foliar S at bolting		996	1022
N + topdress S at flowering		694	716
N + foliar S at flowering		867	821

Table 3. Relative effectiveness of sulphate-S fertilizer applied at different growth stages on seed yield of canola at Porcupine Plain in 1999 (2.2 mg SO_4-S/kg in 0-15 cm soil).

Method of application and growth stage		Seed yield (kg/ha) with sulphate-S at rates (kg S/ha) 15	30
No fertilizer	972 kg/ha		
N alone at 120 kg N/ha	10 kg/ha		
N + pre-seed incorporated S		1890	2217
N + sidebanded S at seeding		2198	2291
N + seedrow S		2023	2343
N + topdress S at bolting		1553	1840
N + foliar S at bolting		1693	1868
N + topdress S at flowering		1204	1391
N + foliar S at flowering		1415	1333

Table 4. Relative effectiveness of sulphate-S fertilizer applied at different growth stages on seed yield of canola at South of Tisdale in 1999 (2.0 mg SO_4-S/kg in 0-15 cm soil).

Method of application and growth stage		Seed yield (kg/ha) with sulphate-S at rates (kg S/ha) 15	30
No fertilizer	319 kg/ha		
N alone at 120 kg N/ha	140 kg/ha		
N + pre-seed incorporated S		1060	1227
N + sidebanded S at seeding		891	1090
N + seedrow S		960	1076
N + topdress S at bolting		665	670
N + foliar S at bolting		764	851
N + topdress S at flowering		377	496
N + foliar S at flowering		575	641

Table 5. Relative effectiveness of sulphate-S fertilizer applied at different growth stages on oil content of canola at Porcupine Plain in 1998 (3.6 mg SO_4-S/kg in 0-15 cm soil).

Method of application and growth stage		Oil content (%) with sulphate-S at rates (kg S/ha) 15	30
No fertilizer	34.8%		
N alone at 120 kg N/ha	33.0%		
N + pre-seed incorporated S		37.9	39.2
N + sidebanded S at seeding		37.8	39.3
N + seedrow S		38.6	39.3
N + topdress S at bolting		34.6	40.0
N + foliar S at bolting		37.6	40.6
N + topdress S at flowering		38.5	39.0
N + foliar S at flowering		38.9	39.9