Do We Need to Add More S Fertilizer at High N Rates for Optimum Canola Yield, Seed Quality, and Uptake of S and N?

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On marginally S-deficient soils in the Parkland region of western Canada, application of high rates of N and other fertilizers in combination with more frequent production of high yielding canola (*Brassica napus or rapa* L.) cultivars causes rapid depletion of S and nutrient imbalance in soil, and S deficiency and yield reduction in crops. Field experiments on Gray Luvisol (Boralfs) soils deficient in available N and S were conducted in north-eastern Saskatchewan, Canada. Interactive effects of N (0, 50 100 and 150 kg N ha^{-1}) and S (0, 10, 20 and 30 kg S ha^{-1}) rates on yield, seed quality, and uptake of S and N in canola were determined. In the absence of S application, increase in N rate made the S deficiency symptoms more severe, reduced yield, S concentration, oil concentration, S uptake and N uptake in seed, and generally tended to have no effect or some increase in yield, S uptake, and N uptake in straw up to 50 or 100 kg N ha^{-1} and reduced these at higher N rates. When S was applied, yield, S concentration, S uptake and N uptake in seed as well as the yield and S uptake in straw increased with increasing N rate, but maximum benefits were attained when S was applied at 20 kg S ha^{-1} and sometimes at 30 kg S ha^{-1}. Irrespective of S rate, fertilizer N had no consistent effect on total S concentration, but reduced oil concentration and increased protein concentration in canola seed. With S fertilization, yield, S uptake and N uptake in seed and straw, and total S concentration and oil concentration in seed were substantially increased, whereas there was no consistent variation in protein concentration in seed. Responses of these parameters to S application were generally greater at higher N rates. Sulphur and N uptake measured in both seed and straw indicated that significant N x S interaction effects were more frequent and pronounced for seed yield than for straw yield, indicating that response to N rate was relatively more dependent on the S level for seed than for straw. In summary, the results suggest that at high N rates an increased amount of S is needed to adequately meet the S requirements for optimum yield and quality of canola.