INFLUENCE OF SULPHUR FERTILIZATION ON SEED YIELD AND SEED QUALITY OF DOUBLE LOW OILSEED RAPE

W. BUDZYŃSKI, T. OJCZYK

Olsztyn University of Agriculture and Technology, Poland

ABSTRACT

The field experiments were carried out in 1990-93 in the non-industrial region of Poland. The sulphur fertilization was applied in doses of 20, 40 and 80 kg/ha on two stages: in the renewal of vegetation, and in the budding stage. A little (5%) but significant increase in the seed yield was observed when doses of 20 and 40 kg of sulphur had been applied in the budding stage. Sulphur fertilization had no impact on the oil and protein content of the seeds, however, it caused increase in the glucosinolate content by 5-10%. Response to sulphur of both Bolko and Ceres cultivar was the same.

INTRODUCTION

Sulphur fertilization under conditions of low intensity of the acidic precipitation positively influences the yield level, oil and sulphur aminoacid contents (Horodyski, Krzywińska 1979; Schnug, 1987; Wielebski, Wójtowicz 1993; Zhao et al., 1993. It can also decrease the level of oleinic acid, and increase glucosinolate content (Booth et al., 1991; Schnug, 1987, Schnug, Haneklaus, 1994; Zhao et al., 1993). Glucosinolates are a very important factor of the natural immunity (Kachlicki, 1990; Schnug, Haneklaus, 1994), however they diminish technological value of the raw material.

EXPERIMENTAL

Results of the field experiments (1990-93) come from the Experimental Station Bałcyny located in the non-industrial, North-East region of Poland. Three doses of sulphur - 20, 40 and 80 kg per ha (and control - 0 kg) were applied in two stages: renewal of vegetation in the spring (end of March) or in the budding stage (beginning of May). A Polish cultivar Bolko (low glucosinolate) and a German cultivar Ceres (medium glicosinolate) were used. Sulphur was supplied into the soil in the form of ammonium sulphate supplemented with urea to the N level of 170 kg/ha. Total sulphur content in the soil before the experiment was in the range of 110-130 mg/kg of soil. Prior to sowing 120 kg of P_2O_5 in the form of sulphur free superphosphate and 160 kg K_2O in the form of potassium chloride were applied.

Seed yield was measured at 13% of humidity. Seed samples obtained from each trial were tested for the oil content - electromagnetic resonance method, protein content - Kjeldahl method, glucosinolate content in the dry defatted meal (sum: progoitrin+gluconapin+ glucobrassicanapin) - by gas chromatography method.

RESULTS

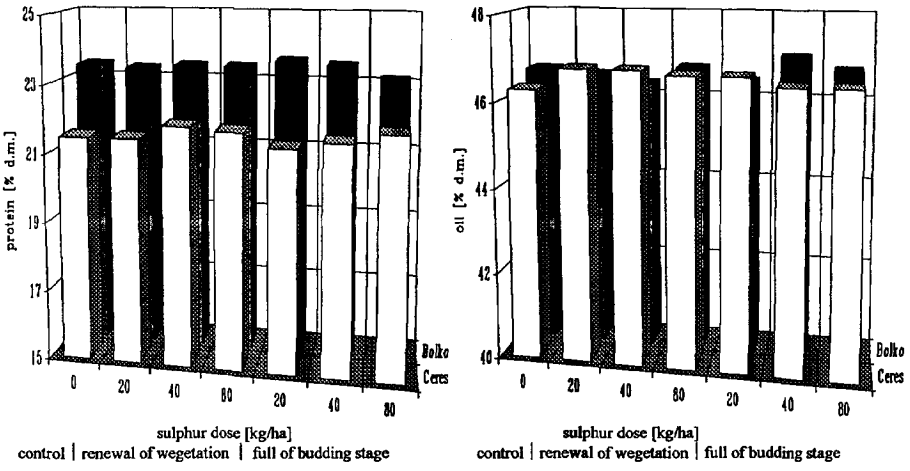
In the case of all trials where sulphur fertilization was used (in comparison to the control) a tendency to form bigger number of seeds in the siliquae was observed, and in the case of treatments, where 20 or 40 kg of S per ha was applied, also a tendency to increase the mass of 1000 seeds occured. This decided about small (5%) but significant increase in the seed yield from the plots where 20 or 40 kg of S was applied in later period of time. However, the significant interaction between fertilization method and variety has not been proved, the tendency towards higher yield was observed for cultivar Ceres.

TABLE 1. Influence of sulphur fertilization on the seed yield and its glucosinolate content

Cultivar	Application time and dose [kg/ha] of sulphur						
	control	renewal of wegetation			full of budding stage		
	no S	20	40	80	20	40	80
	seed yield (t/ha)						
Bolko	4.56	4.47	4.49	4.66	4.71	4.78	4.56
Ceres	4.93	5.02	5.27	5.08	5.26	5.17	5.05
means	4.75	4.74	4.88	4.87	4.98	4.98	4.81
LSD (α= 0.05) for application time and dose of S - 0.17; cultivar - 0.08							
	glucosinolate content (µmol/g)						
Bolko	11.9	12.6	12.9	12.7	12.4	12.8	13.2
Ceres	16.0	17.5	17.4	17.3	17.0	18.0	17.3
means	14.0	15.0	15.2	15.0	14.7	15.4	15.3

The applied doses of sulphur had no differentiating influence on the crude oil and total protein content in the seeds (Fig. 1). No difference has been found in crude oil content. However, the Bolko cultivar seeds contained more (for 1,7%) protein and less glucosinolates than Ceres cultivar seeds.

FIGURE 1. Influence of sulphur fertilization on the oil and protein content in oilseed rape seeds



Negative influence of sulphur on glucosinolate content was clearly observed. Doses of 20 and 40 kg S per ha increased glucosinolate content by as much as 5-10%. The tendency to that content increase especially for cultivar Ceres was seen. Increase in the dose up to 80 kg did not cause further increase in content of these compounds (table 1). No significant relationship between cultivar and sulphur fertilization has been found which proves the same response of both cultivars to the applied doses of sulphur.

REFERENCES

Booth, E.J., Walker, K.C. and Griffiths, D.W. (1991). A time-course study of the effect of sulphur on glucosinolates in oilseed rape (*Brassica napus*) from the vegetative stage to maturity. *Journal of the Science of Food and Agriculture*, 56, 479–493.

Horodyski, A., Krzywińska F. (1979). Wpływ nawożenia siarką na plon i jakość nasion rzepaku ozimego. Zeszyty Problemowe Postępów Nauk Rolniczych, 229, 101–109.

Kachlicki, P. (1990). Glukozynolany i inne związki niskocząsteczkowe specyficzne dla rodzaju *Brassica*. Występowanie, właściwości i rola w metaboliźmie rośliny. *Zeszyty Problemowe IHAR "Rośliny oleiste – Wyniki badań 1989"*, 1, 65–74

Schnug, E. (1987). Relations between sulphur supply and glucosinolate content of 0– and 00–oilseed rape. *Proc. 7th Intern. Rapeseed Congress*, 3, 682–686.

Schnug, E. Haneklaus, S. (1994). Regulation of glucosinolate biosynthesis in oilseed rape by nutritional factors. *Biulletin GCIRC*, 10, fev., 72–78.

Wielebski, F., Wójtowicz M. (1993). Wpływ wzrastających dawek siarki na plony nasion i zawartość glukozynolanów w nasionach dwóch odmian rzepaku podwójnie ulepszonego. *Postępy Nauk Rolniczych*, 6, 63–67.

Zhao, F.J., Evans, E.J., Bilsborrow, P.E. and Syers J.K. (1993). Influence of sulphur and nitrogen on seed yield and quality of low glucosinolate oilseed rape (*Brassica napus* L.). *Journal of the Science of Food and Agriculture*, 63, 29–37.