

Investigations in effects on nitrogen content of oilseed rape crops

Introduction

Nitrogen (N) content in crops declines during the growing period. For diagnostic means, it was suggested to use the concept of critical N content ($\%N_{crit}$) to distinguish between poor and optimum nutrition. Parameters potentially influencing the decrease of plant N content over time are the crop dry matter (DM) itself, the soil mineral N content and – poorly investigated with regard to winter oilseed rape (OSR) - the number of plants per m^2 .

The aim of the presented study was to quantify the influence of the mentioned factors on nitrogen content as a base for a further dynamic quantification of N demand and of N fertilization of OSR.

Materials and Methods

Plant samples from plots of a multi-factorial trial were taken on seven dates during the growing seasons 1996/97 and 1998/99 (sampling area 0.5 m^2). Dry weight as well as N content were determined. The total number of 72 plots resulted from two tillage treatments (conventional and conservation tillage), four different slurry treatments (without slurry, application of slurry in autumn, in spring, in autumn plus in spring; 80 $kg\ N\ ha^{-1}$ per application), and nine different mineral nitrogen fertilization treatments (0 - 240 $kg\ N\ ha^{-1}$).

Critical N contents were described using functions of the form $N_{crit} = f(\ln(Tsum))$ or $N_{crit} = f(\ln(\text{shoot DM}))$. Deviations from this reference N contents were also plotted against soil mineral nitrogen content and described using a linear response-plateau model.

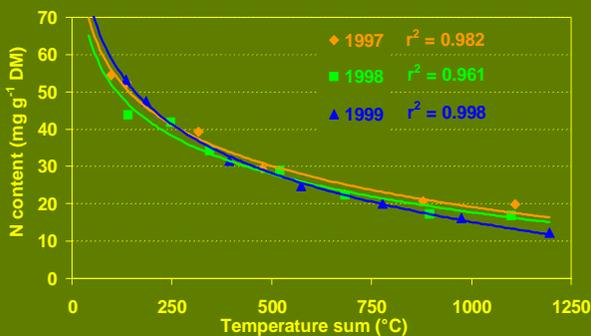


Fig. 1: N content (NC) of OSR shoots for N fertilization $>160\ kg\ N\ ha^{-1}$ as a function of the temperature sum (Tsum) since January 1st. ($NC = -16.699 \ln(Tsum) + 132.47$; $r^2 = 0.9703$)

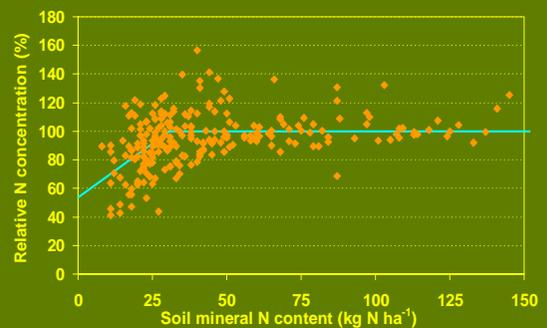


Fig. 2: Relative shoot N content of OSR plants (actual N concentration/N concentration dilution curve *100) as a function of soil mineral N content

Results and Conclusion

Shoot N content of OSR declined under conditions of high N supply (N fertilization $>160\ kg\ N\ ha^{-1}$) from about 50 $mg\ N\ g^{-1}\ DM$ at the first sampling stages to about 20 $mg\ N\ g^{-1}\ DM$ at the end of the growing period (Fig. 1). There were no significant differences between the years.

The relation of the N concentration of OSR shoot for all nitrogen fertilization treatments to the nitrogen percentages of the reference curve plotted against the soil mineral N contents (Fig. 2) indicates that N contents of OSR shoots are independent of soil mineral N contents for values $>$ approx. 30 $kg\ N\ ha^{-1}$ (0-30 cm soil depth).