

THE EFFECT OF FORECROP ON THE SOIL MINERAL NITROGEN CONTENT AND FERTILIZER RATES FOR A RAPE.

V. VANĚK, J. BALÍK, P. TLUSTOŠ, D. PAVLÍKOVÁ

Czech Agricultural University in Prague, 165 21 Prague 6 - Suchbát, CZECH REPUBLIC

ABSTRACT

The results from 100 locations in 1993 and 167 in 1994 has shown strong effect of climate condition on N content and N uptake by rape plants. Higher N uptake about 24 % soil mineral N about 33 % was found at manured rape treatments, compared to nonmanured fields. Clover as forecrop raised about 56 % soil mineral N than was determined at manured fields. That N potential has not been released due to low soil moisture and worse preplant conditions of after the harvest of clover.

INTRODUCTION

Nitrogen inputs into the soils were higher about 35-40 kg N per ha of agriculture land than N plant uptake in the 1971 - 1990 (Vostal 1990). Since 1991, the nitrogen input has been lower about 20-25 kg N per ha than N plant uptake in consequence of agriculture transformation in our country. The dramatic changes in N consumption effect the content of mobile N forms in arable soils. Chochola (1994) showed the fall of soil nitrate concentration about 87 % and organic N (EUF fraction) about 112 % at sugar beet fields in 1994 as compared to 1990. The effect of that changes on the nitrogen nutrition of winter rape was investigated in our study.

EXPERIMENTAL

At the end of the autumn period (25. 11. - 5.12.) the plant N concentration, yield of biomass, and soil mineral N content was analyzed at chosen winter rape fields over the whole Czech Republic. Almost 100 locations with the acreage of 1800 ha were investigated in 1993, and 167 locations with the acreage of 2500 ha in 1994. The most common forecrop of winter rape was a winter barley, the 64 % in 1993 and 58 % in 1994 of total rape acreage. The importance of winter wheat as forecrop is growing up from 17 to 18 %. Other cereals were planted as a rape forecrop on 12 % in 1993 and 16 % in 1994, clover on 7 and 5 % of fields and pea on 3 % only in 1994. The manure was applied for the rape on the 53 % in 1993 of the rape fields and on 42 % in 1994, for rape forecrop on the 70 % of acreage in 1993 and on 60 % in 1994. The manure rate was 40-60 Mg per ha.

Comprehensive results of 1993 and 1994 are summarised in table 1. Both years were differed in climate condition. In 1993, the September and August were dry. Emergence of rape was slower and late. The sowing time was delayed about 3-5 days against recommended schedule. In 1994, the rape was sowed earlier, and soil moisture was higher. Both factors effected positive autumn growth of rape. The biomass yield in autumn of 1994 was about 60-65 % higher than optimum 18-21 g of ten plants (Fábry et

al. 1992). The average N rape content of dry matter was lower than recommended 4.2 % in both experimental years. Especially the average content 3.59 % of N showed the nitrogen deficiency at many fields in 1994. In a few cases was lower than 3 % of N. High plant growth caused high nitrogen uptake by plants. Average uptake was 72 kg N per ha and in many cases was even higher than 100 kg.

TABLE 1. Mean results of 1993 and 1994 experiments

	1993		1994	
	x	V(%)	x	V(%)
weight of 10 plants	15.6	55.6	33.4	42.9
plant N content (%)	4.13	14.9	3.59	18.1
N uptake by rape (kg N.ha ⁻¹)	39.0	52.0	72.0	45.5
soil mineral N in layer 0 - 30 cm (kg N.ha ⁻¹)	40.0	91.5	26.0	80.0

Soil samples were taken from depths to 30 and to 60 cm, extracted by 1 mol.l⁻¹ KCl and determined on the SKALAR flow segment analyzer. High N rape uptake caused important drop in soil mineral N content in 1994 (Figure 1). The average amount was only 51 kg N per ha in the layer 0-60 cm.

The effects of forecrop and manure application are shown in figure 2. The treatments are compared with the manured rape treatment (100 %). The trend of higher N uptake and N content was found in the treatments of manured winter rape. The fall of N plant content about 17 %, plant yield about 8 %, and N uptake about 24 % has been caused by insufficient N supply in treatment without manure. That results are supported about 33 % lower soil mineral N content in this treatment compared to manured treatment. The significant effect of forecrop was found only for clover. The concentration of soil mineral N was about 56 % higher in that treatment than in manured fields. That high N potential has not been released by plants due to lower soil moisture and worse preplanted treatment of soil after the harvest of clover. Growth of rape is slower and worse on that fields above all in the first part of vegetation. The weight of biomass was lower about 25 % and the N uptake by rape was only 70 kg N per ha in the treatment planting after clover.

The results of the autumn experiments allow us to make modification of recommendation for the nitrogen application in the spring of 1995:

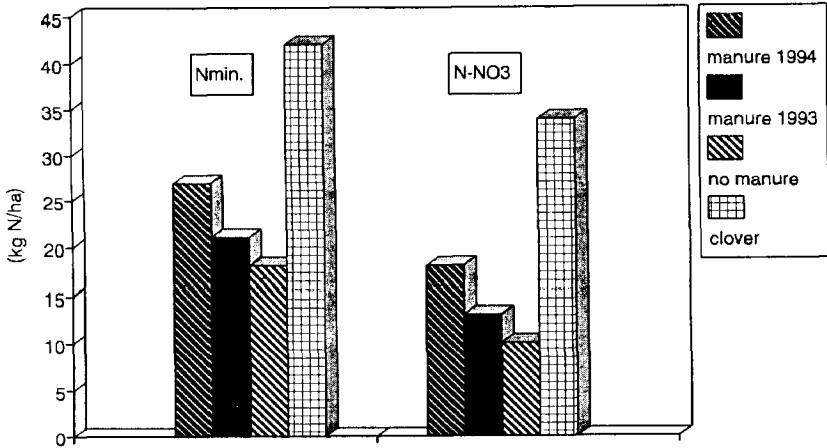
- 1) Early nitrogen application.
- 2) Fields manured for rape forecrop - raising rate about 10-15 kg N per ha.
- 3) Nonmanured fields - raising rate about 20-30 kg N per ha.
- 4) Rape after clover - reducing rate about 20-30 kg N per ha.

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Concentration of mineral N in soil 0 - 30 cm

Figure 1



Relative N content and N uptake by rape 100 % = manure in 1994

Figure 2

