

RAPE NUTRITION THROUGH LEAF SYSTEM

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Additional plant nutrition through leaf system becomes more and more important in rational technology of mineral plant fertilizing. It enables the supplementation in mineral elements, particularly microelements, during plant vegetation.

The results of studies have indicated that winter rape has heavy nutrient requirements for mineral elements in the period from April to June /Szukalski and Sikora, 1981/. In that period the uptake of mineral elements from the soil through roots /e.g. in drough periods particularly on lighter soils/ cannot be sufficient and lags behind the intensive rape development /Sikora, 1985/.

The problem of foliar feeding has recently been often discussed in the scientific papers as well as in popular ones /Beringer and Koch 1985, Stoltenberg 1985, Szukalski and Szukalska-Gołab, 1985/.

During the last years chemical protection of rape has been widely used. The possibilities of foliar feeding of rape with liquid fertilizers were created by equipping agriculture with high-efficiency sprayers and, on larger plantations, airplanes.

On the basis of many years' studies a suitable liquid

fertilizer containing macro- and microelements has been worked out and prepared for the additional foliar nutrition of improved rape varieties.

In 1985, the first Polish, multiple liquid fertilizer with microelements for spraying of rape plants called Florogama-R, was put into practice. The composition of that liquid fertilizer is shown in table 1.

Table 1

Composition of Florogama-R liquid fertilizer
for foliar feeding of rape

Element	Content %
Nitrogen /N/	10,0 ^{x/}
Magnesium /Mg/	2,0
Sulphur /S/	1,0
Sodium /Na/	1,0
Boron /B/	0,8
Copper /Cu/	0,5
Zinc /Zn/	0,3
Manganese /Mn/	0,25
Molybdenum /Mo/	0,01

x/ 8 % N as urea

That liquid fertilizer contains 9 elements: 4 macroelements and 5 microelements. The composition was adapted to the rape requirements. Florogama-R is applied in the dose of 5-10 l per hectare, and ought to be diluted in 100 or more liters of water.

It is worth stressing that as far as macroelements are concerned, the fertilizer contains besides nitrogen magnesium, sulphur and sodium as well, for which the

rape shows relatively high requirements. In our previous paper intended for the current Congress /Szukalski, Sikora and Szukalska-Gołąb, 1987/ we paid an attention to the high requirements of improved winter rape varieties not only for the three basic elements: nitrogen, phosphorus and potassium, but also for sulphur, magnesium, and sodium.

Foliar nutrition, as one of the methods of supplying plant with nutrients, has a particular meaning in the case of microelements. From the balance of mineral elements of rape it results that unlike macroelements, the requirements of rape for microelements can be largely covered by spraying plants with solutions containing microelements.

Table 2

Doses of elements introduced
with 10 liters of Florogama-R solution per 1 ha^{x/}

Element		Dose g/ha
Nitrogen	/N/	1000
Magnesium	/Mg/	200
Sulphur	/S/	100
Sodium	/Na/	100
Boron	/B/	80
Copper	/Cu/	50
Zinc	/Zn/	30
Manganese	/Mn/	25
Molybdenum	/Mo/	1

x/ 10 liters Florogama-R must be diluted in 100 or more liters of water for spraying the rape plantation

While comparing balance of rape requirements in respect of microelements /Szukalski, Sikora and Szukalska-Gołąb,

1987/ to their doses introduced with 10 l of Florogama-R /table 2/ it ought to be pointed out that in the case of basic microelements such as boron and copper, the rape requirements are covered at an average of 50 %.

Characterizing foliar additional nutrition of plants, first of all the potentiality of obtaining a very high degree of microelement utilization by plants should be paid an attention to. The studies show that in soil application of microelements the latter are subject to "lock-up" reactions with others soil substances - mainly manganese, copper and zinc as well as leaching - boron, especially on lighter soils. This kind of soil losses cannot occur in the case of foliar feeding. Doses of microelements when foliar spraying is applied can be 20-50 times smaller than when they are applied into soil, thus effecting in yield increase and improved yield quality /Szukalski, 1979, Szukalski and Sikora, 1985/.

Florogama-R liquid fertilizer can be mixed with agrochemicals, especially insecticides such as against pollen beetle /*Meligethes aeneus*/ and ceutorrhynchid beetles /*Ceutorrhynchus*/, which enables combining of the two operations: fertilizer and agrochemical applications and thereby reducing of application costs. The relevant studies are in progress.

The results we have obtained hitherto indicate that the additional rape nutrition through leaf system causes a better plant development, more abundant flowering and setting of seed-pods, which in consequence increases seed yield at an average of 10 %.

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