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THE INFLUENCE OF CHEMICAL FERTILIZERES OVER THE CONENT AND PRODUCTION OF RAPESEED OIL UNDER MURES COUNTY CONDITIONS

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Abstract

Lately, the experts are paying a higher attention to the agricultural plants, whose seeds are characterized by a high fat content, this mainly having as a purpose to respect the obligations that our country has through EU Directive 2003/30/EG. Thus in Mures County have been experimented on different spring rape crops, fertilized with different doses of chemical fertilizers, aiming at their influence on seed oil content and hence oil production per unit area. Research has revealed that the cultivated varieties of rapeseed (Heros, Bolero, Amica) had an oil content of between 46.1%(N60P0K0) and 48.4%(N90P90K90) and organic production of oil is influenced more than seed production, averaged over the three years of research, being the highest(815.3 kg), fertilization with N90P90K90(54.7% increase).

Keywords: rape, oil content, organic production of oil economical efficiency.

1. Introduction

Romania has taken on the responsibility of gradually introducing biofuel in fuel since the beginning of 2007, when diesel fuel that was sold at the pomp should have contained 2% biodiesel. Later on at the beginning of 2008 the percentage was raised to 3%, and then stating the 1st of July 2009 this percentage was raised to 4%, and now this percentage is 5.7%. Things won't stop here, because U.E. has as an objective that until 2010, 10% of fuel used in transportation will come from redeemable sources.

For this porpoise different possibilities are searched to improve and enlarge the quantity as well as the quality of seed production in different crops, especially the oily ones.

One of these plants is rape (*Brassica napus L. ssp. Deifera*), a plant that has its origins in the Mediterranean basin, being largely used ever since the Middle Ages of Central and Nordic Europe, because of the oil that is obtained from the seeds that can be used as well as for illumination as for nourishment.

In present days the oil content is expressed in percentages from its total seed weight, for dried substance or to a standard humidity, this being determined through the non destructive method (RMN) or the Soxhlet method.

The oil content varies a lot, depending on the genotype and on the environment factors and the technology used on the crops.

The most important part is the water supply of the plants, but also the fertilization of the crops and the growth regulators (3, 4).

It is known the fact that in the southern regions, more dry, the oil percentage is lower than in the wetter regions.

Nitrate fertilizers decrease the oil content, phosphate and potassium fertilizers determine the growth of the content. These sorts of results are normal, if we consider the physiological role of each element: the nitrogen is linked with the formation of protein substances, and the phosphate and potassium with the formation of fosfoglucides.

A series of growth regulators that were applied to the seeds were tested, on the soil or on young plants (in different climates), under the aspect of recently risen plants, and also on the formation of the production components, the content of different fat acids and even of the behavior of the seeds during the time they were kept, and some of them, in certain concentrations have shown activity in all directions.

The content of oil decreases proportionally with the nutrition space of the plants, because the accumulation in the soil of a high dose of nitrogen, as a result of the intensification of the process of nitrification.

The content of oil in rape seeds surpasses 50% of the dry substance especially in the new hybrids. In 16 free of erucic acid species (type "0") in cultures compared to ICCPT – Fundulea, the oil content oscillated between 43.8% and 47.2%, and in 13 free of erupic acid and glucozinolate species (Type "00"), between 43.3% and 48.3% (2).

2. Experimental procedure

To observe at what extent the fertilization with chemical fertilizers influences the content of

oil of the rape seeds and to establish the economical efficiency of rape under pedoclimatic conditions of Mures County, during the period of 2005 – 2007, several species of spring rape were tested, that were planted at different densities and that were administered different chemical fertilizers doses. Thus the following fertilizing options were taken into consideration for farther studies:

V1 - Mt – N0P0K0
V2 - N0P0K0
V3 - N0P0K0
V4 - N0P0K0

As research material the following species were used: Bolero, Heros and Amica (spring species fig. 2.1.). The 4 agro founds were observed in 3 cycles, one parcel of land being of 10 square meters.

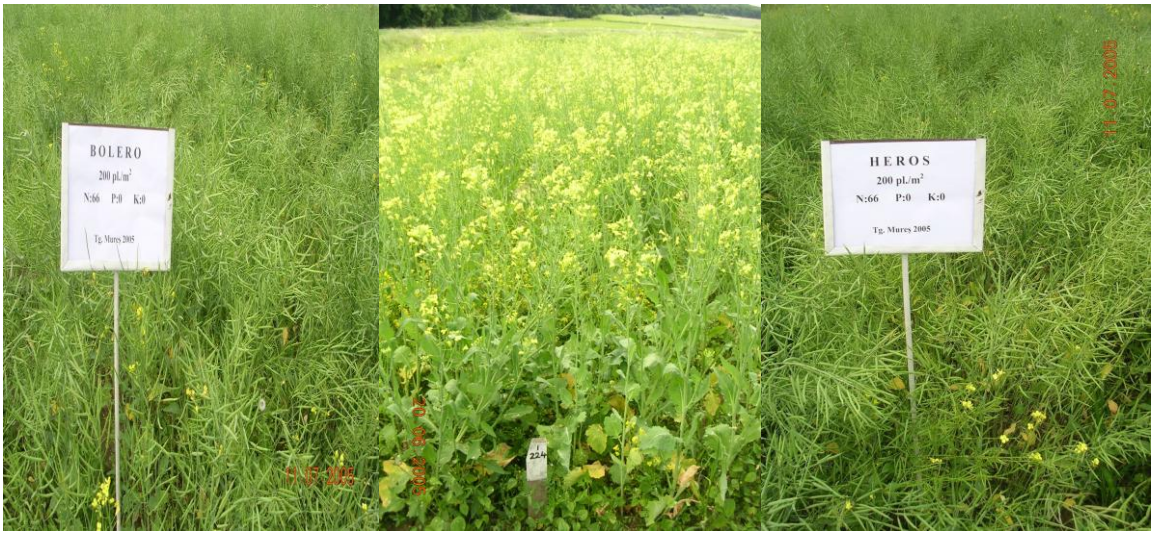
3 different densities were used for each seeding: 100b. g/m^2, 200b g/m^2, 3000b, g/m^2.

The experiment was done following the "Subdivided parcels for polifactorial experiment" method.

The factors that were observed were: A factor – species with 3 graduations, B factor - the density with 3 graduations and C factor – fertilizers with 4 graduations (fertilizer doses).

The analyses of the temperatures and rainfall in the years during which the experiment took place, in comparison with the multiannual average, shows that the agricultural years of 2005 and 2006 were more favorable for rape crops, than the years of 2006 – 2007 because of the pore rainfall. The type of soil on which the experiments were conducted was Luvosoil stagnogleizat.

a) Field of rape



b)Bolero *c)Amica* *d)Heros*

Fig. 2.1. *Spring species.*

In the laboratory was established the content of the oil of the seeds, through the Soxhlet method and through the nuclear magnetic resonance method, determined at the Newport analyzer instrument.

Fig. 2.2. *Soxhlet device*

The samples had a weight of 5 and 7 grams of seed. The results were expressed in percentages. The estimates regarding the economic efficiency were done by establishing the total expenses on hectare, the net profit and the rate of the profit.

The profit (Pr) was calculated by deducting the total income, the expenses of production and the tax on profit.

The rate of the profit was calculated with the help of the following formula:

Rp = Pr x100/Cht were: Rp – profit rate, Pr – profit and Cht – total production expenses.

The profit rate is a relative indicator that expresses the level of profit that was made with each 100 lei that were spent on production.

3. Results and discussions

If we analyze the oil content of the researched seed species we can observe that the factors that were used had a direct influence over the content.

Table 3.1

The content of spring rape seed oil under the influence of fertilization. 2005 – 2007 average

Specification	Years			Average 2005-2007	% towards the Mt	The differences	Signification
	2005	2006	2007				
The influence of the fertilization over the oil content							
$N_0P_0K_0$	47,8	49,4	47,2	48,0	100,00	Mt	
$N_{60}P_0K_0$	46,1^{ooo}	47,4^{ooo}	44,7	46,10	96,04	-1,9	000
$N_{60}P_{60}K_0$	46,8^{ooo}	48,2^{ooo}	46,0	46,90	97,70	-1,1	000
$N_{90}P_{90}K_{90}$	47,9	49,7^{ooo}	47,2	48,40	100,83	0,40	*
Dl 5%	**0,20**	**0,20**	**0,10**			**0,30**	
DL 1%	**0,25**	**0,25**	**0,20**			**0,50**	
DL 0,1%	**0,30**	**0,30**	**0,30**			**0,60**	

The content of seed oil in table 3.1 was influenced by the researched factors and the climate conditions during the researched years.

From the 3 years of experiments, the highest oil content was achieved in 2006, and the lowest in 2007, a year with high temperatures and low on rainfall.

The influence of fertilization was manifested in the way that, in the not fertilized form the oil that was obtained was of 48%, the content of oil decreases when it is fertilized with N60P60K0 and grows back up surpassing the unfertilized specimen with 0.40% when N90P90K90 is applied. The phosphor and potassium have diminished the nitrogen's action and have determined the growth of the oil content, the difference being significant.

The oil production on surface unit is mostly influenced by the seed production, and then by the seed oil content.

Table 3.2

The influence of fertilization over the oil production. 2005 – 2007 average

Specification	Oil production kg/ha	% towards the Mt	Difference kg/ha	Signification
The influence of fertilization				
$N_0P_0K_0$	527,0	100,0	Mt	
$N_{60}P_0K_0$	638,6	121,2	111,6	***
$N_{60}P_{60}K_0$	696,5	132,2	169,5	***
$N_{90}P_{90}K_{90}$	815,3	154,7	288,3	***
Dl 5%	**43,8 kg/ha**			
DL 1%	**58,4 kg/ha**			
DL 0,1%	**76,1 kg/ha**			

The influence of fertilization was more significant because of the bigger seed production obtained through fertilization. The biggest oil production was obtained in the variant that was fertilized with N90P90K90, of 815.3 kg/ha. The difference of 288.3 kg of oil/ha is very significant. On the second plan was the variant that was fertilized with N60P60, with a very significant growth of 169.5 kg/ha (table 3.2)

It was necessary for the economical efficiency of this crop to be established because it was needed to be known if in Mures County this kind of crop is profitable and at what doses of fertilization.

It was shown that, the fertilization with N60P0K0 has determined the highest rate of profit, of 26.77%, followed by the N90P90K90 with 18.93%, and the N60P60K0 with 16.70%. The variant N0P0K0 had a rate of ratability of 8.2% (table 3.3)

Table 3.3

The economical efficiency of spring rape. 2005 – 2007 average

Specification	Average production kg/ha	Total income lei/ha	Total income lei/ha	Production cots lei/kg	Gross profit lei/ha	The rate of profit %
Economic efficiency of fertilization						
$N_0P_0K_0$	1068	1410	1302	1,219	108	8,29
$N_{60}P_0K_0$	1392	1837	1449	1,040	388	26,77
$N_{60}P_{60}K_0$	1508	1991	1706	1,131	285	16,70
$N_{90}P_{90}K_{90}$	1732	2286	1922	1,109	364	18,93

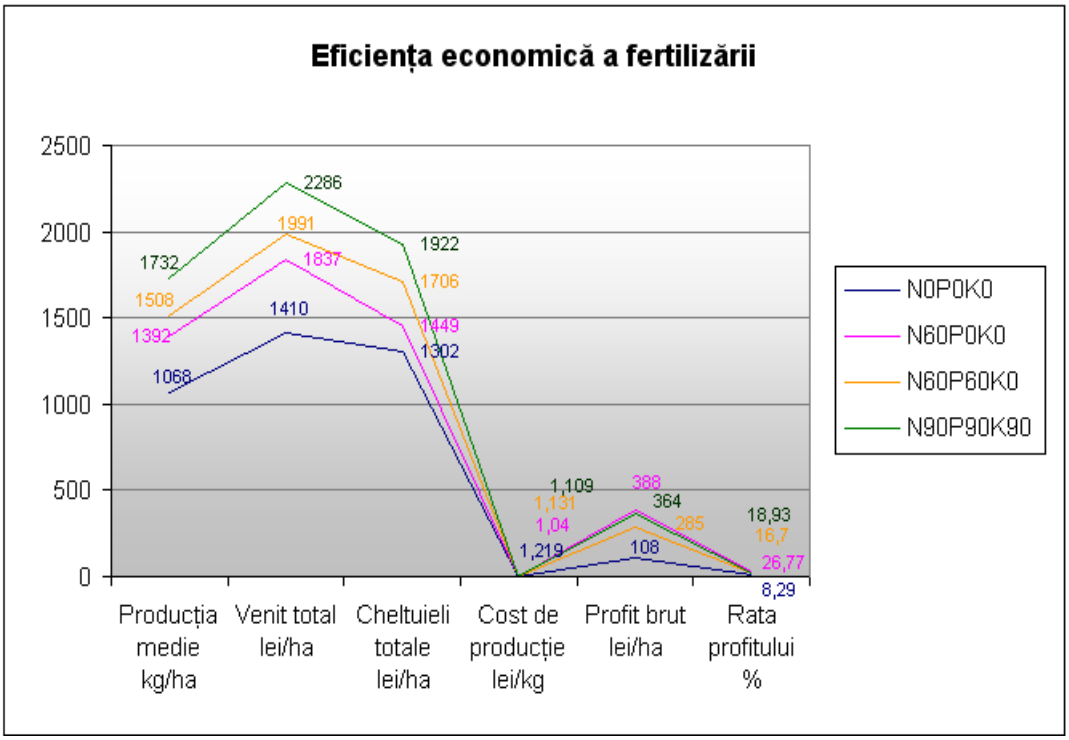


Fig. 3.1. *Economic efficiency of fertilization*

4. Conclusions

- During the last years the producers interest in rape crops has risen, but the research over its technology and most important over spring rape are not sufficient enough, and this justifies the experiments with different species of spring rape in Mures County
- The achievement of big productions of seed on surface unit, but be in concordance with a high quality, expressed through the high level of oil and a good density of oil.
- The fertilization has differenced more the content of the oil, depending on the fertilized variant, being influenced by the climatic conditions over the years. The variant fertilized with N90P90K0 stands out with 48.4 % oil, followed by the unfertilized variant with 48.0%; very important is the fact that the fertilized variant with N60P0K0 had a low oil content of 46.1%, a growth can be observed after the fertilization with N60P60K0
- The biological production of oil is largely influenced by the seed production, on average over the 3 years, the highest being on Heros soil, of 815.3 kg/ha, when it was fertilized with N90P90K90 (54.7 growth).

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