CONTRIBUTIONS TO THE DEVELOPMENT OF A LENTIL CULTIVATION TECHNOLOGY BETWEEN THE CARAS AND NERA RIVERS

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Abstract: *The goal of the present research was to expand lentil crops in the area between the rivers Caras and Nera, an area where they cultivate only beans and peas among legumes. The soil and climate conditions in the area are favourable to lentil cultivation provided the cultivation technology is proper. The paper presents data concerning the behaviour of some lentil cultivars and populations, in different conditions of fertilisation, as well as results concerning sowing technology. Research was carried out in South-Western Romania, at Oraviţa-Răcăşdia, in a moderate continental temperate climate, the sub-Banat type with Mediterranean influences, on a vertic, luvic, brown soil, moderately gleyeid, strongly decarbonated. The biological material we studied was the Oana lentil cultivar and the De Szeged, Voivodina and De Vinga lentil populations. Fertilisation was done with variable rates of nitrogen (**N_0, N_{20}, N_{40}, *and* N_{60}**) on a constant fund** $P_{40}K_{40}$**. We took into account different row distances and strip sowing (12.5 cm; 25 cm; 37.5 cm; 12.5/40 cm). The authors also present data concerning the impact of the studied factors on protein and protein content. Thus, protein content increased from 25.5% in the control variant (**$N_0P_{40}K_{40}$**) to 27.2% in the variant fertilised with** $N_{60}P_{40}K_{40}$**. Protein yield was favourably influenced by nitrogen fertilisation increasing compared to the variant** N_0 **up to 28% in the variant fertilised with** N_{60}**, on a constant agri-fund of** $P_{40}K_{40}$**. The paper is financially supported by the CNCSIS research project entitled „Developing lentil and chickpea cultivation technology in the soil and climate conditions of the Timiş-Caraş-Nera area".*

Keywords*: lentil, cultivation technology*

INTRODUCTION

Lentil is an important legume with broad uses in human food and in animal feed due to the content of over 25% protein in the seeds. World area cultivated with lentil is over 4,000,000 ha.

In our country, though lentil finds conditions of very good favourability, the area cultivated with lentil is only 1,000 ha.

The present research aimed at expanding this crop in an area where this valuable crop has never been cultivated.

MATERIAL AND METHODS

To point out the cultivar or the provenance most suitable to the area in which the research was carried out, we organised a bi-factorial experiment with the following graduations:

- factor A – the biological material used (Oana, De Szeged, Voivodina, and the population De Vinga);
- factor B – row distance (12.5 cm; 25.0 cm; 37.5 cm; and 12.5/40 cm).

Nitrogen fertilisation in lentil is an issue with contradictory results in literature. Our research has taken into account, on a constant agri-fund of phosphorus and potassium ($\mathbf{P_{40}K_{40}}$), variable rates of nitrogen ($\mathbf{N_0}$, $\mathbf{N_{20}}$, $\mathbf{N_{40}}$, $\mathbf{N_{60}}$).

At the time of harvesting, we sampled to point out the impact of fertilisation on weight features (mass of 1,000 grains and hectolitric mass) and on protein content and yield.

RESULTS AND DISCUSSION

Yield results depending on cultivar and row distance are shown in Table 1.

Table 1.

Yield results depending on cultivar and row distance

Factor A	Factor B – Row distance				Averages of the factor A			
	12.5	25	37.5	12.5/40	Harvest kg/ha	%	Difference kg/ha	Significance
Oana	1125	1306	1333	1295	1265	100	-	
De Szeged	1096	1204	1302	1278	1220	96	- 45	
De Voivodina	1212	1395	1449	1402	1364	108	99	X
De Vinga	1080	1208	1256	1108	1163	92	- 102	0

Dl 5.0% = 71 kg/ha
Dl 1.0% = 108 kg/ha
Dl 0.1% = 166 kg/ha

Averages of the factor B

Specification	12,5	25	37,5	12,5/40
Yield kg/ha	1128	1278	1335	1271
%	100	113	118	113
Difference kg/ha		150	207	143
Significance		x	xx	x

Dl 5.0% = 122.0, Dl 1.0% = 198.0, Dl 0.1 % = 289

Among cultivars, on the average for the four row distances we noted the provenance De Voivodina in which the yield was 8.0% higher than the yield in the cultivar Oana. The lowest yield was in the population de Vinga, 8.0% lower than the control cultivar. The population De Szeged yielded comparatively with the cultivar Oana, with a difference lacking significance.

Among row sowing distances, we noted the row distance 37.5 cm in which the yield was 18.0% higher than that obtained for a row distance of 12.5 cm. Results obtained in the variants sowed at row distances of 25 cm and of 12.5/40 cm were practically equal, 13.0% higher than the yield in the variant sowed at a row distance of 12.5 cm.

Table 2 presents results in the cultivar Oana fertilised with variable rates of nitrogen applied on an agri-fund of $\mathbf{P_{40}K_{40}}$.

Table 2.

Impact of variable rates of nitrogen fertilisers applied on a constant agri-fund of phosphorus and potassium

Variant	Yield kg/ha	%	Difference kg/ha	Significance
$N_0P_{40}K_{40}$	1075	100		
$N_{20}P_{40}K_{40}$	1115	104	210	
$N_{40}P_{40}K_{40}$	1303	121	228	xxx
$N_{60}P_{40}K_{40}$	1280	119	205	xx

Dl 5% = 103.0 kg/ha, Dl 1% = 161.0 kg/ha, Dl 0.1% = 219.0 kg/ha.

It is obvious that the highest yield was in the variant fertilised with $\mathbf{N_{40}}$, in which the increase in yield was 21.0%, with a very significant difference compared to the control of 228.0 kg/ha.

Increasing the nitrogen rate to $\mathbf{N_{60}}$ is not motivated, the increase in yield being lower than that in the variant fertilised with $\mathbf{N_{40}}$.

Figure 1 shows that the largest mass of 1,000 grains (61.20 g) was in the variant fertilised with $\mathbf{N_{40}}$, i.e. 0.9 g higher than that of the variant fertilised with $\mathbf{N_0}$.

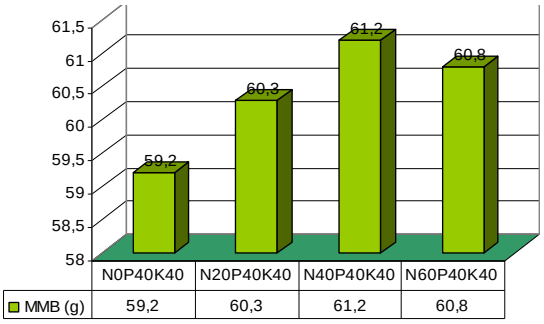

Figure 1. Variation of the mass of 1,000 grains (g) depending the fertilisation

Figure 2 presents the variation of the hectolitric mass which increased together with the nitrogen rate up to 79.9 g/hl compared to the control variant $\mathbf{N_0}$ in which hectolitric mass was 78.8 kg/hl.

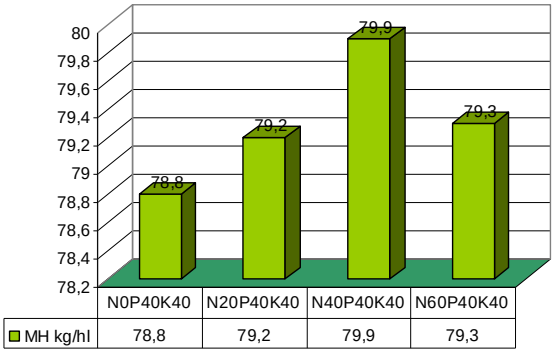

Figure 2. Variation of the hectolitric mass (hl) depending the fertilisation

Figure 3 presents the variation of the protein content on a constant agri-fund of $\mathbf{P_{40}K_{40}}$ in the cultivar Oana.

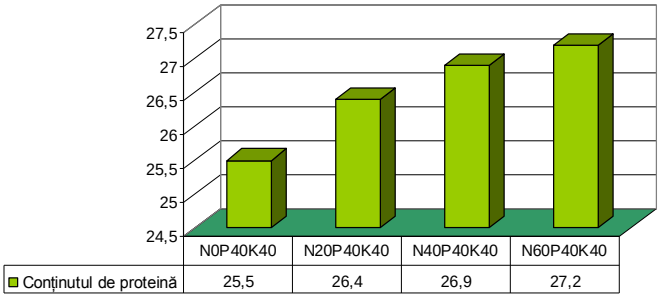

Figure 3. Variation of the protein content on a constant agri-fund of $\mathbf{P_{40}K_{40}}$ in the cultivar Oana

Therefore, in the studied area, protein content increased together with the nitrogen rate from 25.5% in the control variant up to 27.2% in the variant fertilised with $\mathbf{N_{60}}$. To note that between the variants fertilised with $\mathbf{N_{40}}$ and $\mathbf{N_{60}}$ the difference was only 0.3%.

Table 3 presents protein yield which varied, in the studied area, between 274.0 kg/ha and 351.0 kg/ha.

Table 3.

Protein yield depending on fertilization in the cultivar Oana

Variant	Protein yield	%	Difference	Significance
$N_0P_{40}K_{40}$	274	100		
$N_{20}P_{40}K_{40}$	296	107	20	x
$N_{40}P_{40}K_{40}$	351	128	77	xx
$N_{60}P_{40}K_{40}$	348	127	74	xx

Dl 5% = 15.0 kg/ha, Dl 1.0% = 46.0 kg/ha, Dl 0.1% = 92.0 kg/ha.

The highest protein yield was determined in the variant fertilised with $\mathbf{N_{40}}$. In the variant fertilised with $\mathbf{N_{60}}$ protein yield was sensibly equal to that of the variant fertilized with $\mathbf{N_{40}}$.

CONCLUSIONS

The cultivar Oana an average yield of 1,265 kg/ha, i.e. only 99 kg/ha lower than that of the Provenance de Voivodina.

The yield obtained in the Provenance de Szeged is sensibly equal to that obtained in the cultivar Oana, with no significance in the differences in yield.

Among row distances, we noted the variant sowed at 37.5 cm in which yield was 18.0% higher than the yield of the variant sowed at 12.5 cm.

Among the fertilisation variants tested, the best results were in the variant fertilised with $\mathbf{N_{40}P_{40}K_{40}}$ in which we obtained a very significant increase in yield of 2,281 kg/ha compared to the control variant $\mathbf{N_0P_{40}K_{40}}$. In this variant, we also obtained the largest mass of 1,000 grains (61.20 g) and the highest hectolitric mass (79/9 kg/hl).

In the studied area, protein content increased from 25.5% in the control variant ($\mathbf{N_0P_{40}K_{40}}$) to 27.2% in the variant fertilised with $\mathbf{N_{60}P_{40}K_{40}}$.

Protein yield was influenced favourably by nitrogen fertilisation, i.e. it increased compared to the variant $\mathbf{N_0}$ with up to 28.0% in the variant fertilised with $\mathbf{N_{60}}$ on a constant agri-fund of $\mathbf{P_{40}K_{40}}$.

Among pathogens of lentil, we identified *Colletrichum truncatum* and *Uromyces viciae-fabae*. The attack of these lentil pathogens was below 1.0% in *Colletrichum truncatum* which occurred mainly on the leaves and below 3.0% in the case of *Uromyces viciae-fabae*. Thus, we can say that both pathogens were below the economic damage threshold without influencing significantly the yielding capacity of the plants.

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