ISSN 1788-5345

RESPONSE OF SOME ROMANIAN AND FOREIGN LENTIL GENOTYPES TO DIFFERENTIATED FERTILISATION AND TO SOWING AT DIFFERENT ROW DISTANCES

SEBASTIAN MOLDOVAN, GHEORGHE DAVID

Banat's University of Agricultural Sciences and Veterinary Medicine,
Calea Aradului 119, Timişoara, Roumania
sebimoldovan1835@yahoo.com

ABSTRACT - Response of some Romanian and foreign lentil genotypes to differentiated fertilisation and to sowing at different row distances

The present research aimed at improving lentil cultivation technology, at contributing to the identification of new lentil cultivars fit for the reference area and at expanding lentil cultivation. As a major importance, lentil grains represent a source of energy and nutrients having in their composition many compounds bio-benefical for human body. Lentil grains have a high quality protein content and healthy carbohydrates (starch). Lentils also contain a lot of ballast material (fiber) which helps digestion. Lentil flour can be used in combination (10-20%) with wheat flour in bread-making. The following fertilisation rates are to be noted for their increasing yields: $N_{20}P_{60}K_{60}$ and $N_{40}P_{60}K_{60}$, which differentiated positively in both cultivation variants, i.e. at a row distance of 12,5 cm and 25 cm, respectively. The lowest yield was in the De USAMVBT lentil population, i.e. 932 kg/ha, sowed at a row distance of 12,5 cm, in the control variant $N_0P_{60}K_{60}$. Establish fertilization levels and row distances those genotypes, has great importance as biological materials have been created in climatic conditions different from those in the area who have done research and that the area is assuming to be grown. Research was carried out in the area of the locality Comorîşte (Caraş-Severin County); the experiments were organised on a typical clayish luvosol, on medium fine, moderately eroded argyle.

Key words: lentil genotypes, fertilisation rates, row distance.

INTRODUCTION

Ensuring the necessary protein at global level depends more and more on the contribution of protein rich crops. FAO's "International Dietary Energy Consultative Group" mentions a new "green revolution, that of legumes", while the main expectation in solving the protein deficit worldwide is grain legumes.

This is the main argument in expanding the area cultivated with grain legumes in Western Romania, where there is a long-lasting tradition in the cultivation of lentil.

A second argument is the value of these crops in terms of the content food high in essential amino acids, proteins from lentils, and very high digestibility.

Lentils are categorized as food-grade nutrition due to high content of fiber, iron, magnesium, phosphorus and protein and to very low fat content. Lentils do not contain cholesterol and bring about 110-160 kcal/100 g, depending on the cultivar (www.bioterapi.ro).

Currently lentils are used extensively on a global scale, the Asian and Mediterranean population preferred in various dishes, and is preferred by vegetarians.

The goal of the research was to emphasise the effect of fertilisation and row distance on yield and on quality indicators in the lentil cultivars 'Oana', cultivar of Spanish origin – 'Laura' and population De USAMVBT, aiming at expanding its cultivation and at obtaining economically efficient yields.

ISSN 1788-5345

In the research area, i.e. in the area of the locality Comorîşte (Caraş-Severin County), the soil of the experimental plot was a typical clayish luvosol, on medium fine, moderately eroded argyle.

MATERIAL AND METHOD

We organised a tri-factorial experiment after the sub-divided plot method with three replicates, in which *factor A* was the lentil cultivar, with three graduations: a_1 - the Oana lentil cultivar, a_2 – the Laura lentil cultivar and a_3 – the De USAMBVT lentil population; *factor B* – fertilisation mode, with three graduations: b_1 – $N_0P_{60}K_{60}$, b_2 – $N_{20}P_{60}K_{60}$, b_3 – $N_{40}P_{60}K_{60}$, and *factor C* row distance, with two graduations: c_1 – 12.5 cm and c_2 – 25 cm.
Winter wheat was the pre-emergent crop.
The lentil genotypes under study upon setting the experiment were: the 'Oana' lentil cultivar the 'Laura' lentil cultivar, and the De USAMVBT population.
It is worth mentioning that all lentil genotypes belong to the species *Lens culinaris microsperma*.
Sowing was done in the second decade of March, the row distances were 12.5 cm and 25 cm, with a density of 250-270 germinal seeds/m^2 and sowing depth was 4-5 cm.
During vegetation biometric measurements were made concerning plant height, the number of ramifications per plant, number of pods per plant, number of grains per pod.
Yield results were calculated at 13% moisture, according to the setting method of the experiments in the field, and biometric measurement results were interpreted through the analysis of the statistic set of variations.

RESULTS

A synthesis of the yield results is presented in Table 1. The yields of the experimental plot ranged between 932 kg/ha (the De USAMBVT lentil population – in the control variant $N_0P_{60}K_{60}$ and at a row distance of 12.5 cm) and 1.866 kg/ha (the Oana lentil cultivar – in the variant $N_{20}P_{60}K_{60}$ and at a row distance of 25 cm).
Nitrogen fertilisers applied at rates of N_{20} on a base of $P_{60}K_{60}$ increased the yield with 8%, i.e. 112 kg/ha, resulting in a distinctly significant difference in yield. Increasing the nitrogen rate to N_{40} is not motivated since the increase in yield (4%) is lower than in the variant fertilized with N_{20}, the difference of 59 kg/ha is meaningless.
Among the biological materials we tested, the best yields ranging between 1.573 and 1.866 kg/ha were in the Romanian lentil cultivar Oana (better adapted to higher temperatures and climatic condition in this area).
The lentil cultivar Laura – Spanish origin yielded a similar mass, i.e. an average yield of 1.528 kg/ha.
The lowest yield was in the lentil population De USAMBVT (932 kg/ha) in the control variant $N_0P_{60}K_{60}$ sowed at a row distance of 12.5 cm.
Increasing row distance from 12.5 cm to 25 cm is motivated, the average increase in yield in the three lentil cultivars reaching 12% with a very significant difference of over 159 kg/ha.

ISSN 1788-5345

Table 1: Crop results in the Comorîşte area (Caraş-Severin County, 2010)

A Factor Cultivar	B Factor Nitrogen rate	C Factor Row distance (kg/ha)		Average production (kg/ha)	%	Difference (kg/ha)	Significance
		12,5	25				
Oana	$N_0P_{60}K_{60}$	1573	1713	1643	100	-	
	$N_{20}P_{60}K_{60}$	1692	1866	1779	108	136	
	$N_{40}P_{60}K_{60}$	1593	1818	1706	103	59	
Laura	$N_0P_{60}K_{60}$	1375	1552	1464	89	- 179	0
	$N_{20}P_{60}K_{60}$	1479	1686	1583	96	- 60	
	$N_{40}P_{60}K_{60}$	1442	1630	1536	93	- 107	
De USAMVBT	$N_0P_{60}K_{60}$	932	1030	981	59	- 662	000
	$N_{20}P_{60}K_{60}$	1001	1125	1063	64	- 580	00
	$N_{40}P_{60}K_{60}$	977	1078	1028	62	- 615	000

Dl 5% = 144 kg/ha; Dl 1 % = 264 kg/ha; Dl 0,1% = 586 kg/ha.

B Factorial averages

Nitrogen rate	$N_0P_{60}K_{60}$	$N_{20}P_{60}K_{60}$	$N_{40}P_{60}K_{60}$
Average production (kg/ha)	1363	1475	1422
%	100	108	104
Difference (kg/ha)	-	112	59
Significance		xx	x

Dl 5% = 55 kg/ha ; Dl 1 % = 108 kg/ha ; Dl 0,1% = 306 kg/ha.

C Factorial averages

Row distance	12,5 cm	25 cm
Average production (kg/ha)	1340	1499
%	100	112
Difference (kg/ha)	-	159
Significance		xxx

Dl 5% = 31 kg/ha ; Dl 1 % = 58 kg/ha ; Dl 0,1% = 128 kg/ha

Figure 1: shows the variation of the 1,000 grain weights (g), depending on lentil cultivar, nitrogen rate, and row distance.

It is obvious that on all experimental plots the highest mass of 1,000 grains was in the lentil cultivar Oana, i.e. between 25.44 and 27.54 g.

It is worth to note that applying a rate of N_{20} contributed to the increase of 1,000 grain weight with 1-2 g in the biological experimental materials we used.

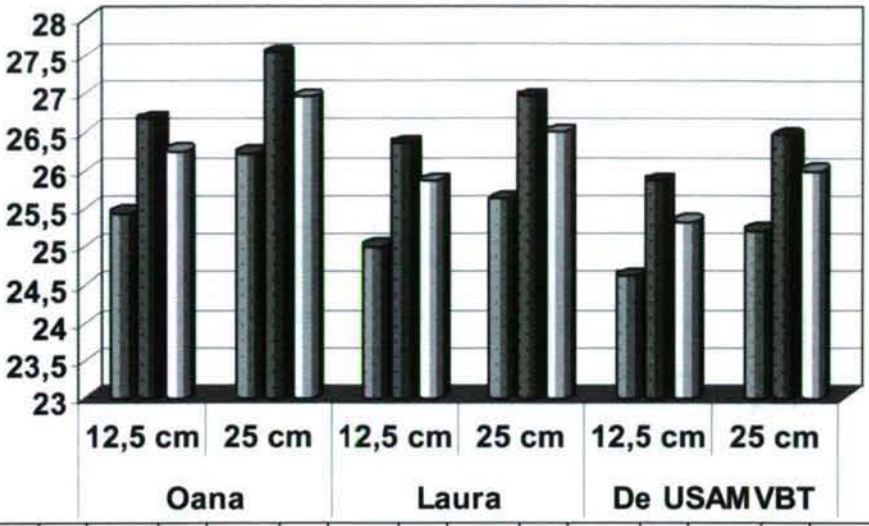
The lowest values were in all lentil genotypes in the control variant (N_0), a plot on which the plants filled their grains less than in the other two fertilisation rates.

Figure 2 shows the variation of the hectolitre mass kg/hl, depending on chickpea cultivar, nitrogen rate, and row distance. Determination of this weight feature of the seeds was done to see if it reflects the adjustment of a cultivar to an area given that high hectolitre mass reflects a better quality of the product, filled grains with compact structure rich in proteins. Measurements were made exclusively on pure seed.

Results differentiate the experimental variants between 55.6 kg/hl and 57.1 kg/hl. The lowest values were in the lentil population De USAMBVT, while the highest ones were in the lentil cultivar Oana followed by the lentil cultivar Laura.

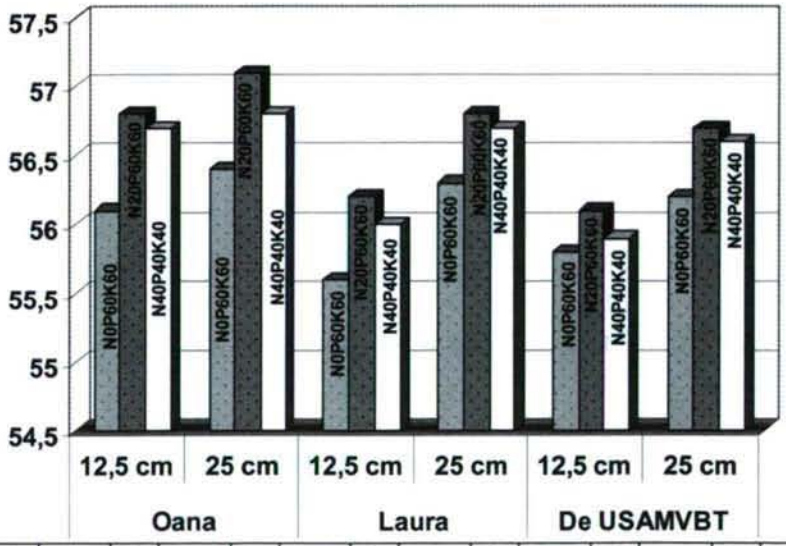
Among experimental plots, the highest values on the plot fertilised with $N_{20}P_{60}$ K_{60}, while the lowest values on the control plot with a constant base of $P_{60}K_{60}$, on which the plants developed less than on the other ones, which had a negative impact on the seed filling and maturation.

ISSN 1788-5345



Row distance (cm)	12.5	25	12.5	25	12.5	25	12.5	25	12.5	25	12.5	25	12.5	25	12.5	25
TGM g	25.44	26.22	26.68	27.54	26.25	26.96	25.01	25.63	26.36	26.97	25.87	26.5	24.62	25.21	25.87	26.46	25.33	25.99
N rate	$N_0P_{60}K_{60}$		$N_{20}P_{60}K_{60}$		$N_{40}P_{60}K_{60}$		$N_0P_{60}K_{60}$		$N_{20}P_{60}K_{60}$		$N_{40}P_{60}K_{60}$		$N_0P_{60}K_{60}$		$N_{20}P_{60}K_{60}$		$N_{40}P_{60}K_{60}$	
Genotype	Oana						Laura						De USAMVBT					
$\bar{X}$	26.51						26.05						25.58					
%	100						98						96					

Figure 1: Variation in 1,000-grain weight depending on lentil genotype, nitrogen rate, and row distance (2010)



Row distance (cm)	12.5	25	12.5	25	12.5	25	12.5	25	12.5	25	12.5	25	12.5	25	12.5	25	12.5	25
HM kg/hl	56.1	56.4	56.8	57.1	56.7	56.8	55.6	56.3	56.2	56.8	56	56.7	55.8	56.2	56.1	56.7	55.9	56.6
N rate	$N_0P_{60}K_{60}$		$N_{20}P_{60}K_{60}$		$N_{40}P_{60}K_{60}$		$N_0P_{60}K_{60}$		$N_{20}P_{60}K_{60}$		$N_{40}P_{60}K_{60}$		$N_0P_{60}K_{60}$		$N_{20}P_{60}K_{60}$		$N_{40}P_{60}K_{60}$	
Genotype	Oana						Laura						De USAMVBT					
$\bar{X}$	56.65						56.26						56.21					
%	100						99.31						99.22					

Figure 2: Variation of the hectolitre mass kg/hl, depending on lentil genotype, nitrogen rate, and row distance (2010)

ISSN 1788-5345

CONCLUSIONS

1. Results of the research carried out on the response of some lentil genotypes pointed out that the best results were in the lentil cultivars Oana and Laura in which average yields per experimental cycle were above 1,600 kg/ha.
2. Nitrogen fertilisers applied at rates of N_{20} resulted in an increase of 8% in yield. Increasing the fertiliser rate to N_0 is not motivated because it causes plants and reduce yields fall below the level achieved with the dose of N_{20}.
3. Among the studied lentil genotypes, it is worth to note the lentil cultivar Oana in which the average yield per fertilisation rate was above 1,700 kg/ha.
4. Laura the Spanish cultivar, can be taken into consideration, to diversify the structure of cultivars.
5. Nitrogen fertilizers applied in the N_{20} and N_{40} doses, on the constant base of $P_{60}K_{60}$ were poorly capitalized by the lentil, actually better explained by the potential fertility of the soil on which the researchwas performed and by the low requirements of this species in the element.

ACKNOWLEDGEMENTS

This work has benefited from a grant awarded by the Romanian Ministry of Education, Research, Youth and Sport, through the National Council for Scientific Research in Higher Education (PN II IDEI no. 1067/2009, project code ID-867). Title: „ DEVELOPING A CULTIVATION TECHNOLOGY IN LENTIL AND CHICHPEA IN THE SOIL AND CLIMATIC CONDITIONS BETWEEN THE TIMIŞ AND CARAŞ AND NERA RIVERS". Project Manager: Prof. PhD Gheorghe David.

REFERENCES

1. Bîlteanu, Gh. (2003): *Fitotehnie,* Iaşi, Ed. Ion Ionescu de la Brad, vol. I,
2. Borcean I, David Gh., Borcean A. (2006): *Tehnici de cultură şi protecţie a cerealelor şi leguminaselor,* Timişoara, Ed. de Vest
3. David Gh., Pîrşan P., Imbrea Fl. (2006): *Tehnologia plantelor de câmp-Cereale, leguminoase pentru boabe şi plante tehnice,* Timişoara, Ed. Eurobit
4. Muntean L.S., Borcean I., Axinte M., Roman Gh. (2003): *Fitotehnie,* Iaşi, Ed. Ion Ionescu de la Brad
5. Pîrşan, P. (1998): *Leguminoase pentru boabe*, Timişoara, Ed. Mirton