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RESEARCH REGARDING CHEMICAL COMPOSITION AND NUTRITIONAL VALUE OF *LENS CULINARIS* MEDIK. SPECIES (LENTIL) IN ORGANIC AGRICULTURE

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Abstract

Foods for human consumption fall into two categories as vegetable and animal origin. Raw materials of vegetable origin foods are divided into three sub-groups as cereals, oil seed and grain legumes. Grain legumes occupy a crucial place in human diet among these foods. Common bean, broad bean, chickpea, lentil, pea, soya and black eyed peas are the species of grain legumes. Lentil is one of the legume species that have been used successfully in human diet for a very long time.
The paper presents the results of the research regarding chemical composition and nutritional value of Lens culinaris Medik. species (lentil) promoted in organic agriculture.
The experiment was carried out in Moara Domneasca Experimental Field, during 2007-2009. It was studied 7 lentil genotypes: Beluga (France), Sorte du Puy (France), Laird (Turkey), Richlea (France), Masoor (Turkey), Eston (Greece) and a local genotype „Moara Domneasca".
In average, the chemical composition of the lentil genotypes cultivated in Moara Domneasca Experimental Field was the following: 22.18% proteins, 3.03% fats, 63.29% carbohydrates, 4.00% minerals, while the energy value was 259.97 kcal.
The protein yields ranged between 259 kg/ha and 335 kg/ha, the average being 297 kg protein/ha. The highest proteins yields, of more than 300 kg protein/ha, were obtained from Laird and Richlea genotype

Key words: *lentil, chemical composition, nutritional value.*

INTRODUCTION

Foods for human consumption fall into two categories of vegetable and animal origin. Raw materials of vegetable origin foods are divided into three sub-groups as cereals, oil seed and legumes.
Grain legumes occupy a very crucial place in human diet among these foods. Common bean, broad bean, chickpea, lentil, pea, soybean and black eyed peas are main species of grain legumes. Lentil is one of the legume varieties that have been used successfully in human diet for a very long time (Özer et all, 2010).
The lentil plant, *Lens culinaris* L., is a member of Fabaceae family and constitutes one of the most important traditional dietary components. FAO reported that world production of lentils was about 2.83 million metric tons for 2008, primarily coming from Canada (36.9%) and India (28.7%), followed by Nepal, China and Turkey (Truta, 2008).
Lentil plants grow to around 0.5 m in height as a slender bush or twining vine. Lentil plants flower from the bottom of the plant, and the flowering progresses upward. The flowers range in color from white to pale blue. Seed pods usually hold one or two seeds.
Numerous cultivars vary in the seed size and texture, and colors range from green to yellow to orange to red and brown (Roman et al., 2009).
Lentils have been incorporated into different world cuisines throughout the globe, especially the Mediterranean and Indian regions. Lentils have been classified among soft seed-coated pulses that require shorter cooking time, and thus have smaller losses in nutrients as compared to those with hard seed coat (Satya et all, 2010). The shorter cooking time of lentils (23–26 min.) in comparison with most other

pulses makes lentils very convenient for human consumption (Solanki et all, 1999).

Lentil is an important legume since it has higher protein amount/quality than cereals; it is also rich in vitamins and mineral constituents in addition to being a protein source. Furthermore, it provides amino acid balance when consumed with cereals. It is rich in respect of fiber and thus it helps overcoming hunger and balancing the appetite. Lentil is rich in calcium (Ca) (which is necessary for the development and overall health of bones), iron (Fe) (which forms blood in the metabolism) and vitamin B (which helps the nervous system to work efficiently) (Özer et al., 2010).

MATERIALS AND METHODS

The paper presents the results of the research regarding chemical composition and nutritional value of *Lens culinaris* Medik. (lentil) species promoted in organic agriculture.

The experiment was carried out in Moara Domneasca Experimental Field, located near Bucharest, during 2007-2009 and it was organized based on the multi-stage block method with randomized variants in 4 replications.

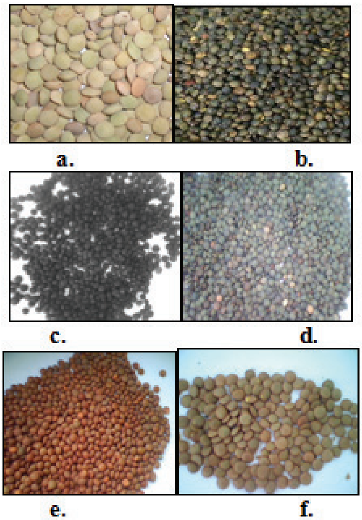

Figure 1. Biological material (genotypes) used in the lentil experiment, a-Laird,Turkey; b-Sorte du Puy, France; c-Beluga, France; d-Eston, Greece; e-Masoor, Turkey; f-Richlea, France.

The biological material used in the experiment came from organic crops and was represented by 7 lentil genotypes (Figure 1) : Beluga (France), Sorte du Puy (France), Laird (Turkey), Richlea (France), Masoor (Turkey), Estonia (Greece) and the local population 'Moara Domneasca' (Romania).

The biochemical compounds (glucides, starch, proteins, fats and minerals) have been analysed by using the common chemistry laboratory methods: for carbohydrates, Bertrand Method; for proteins, Kjeldahl Method; for fats, Soxhlet Method; for minerals, Spectrophotometer Method.

RESULTS AND DISCUSSIONS

Chemical composition of lentil seeds was as follows: 22.18% proteins, 3.03% fats, 63.29% carbohydrates, 4.00% ash, while the energy value was 259.97 kcal.

Regarding protein content, from Table 1 resulted values between 21.14% and 22.85%, the average being 22.18%.

The highest protein contents were determined for “Laird” and “Richlea” genotypes seeds-22.85% and 22.67%-and the lowest protein content was found at “Sorte du Puy” genotype, with 21.14%.

Higher fats content was observed at Sorte du Puy genotype with 3.40%, Beluga genotype with 3.25%, Masoor and Eston genotypes with 3.06% and 3.02% fat content. The lowest values?? were recorded in Moara Domneasca and Richlea genotypes, with 2.78% and 2.81% lipid content.

Carbohydrates content was on average 63.29%, with little difference between the variants; the highest content being recorded at “Laird” genotype with 63.98% and the lowest at “Eston” genotype with 62.87%.

Minerals content presented values ranging from 3.84% for Moara Domneasca genotype and 4.13% for Masoor genotype and the experiment average was 4.00%.

Energy values?? were at least 255.86% kcal from genotype Sorte du Puy and maximum of 265.00% kcal for genotype Laird.

The production data resulted in three experimental years illustrates the favorability of natural conditions for lentils and a high productivity of the tested biological material.

Table 1. Seeds chemical composition of lentil genotypes (% d.m.) (Moara Domneasca Experimental Field, 2009)

Genotype	Protein	Fats	Carbohydrates	Minerals	Energy value (kcal%)
Beluga	21.78	3.25	62.98	4.11	259.02
Sorte du Puy	21.14	3.40	63.57	4.04	255.86
Laird	22.85	2.95	63.98	3.94	265.00
Richlea	22.67	2.81	63.21	3.91	259.77
Masoor	22.27	3.06	63.43	4.13	263.28
Eston	22.34	3.02	62.87	4.07	258.92
Moara Domneasca	22.21	2.78	63.02	3.84	256.74
Average	**22.18**	**3.03**	**63.29**	**4.00**	**259.97**

Table 2. Protein yields of lentil genotypes (Moara Domneasca Experimental Field, 2009)

Genotype	Protein yields		Differences (kg/ha)	Significance
	kg/ha	%		
Beluga	259	86.71	-38	ooo
Sorte du Puy	276	9336	-21	ooo
Laird	335	113.99	38	***
Richlea	317	106.99	20	***
Masoor	287	99.30	-1	o
Eston	309	99.30	12	**
Moara Domneasca	302	99.65	0.5	-
Average	**297**	**100**	Mt	-

$DL_{5\%}$= 7.1 kg/ha
$DL_{1\%}$= 10.7 kg/ha
$DL_{0,1\%}$= 17.2 kgha

Table 2 presents protein yields calculated based on seed yields and protein content.

Seeds yields for the experiments with different genotypes of lentil were on average of 1291 kg/ha, the limits ranging between 1143 kg/ha at "Beluga" genotype and 1427 kg/ha at "Laird" genotype.

The protein yields ranged between 259 kg/ha and 335 kg/ha, the average being 297 kg/ha.

Most productive genotypes were determined to be "Laird" with 335 kg protein/ha, exceeding the average by 38 kg/ha, and "Richlea", with 317 kg/ha and an increase of protein yield with 20 kg/ha.

The lower protein yields were recorded in "Beluga" and "Sorte du Puy" genotype, which produced 259 kg/ha, respectively 276 kg protein/ha.

It can be noticed that "Richlea" and "Laird" genotype gave the highest seed yields, had the highest seeds protein content and gave the highest protein yields

CONCLUSIONS

Chemical composition of the lentil seeds was as follows: 22.18% proteins, 3.03% fats, 63.29% carbohydrates, 4.00% minerals, while the energy value was 259.97 kcal.

Fats content ranged from 2.78% at "Moara Domneasca" genotype to 3.40% at "Sorte du Puy" genotype.

Carbohydrates content was 63.29% on average with low differences between genotypes, the highest content being recorded at "Laird" genotype with 63.98% and the lowest at "Eston" genotype with 62.87%.

The results obtained in the three experimental years illustrate the favorability for lentils of the experimental area natural conditions, which offer favorable prerequisites for the

achievement of successful crops and high quality production.

Lentils is one of the alternative crops promoted by the organic agriculture system and can be a potential alternative crop for organic farms in the area.

However, introduction and expansion in culture of these species may contribute to diversification of human nutrition and animal feeding.

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