RESEARCHES REGARDING THE OIL QUALITY OF RAPESEED FROM THE AREA OF TĂŞNAD, SATU-MARE

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Abstract: *Rapeseed from the LEAR varieties (with Law Erucic Acid Rape contents) is an important material for the processing of the oil used in food. The oil structure is rich in poli-unsaturated fatty acids esterified in lipids. Their ratio is about 30%, containing linoleic acid (ω-6 fatty acid) and α - linolenic acid (ω-3 fatty acid) in a ratio of 2.5 to 1, which is considered optimal for their uptake by human and animal bodies. The purpose of the paper was to study the composition of rapeseed oil obtained from rapes varieties, cultivated in the north-west plain of Transylvania under the climate conditions of the years of 2005-2006. There were observed the influence of the technological factors upon the quantity and quality of fat structure of rapeseed. The rapeseed varieties studied were: Heros (created by the company UNION SAAT) and Olindigo. They were sown at three different densities. Three chemical fertilizer dosages were applied. In the laboratory there were determined the thousand seeds weight according to Romanian standard SR 6123/99, the hectoliter weight according to the Romanian standard STAS SR 6124/99, the oilseed content and the oil composition (by gas chromatographic methods). The results showed that the genetic and technological factors influence the fat quantity and - quality of the studied rape genotypes. The values of the oil contents were close for the two varieties, being 1.53% higher in the variety Olindigo (39.61%) compared to the Heros. The oil content of the rapeseed Heros decreases with the increasing of the sowing density and with the increasing of the chemical fertilizers doses. For the variety Olindigo the delimitations after fertilization doses are clearer, increasing slightly for the maximum dosage variant. For the both of the varieties of rapeseed in the case of the medium experimental variant (density of sowing rows and chemical fertilizers) it was observed that it was synthesized a higher proportion of polyunsaturated fatty acids in the fat structure of the oil. The composition of the oil, from rapeseed grown in different experimental variants, in saturated fatty acids (between 7.26 and 7.61% contents), mono-unsaturated (between 60.81 and 63.22%) and poli-unsaturated fatty (between 30.39 and 31.71 %) presented closed values and comparable with those from the literature.*

Key word: *rapeseed, oil, fatty acids*

INTRODUCTION

The rapeseed oil, like the other vegetable oils, is important for the technique and for the use in alimentation.

For the technical industries the rape oil is used for a wide range of products from soaps to painting and textile industries (SALONTAI, 1982, BĂLTEANU, 1991). In the lasts decade it gained increasing importance for bio-fuels production (BORCEANU, 2004, BRENNDÖRFER, 2005). In our country the use of rapeseed oil in human consumption is less commonly. The improving of rape variety resulted in products having in their composition decreased content of erucic acid in favor of increased, especially, oleic acid. In the 70ties new varieties of rape (*Brassica napus L.* and *Brassica rapa*, named also the European Canola) were admitted in Europe while the use of their products were restricted for alimentation due to the anti-nutritional contained compounds.

In 1990 the rape 00 (double zero) (with law content of erucic acid and glucosinolates)

was admitted for alimentary purposes. Compared to the LEAR oil the HEAR (high-erucic-acid-rape) used for technical purposes, contains erucic acid (C22:1) to 40% (BOCKISCH, 1993) (BOCKISCH, 1993).

The rapeseed oil has a yellow slight green, easily amber, with a delicious, light nutty flavor (when processed by cold pressing). It presents also a complex flavor associated with dry fruits as sweet almond, with vegetal notes as dry straw and hay, but also asparagus and artichoke. The savor develops in an aromatic purity perceptible at the nose level, but especially at the palate level with a particular floral and vegetal expression. The native rapeseed, as well as the refined oil is recommended for cooking (high smoking point) but also for salads because of its alimentary value.

The chemical composition of the rapeseed oil compared to other vegetal oil, presented in table 1, emphasizes similarities with those of the olive oil, concerning the amount of mono-unsaturated fatty acid (oleic acid) esterified in the glycerides. Due to the low saturated fatty acids contents, the lowest from all the vegetal oil, the rapeseed oil can replace successfully many of the vegetal oils or dietetic margarines. The rapeseed oil is recommended by experts, because of its special value, given by the high content in essential fatty acids as the linoleic acid (ω-6 acid) and α-linolenic acid (ω-3).

The optimal structure of the rapeseed oil, considered extremely valuable by nutritionist is given by:

- a high content of monounsaturated acid, especially the oleic acid;
- the ideal rate of 2,5:1 between the linoleic acid (ω-6) and α-linolenic acid (ω-3);
- a reduced contents of saturated acids;
- high contents of vitamin E and pro-vitamin A.

The quality of rape culture depends on variety, pedo-climatic conditions, production conditions or fertilizer dosage.

Tabel 1

The fatty acid profile of the oil processed from different oleaginous materials (%)
([1]BOCKISCH, 1993, [2]MORAR, 2005)

Specification		[1]Rape LEAR	[2]Rape	[1]Olive	[1]Sunflower	[1]Soya
Palmitic acid	C16:0	4,5	3,81	10	6,5	10
pamitoleic	C16:1	0,5	0,17	<1	0,5	<0,5
stearic	C18:0	1,5	0,63	3,5	5	4
oleic	C18:1	56	66,46	59	24	21
linoleic	C18:2	21	19,25	20	63	56
linolenic	C18:3	10	9,18	0,5	0,5	8
arahic	C20:0	0,5	0,40	1,5	0,5	0,5
gadoleic	C20:1	2	0,07	1,5	0,5	0,5
erucic	C22:1	4	-	-	-	-
SFA		6,5	4,84	15	12	14,5
MUFA		60,5	66,63	60	24,5	21,5
PUFA		31	28,43	20,5	63,5	64

SFA- saturated fatty acids, MUFA- mono-unsaturated fatty acids, PUFA, poly-unsaturated fatty acids

The purpose of the research was to study the influence of different technological factors (i.e. sowing density and fertilizers dosages) upon the fat composition of two rapeseed variety cultivated in the North-West plain of Transylvania under the ecological conditions of the years of 2005-2006.

MATERIALS AND METHODS

There were investigated two varieties of Colza rape: Heros and Olindigo cultivated in the environment of Tăşnad locality, county of Satu-Mare, the plane of Nord-Vest of Transylvania, during the years 2005 – 2006.

The material used in the fields experiment were the Heros, a variety created by the company SAATEN UNION, with an average oil contents of 38,8 - 41 % and the variety Olidingo, with an oil content of 38 to 40 %. Both of those have acid erucic content below 0,1 %.

At the rapes culture experiments the following factors were varied: the sowing density (75, 100 and 125 g.k./sqm) and the dosage of chemical fertilizers (three dosages for estimated production of 2,3 and 4 t/ha).

In the laboratory there were determined the thousand seeds weight according to Romanian standard SR 6123/99, the hectoliter weight according to the Romanian standard STAS SR 6124/99, the oil content and the fatty acid esterified in the oil composition .

The determination of the oil was made by extraction of the grinded rape seed samples with chloroform for 1,5 hours under continuously homogenizing, filtration of the sample and repeating of the extraction followed by the desiccation of the extract.

The analyzing of the rapeseed oil composition was made by determining the methyl esters of the fatty acids (trans-esterifying of the lipids from the samples) by GC method. There was used a Shimadzu GS 17A, with FID and capillary Chrompack column, specialized for fatty acids determination (l: 3m, ID: 0,25 mm, stationary phase (PEG): 0,25µm and splitting rate of 28:1. The working phases were: samples (by dosing to the samples of intern standard, methanol, benzene and sulfuric acid), separation of the oil/water phases (after dosing of 10 ml of hexane and 2 ml water followed by samples homogenizing), drying of the samples (anhydrification with anhydrous sodium sulfate and hexane evaporations). Finally the residuum is rerun in 1 ml hexane and 5 µl of samples is injected in the apparatus).

The temperature program used had following steps: column conditioning for 70 °C (2 min), followed by temperature increase until 150°C (by a gradient of 10°C/min.), increasing of the temperature until 235°C by a gradient of 4°C/min. The gas pressure was of 147 kPa. The injector and detector temperature were set at 260°C.

RESULTS AND DISSCUSIONS

Analyzing the results of the investigation regarding the influence of the studied factors upon the rapeseed quality (table 2 and 3) it is emphasizes that the sowing density and the different fertilizer dosage influenced slightly the quality of the seed, but these were in the limits provided by the technical data for the both varieties and comparable with data from the specialty literature. The values for the weight of 1000 seed were between 2,56 and 3,04g for the Heros variety and between 3,01 to 3,07 g for Olindigo variety. The hectoliter weight had values between 66,27 and 66,91 kg/hl for the Heros variety and 66,00 and 66,73 kg/hl for Olindigo variety (SALONTAI, 1985, BOCKISCH, 1993).

The oil contents of the rapeseed under the conditions of the year 2006 was a little higher for Olindigo with a value of 39,61 % compared with the Heros variety (38,08%).

Analyzing the fatty acids contents esterified in the lipids it was showed that:

- for the Heros variety the total content of saturated fatty acid increases with the sowing density, while it increase with the fertilizer doses increasing. The content of mono-unstaturated fatty acids was higher for the middle sowing density and lower for fertilizer dosing. For the polyunsaturated acid content the values were also higher when sowing density

and fertilizer density were higher;

- for the Olindingo rapessed, the contents of the saturated acid esterified in the oil was higher at the lower sowing density and lower fertilizer dosage. Higher monounsaturated fatty acid content was obtained for the median density sowing and fertilizer dosing experience. The polyunsaturated fatty acid content synthesized in the composition of the fatty material of the seed was higher in the median experience variant (100 k.g. and fertilizer dosage for estimated production on 3 t/ha).

Table 2

The data resulted at the investigation of the influence of the sowing density and dosage fertilizing upon the thousand seed weight, hectolitric weight, oil content and fatty acid esterified in the lipids of the oil in the rapesseed HEROS (2006)

Crt. nb.	Specification	Graduation	1000 kernels (g)	HW (kg/hl)	Oil Content (%)	Fatty acids composition (%)		
						SFA	MUFA	PUFA
1.	A Genotype	Heros	3,04	66,27	38,08	7,39	61,54	28,56
2.	B Sowing density	75g.k./mp	3,02	66,87	38,11	7,61	61,01	23,40
		100g.k./mp	2,56	67,67	38,32	7,32	62,40	30,28
		125g.k./mp	2,98	66,70	37,83	7,25	61,26	30,93
3.	C Fertilizer level	2t/ha	2,95	66,97	38,78	7,25	62,60	30,15
		3t/ha	2,96	66,97	38,06	7,48	60,81	23,62
		4t/ha	3,04	66,27	37,42	7,45	61,26	30,69

SFA- saturated fatty acids, MUFA- mono-unsaturated fatty acids, PUFA, poly-unsaturated fatty acids

The values of fatty acid esterified in the lipid for the studied rapeseed variety were for the saturated fatty acid between 7,25 and 7,61 %, for the mono-unsaturated fatty acids between 61,01-63,22% and for the polyunsaturated acids between 23,40-31,44%. The data are comparable with those of the literature and points, once again, out the alimentary value of the rapeseed oil.

Table 3

The data resulted at the investigation of the influence of the sowing density and dosage fertilizing upon the thousand seed weight, hectolitric weight, oil content and fatty acid esterified in the lipids of the oil in the rapesseed OLINDIGO (2006)

Crt. nb.	Specification	Graduation	1000 kernels (g)	HW (kg/hl)	Oil Content (%)	Fatty acids composition (%)		
						SFA	MUFA	PUFA
1.	A Genotype	Olidingo	3,07	65,73	39,61	7,41	61,84	30,96
2.	B Sowing density	75g.k./mp	3,01	66,47	38,88	7,47	61,39	30,72
		100g.k./mp	3,00	66,57	39,86	7,31	63,22	31,44
		125g.k./mp	3,02	66,00	40,08	7,44	61,34	30,70
3.	C Fertilizer level	2t/ha	3,04	66,33	39,47	7,60	62,30	30,96
		3t/ha	3,02	66,50	39,32	7,36	62,48	31,09
		4t/ha	3,07	65,73	40,04	7,26	61,67	30,66

SFA- saturated fatty acids, MUFA- mono-unsaturated fatty acids, PUFA, poly-unsaturated fatty acids

CONCLUSIONS

The results showed that the genetic and technological factors influence the fat quantity and - quality of the studied rape genotypes. The values of the oil contents were close for the two varieties, being 1.53% higher in the variety Olindigo (39.61%) compared to the Heros.

The oil content of the rapeseed Heros decreases with the increasing of the sowing density and with the increasing of the chemical fertilizers doses. For the variety Olindigo the

delimitations after fertilization doses are clearer, increasing slightly for the maximum dosage variant. For the both of the varieties of rapeseed in the case of the medium experimental variant (density of sowing rows and chemical fertilizers) it was observed that it was synthesized a higher proportion of polyunsaturated fatty acids in the fat structure of the oil.

The composition of the oil, from rapeseed grown in different experimental variants, in saturated fatty acids (between 7,26 and 7,61% contents), mono-unsaturated (between 60,81 and 63,22%) and poli-unsaturated fatty (between 30,39 and 31,71 %) presented closed values and comparable with those from the literature. The structure of the rapessed resulted in the different experimental variants was slightly influenced by the cultivations conditions.

Further systematic research is requested in order to establish the optimal condition for rapeseed culture with improved quality indicators, with regard of the existent rapeseed varieties.

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