RAPE OIL CONTENT AND PRODUCTION UNDER THE INFLUENCE OF SOWING DENSITY IN THE CONDITIONS OF S.C.D.A. LOVRIN IN 2011

Corina RĂDUCAN, Valeriu TABĂRĂ

Banat's University Of Agricultural Sciences And Veterinary Medicine Timişoara
Calea Aradului nr. 119
Corresponding author: corina2006oana@yahoo.com

Abstract: *From the rape culture, of special interest are both seed production and especially the oil content and hence oil production. Rape seed oil is low in saturated fat and contains both omega-6 and omega-3 fatty acids in a ratio of 2:1. If consumed, it also reduces Low-density lipoprotein and overall cholesterol levels, and as a significant source of the essential omega-3 fatty acid is associated with reduced all-cause and cardiovascular mortality. Rapeseed counts as hardly any other crop as the renewable resource par excellence. Rapeseed has been grown as an agricultural crop since the 16th century. As well as its use as a cooking oil, it is also used as an energy source, mainly in the production of biodiesel and as a raw material in the chemical industry. Erucic acid derived from rapeseed is processed to make surfactants, softeners, wetting agents and emulsifiers. The oil content of rapeseed is affected by the variety, location, stage of crop maturity and the weather conditions during the growing phase (temperature sum). Other important factors include harvest time, height of growth, lodging resistance and susceptibility to disease (phoma, sclerotinia). For research, several varieties and hybrids belonging to different companies were used: PAMELA variety (LG), EXOTIC and EXTEND hybrids (Monsanto) and PR46W14 hybrid (Pioneer). The used agrofond was N90P90K90, the other technology elements are specific to the area. The experimental results were calculated and interpreted by specific methods of experimental technique. Analysis of average production achieved by varieties and hybrids under study, points out that there are small differences between them. If the case of S.C.D.A. Lovrin experiment it was found that oil content varies from one cultivar to another. However, is strongly influenced by sowing density. In Extend and Exotic hybrids, oil content increases with density (maximum is at the of 200 gs/m²). At Pamela variety and PR46W14 hybrid, oil content in seeds is reduced with increasing sowing density from 50 to 200 gs/m². Oil production is closely linked to production and seed oil content.*

Key words: *rapeseed, sowing density, production, oil, hybrid*

INTRODUCTION

Rape seeds contain 42-49% oil with multiple industrial uses, and lately with important weight in people feed as salad oil and margarine. (Gh Bîlteanu, 1969.)

Rapeseed oil, in addition to food use, is used as raw material for margarine manufacture, for paints and varnishes manufacture, soap manufacture (V. Tabără, 2005).

Rapeseed oil contains fatty acids in different portions: oleic, linoleic, linolenic, erucic and palmitic. Iodine index is between 94-112. Erucic acid (unsaturated fatty monocide) seems to be the main factor of some heart diseases, such as degenerative alterations and some swelling etc. (A. Benvenuti, G. Vicontini, 1973 cited by Simona Nita, 2004). This is the reason why in recent years, in the culture were introduced some varieties free of erucic acid and glucosinolate (V. Tabără, 2005).

Rapeseed oil is the cooking oil whose fatty acid profile is ideal in relation to our daily needs. It is very interesting especially with the amount of alpha-linolenic acid (OMEGA3), also known as essential fatty acid because it is essential for health, given that our body can not synthesize it by its own (http://cristian-adevaruldepretutindeni.blogspot.com/2009/07/uleiul-de-rapita.html).

Crude oil is used as biofuel with features similar to those of diesel (V. Tabără, 2005).

MATERIAL AND METHODS

For research, several varieties and hybrids belonging to different companies were used: PAMELA variety (LG), EXOTIC and EXTEND hybrids (Monsanto) and PR46W14 hybrid (Pioneer).

Research is carried out at S.C.D.A. Lovrin in a bifactorial experience placed in randomized blocks. Experimental factors are:

A factor – variety

a_1 = Pamela
a_2 = Extend
a_3 = Exotic
a_4 = PR46W14

B factor –density

b_1 = 50 g.s. / m²
b_2 = 100 g.s. / m²
b_3 = 150 g.s. / m²
b_4 = 200 g.s. / m²

Sowing time was in the first half of the first decade of October. The used agrofond was $N_{90}P_{90}K_{90}$, the other technology elements are specific to the area.

The experimental results were calculated and interpreted by specific methods of experimental technique.

The oil content of the studied varieties was determined by extraction with a SOXTHERM extraction unit. The extraction process is performed in 5 programmable steps which ensures complete extraction of the samples:

- **Stage 1 (Hot extraction) -** The sample is immersed in boiling solvent and the extractable material is liberated from the sample. An equilibrium is set up between the extract in solution and that still on the sample surface.
- **Stage 2 (Evaporation A) -** The level of the solvent is lowered below the extraction thimble. The excess solvent is collected in the rear solvent recovery tank .
- **Stage 3 (Rinsing time) -** The material is extracted by the refluxed, condensed solvent and is collected in the solvent, below in the extraction beaker.
- **Stage 4 (Evaporation B) -** The bulk of the solvent is distilled over into the rear storage tank for later recovery.
- **Stage 5 (Evaporation C) -** The extraction beakers are lifted from the hotplate automatically. Some of the residual solvent may be removed via convection heating. Cooling water and heating are switched off when the extraction is finished after the fifth stage.

RESULTS AND DISCUSSIONS

Rape is grown primarily for increased oil content.

Table 1 shows the oil content of the four rape cultivars under the influence of seeding density. In terms of oil content is found that the four studied cultivars have similar values, 40-42%. It appears that in terms of oil content depending on plant density, there are differences between the analyzed variants. In the case of the variety PAMELA, increasing plant density, the oil content in seeds is reduced from 42.4% in variants sown at 50 gs/m² to 41%. In the case of EXTEND hybrid, seed oil content increases from 41% in variants with 50 gs/m² to 42.6% in variants sown with 200 gs/m². The same is found in the case of EXOTIC hybrid to which oil

content in seeds increased from 40.2% in variant sown with 50 gs/m² to 41.6% in variants sown at a density of 200 gs/m²; at PR46W14 hybrid, the oil content is reduced by increasing plant density.

Table 1

Oil content (%), according to the cultivated variety and seeding density in 2011

A factor Variety / hybrid	B factor Seeding density	Oil content %
PAMELA	50 bg/m^2	42,4%
	100 bg/m^2	41,8%
	150 bg/m^2	41,4%
	200 bg/m^2	41%
PAMELA average		41.65
EXTEND	50 bg/m^2	41%
	100 bg/m^2	41,2%
	150 bg/m^2	41,4%
	200 bg/m^2	42,6%
EXTEND average		41.55
EXOTIC	50 bg/m^2	40,2%
	100 bg/m^2	40,8%
	150 bg/m^2	41%
	200 bg/m^2	41,6%
EXOTIC average		40.9
PR46W14	50 bg/m^2	42,4%
	100 bg/m^2	41,8%
	150 bg/m^2	41,6%
	200 bg/m^2	41,4%
PR46W14 average		41.8

Table 2 shows the synthesis of the four cultivars of rape oil production under the influence of seeding density. In terms of oil production, studied cultivars differ between them. Oil production over 1300 kg / ha are obtained at PAMELA varieties and EXOTIC and EXTEND hybrids. At PR46W14 hybrid the oil production obtained was of 1268 kg/ha. The production increase of 47 kg/ha for EXTEND hybrid and the differences of 29 kg/ha respectively 123 kg/ha achieved at EXOTIC and PR46W14 hybrids compared to PAMELA hybrid are not statistically provided and are falling in the category of experimental errors.

In terms of the influence of sowing density on oil production, is found that at the densities of 100-150 gs/m², it tends to increase compared with the density of 50 gs/m². At seeding densities of 100 and 150 gs/m² production increases are statistically provided as very significant at 100gs/m² (144 kg/ha) and significantly distinct at density of 150 gs/m² (84 kg/ha).

Table 2

Oil production by variety, hybrid and seeding density obtained for rape in 2011 in conditions of S.C.D.A. Lovrin

A factor Variety	B factor - Density				Factor A average			
	b_1 50 gs/m^2	b_2 100 gs/m^2	b_3 150 gs/m^2	b_4 200 gs/m^2	Yield kg/ha	%	Difference kg/ha	Significance
PAMELA	1291	1463	1486	1322	1391	100		
EXTEND	1368	1455	1469	1459	1438	103	47	

EXOTIC	1517	1416	1273	1242	1362	98	-29	
PR46W14	1060	1476	1344	1190	1268	91	-123	

DL 5% = 124kg/ha

DL 1% = 165kg/ha

DL 0,1% = 217kg/ha

Factor B average

B factor (Density)	b_1 50bg/m2	b_2 100bg/m2	b_3 150bg/m2	b_4 200bg/m2
Yield kg/ha	1309	1453	1393	1303
%	100	111	106	100
Difference kg/ha		144	84	-6
Significance		***	**	
		DL 5% = 62 kg/ha	DL 1% = 83 kg/ha	DL 0,1% = 108 kg/ha

Graphical representation of Figure 1 shows the variation of oil production for the cultivars investigated in conditions of 2011 at S.C.D.A. Lovrin

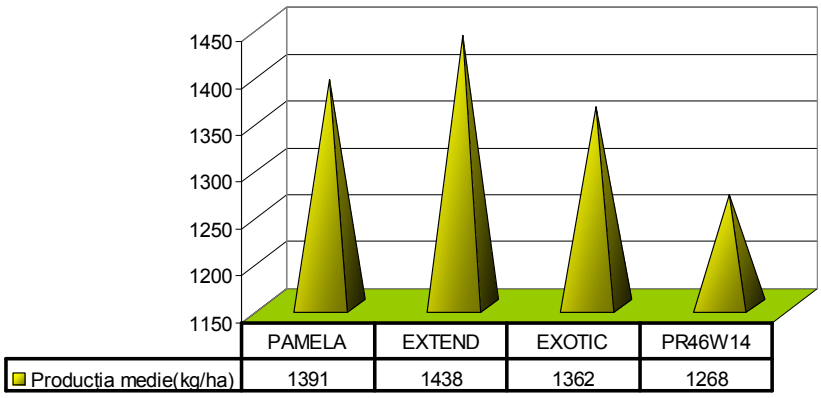

Fig. 1 - Variation of oil production (kg / ha), depending on the variety and hybrid cultivated in S.C.D.A. Lovrin in 2011

Figure 2 shows the variation of oil content for the four rape cultivars under the influence of sowing density. From the plot it can be concluded that planting density influences strongly enough the oil content of rapeseed.

Depending on cultivar-density interaction there is a specific response to each one. At Pamela hybrid, the highest yield 1486 kg/ha is achieved at a density of 150 gs/m². The highest oil production at Extend hybrid (1469 kg/ha) is obtained at the density of 150 gs/m². The highest oil production at Exotic hybrid 1517 kg/ha is obtained at 50 gs/m² followed by 100 gs/m² density. The maximum oil production at PR46W14 hybrid (1476 kg/ha) was obtained at the density of 100 gs/m².

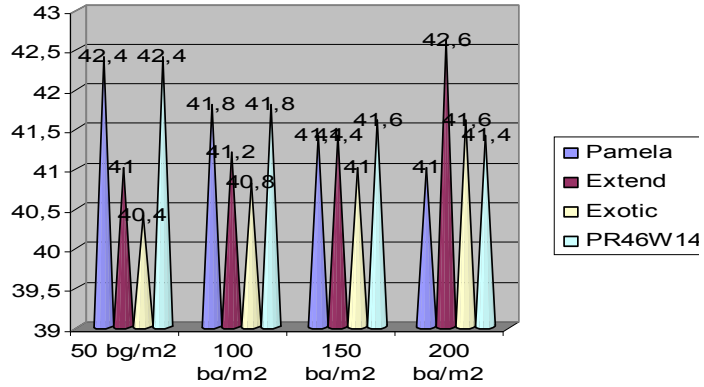

Fig. 2 - Oil variation (%), depending on the variety and hybrid grown in different planting densities in 2011

CONCLUSIONS

Analysis of the results obtained in rapeseed production under the influence of variety / hybrid and seeding density in S.C.D.A. Lovrin in the climatic conditions of 2011 allows us to formulate some conclusions even if the results are only for a year of experimental cycle.

1. Oil content varies between 40.2% at EXOTIC hybrid planted at a density of 50 gs/m² and 42.6% at EXTEND hybrid when planted at a density of 200 gs/m².

2. The oil content varies depending on the variety / hybrid and depending on the seeding density.

3. The oil content of varieties / hybrids vary for the same variety / hybrid under the density influence. At PAMELA variety the largest oil content is achieved at a density of 50 gs/m² - 42.4% while at EXTEND hybrid the maximum oil content in seeds maintained at a density of 200 gs/m².

4. Oil production is dependent on seed production per unit area achieved and seed oil content. In the whole experience, the highest oil production is realized in EXTEND hybrid, 1438 kg/ha.

5. In terms of density, the highest oil production is obtained when rape is sown at a density of 100 gs/m² -1453 kg/ha, the achieved production growth compared to reference variety is of 144 kg/ha which is provided statistically as very significant.

6. Exotic and PR46W14 hybrids had the highest oil production in 2011 under the seeding density of 50 or 100 gs/m².

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