

ECONOMIC EFFICIENCY OF WINTER RAPE (*BRASSICA NAPUS L. SSP. OLEIFERA D.C.*)

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Rape (Brassica napus L ssp. Oleifera D.C) is a plant of Mediterranean origin, being largely used in the Middle Ages in the Central and Northern European countries due to the oil obtained from seeds, used both in cooking and in lighting. Considering these aspects, research has been carried out at SCDCB Tg Mures to analyze the behavior of winter rape cultivars in the presence of different doses of fertilizers based on N, P and K, as well as by experiencing several degrees of seeding thickness. Analyzing the profit rate according to the interactions of the researched items it followed that in the year 2004 – 2005 the highest profit rate, of 125%; was registered for the variant Valesca x 200 b.g./m² x N₆₀P₀K₀. In the year 2005 – 2006, the interaction between Valesca x 200 b.g./m² x N₆₀P₀K₀, had a rate of profit of 126.6% and in the year 2006 – 2007, the variant Vectra x 200 b.g./m² x N₀P₀K₀ had a rate of profit of 80.1%. Among the fertilized variants, Vectra x 300 b.g./m² x N₆₀P₆₀K₀ had a rate of profit of 53.20% while the variant Valesca x 200 b.g./m² x N₆₀P₀K₀ had a rate of profit of 56%.

Key words: economic efficiency, *Brassica napus*, winter rape

Rape (*Brassica napus L ssp. Oleifera D.C*), plant which originates in the Mediterranean countries, has been largely used ever since the Middle Ages in the Northern and Central European countries, due to the oil obtained from seeds, which is used both for cooking and for lighting.

The high content of oil of the rape seeds – varying from 43 to 52% in “00” – type cultivars and hybrids – as well as the 21 – 24% protein content place rape in the category of oleoproteic plants. This is the reason why rape enjoys special attention in the European Union, which supports the cultivation of this plant, but not to the detriment of the food cultures.

In the context of Romania, Nagy, A and others suggest the creation of an integrated system for biological fuel production which should include the rape methylic diester, so that each farm should use energy in a more efficient way while protecting the environment [4].

Both in theory and in practice, rape is considered to be a culture which lends itself to both organic and strictly mineral or combined fertilization. Some authors consider that an integrated, adequate use can double current rape productions and, as a consequence, the rate of profit will also increase [2,5].

The seeding thickness, expressed by the number of plants/m² is important due to its positive correlation with the number of plants presented in the autumn,

but also with the number of plants which survive the winter and form the thickness of the plants at harvest [1].

The role, function and particular economic importance of the rape cultures in the process of an intensifying agriculture, as well as the ever growing demands of the national economy for the products of this culture have determined in the past few years a considerable growth of the cultivated areas and at the same time, an intensification of the efforts to increase profitability and the economic efficiency of the resulted productions.

MATERIAL AND METHOD

A series of research was conducted at SCDCB Tg. Mureș, Mureș County, to analyze the behavior of winter rape cultivars when applying different doses of N, P and K-based fertilizers and when experiencing several degrees of seeding thickness. The purpose of this research was to observe the influence of the above-mentioned factors on production and on its quality.

The research was performed in the period 2004 – 2007 and the observed factors were: Factor A – fertilization with four graduations ($N_0P_0K_0$; $N_{60}P_0K_0$; $N_{60}P_{60}K_0$; $N_{90}P_{90}K_{90}$), factor B – rape cultivation with three graduations: Valesca, Kardinal, Digger (in 2004-2006, hybrid Vectra in 2006-2007); factor C – thickness, with three graduations: 100 b.g./m², 200 b.g./m², 300 b.g./m².

The type of experience applied in the research was “ polifactorial experience” of type 3x3x4, and the method is that of the “randomized blanks”.

The size of a lot was 10 mp. The technology was the classical one.

The experiences took place on a stagnic luvosol with 1.9% humus, 16,3 mg P₂O₅/100 g soil, 19,9 mg K₂O/100 g soil and pH 6,5.

RESULTS AND DISCUSSIONS

Following the research of the economic efficiency of the productions obtained from the experiences organized in the experimental field at S.C.D.C.B. Tg. Mureș, in the period 2004-2007 by allotting different production factors, the following conclusions can be reached:

In the agricultural year 2004-2005, of the three studied types, only the Valesca type obtained a high rate of profit, of 70.03%, followed by the Digger type, with a rate of profit of 9.82%. Losses were recorded at the Kardinal type (table 1).

The seeding thickness had a positive rate of profit. The highest one, 32.41%, was recorded for the thickness of 200 b.g./m².

Fertilization determined the increase of the rate of profit from 27.35% in the variant $N_{60}P_0K_0$, and 29.98% in the variant $N_{60}P_{60}K_0$, to 27.11% in the variant fertilized with $N_{90}P_{90}K_{90}$.

The interaction between factors determined the increase of the profit rate. Thus, the highest rate of profit was recorded in the case of Valesca variant x 200 b.g./m² x $N_{60}P_0K_0$, with 125%, followed by the variant Valesca x 200 b.g./m² x $N_{60}P_{60}K_0$.

Table 1

The economic efficiency of winter rape in 2004-2005

Specification	Average production kg/ha	Total income lei/ha	Total expenses lei/ha	Production cost. lei/kg	Gross profit lei/ha	Rate of profit %
Economic efficiency of cultivars						
VALESCA	2166	2729	1605	0,741	1124	70,03
DIGGER	1384	1744	1588	1,147	156	9,82
KARDINAL	1260	1588	1590	1,261	-2	-0,12
Economic efficiency if seeding thickness						
100 b.g./m ²	1520	1915	1562	1,027	353	22,59
200 b.g./m ²	1676	2112	1595	0,951	517	32,41
300 bg/m ²	1615	2035	1625	1,006	410	25,23
Economic efficiency of fertilization						
N ₀ P ₀ K ₀	1075	1355	1235	1,148	120	9,7
N ₆₀ P ₀ K ₀	1471	1853	1455	0,989	398	27,35
N ₆₀ P ₆₀ K ₀	1775	2237	1721	0,969	516	29,98
N ₉₀ P ₉₀ K ₉₀	1983	2499	1966	0,991	533	27,11

Selling price: 1,26 lei/kg

In the agricultural year 2004 – 2005, the Valesca variant obtained high profits for all seeding thickness and fertilization formulae. In the case of the Digger variant the highest rate of profit (28.4%) was obtained in the variant with 300 b.g./m² x N₆₀P₆₀K₀, and in the case of the Kardinal cultivar, the rate of profit of 54% was obtained in the variant with 200 b.g./m² x N₆₀P₆₀K₀.

In the agricultural year 2005 – 2006 (figure 2) the rate of profit was higher than in the previous year. The Valesca cultivar stood out with a rate of profit of 96.02% followed by Digger with 29.25% and Kardinal with 4.59%.

The most profitable thickness was that of 100 b.g./m² with a rate of profit of 51.12% followed by 200 b.g./m² with a rate of profit of 47.95%. The rate of profit was higher in the case of fertilization, as well. In the variant fertilized with N₆₀P₀K₀ the rate of profit was 53.78%, followed by the variant N₉₀P₉₀K₉₀ with a rate of profit of 45.74%.

Table 2

The economic efficiency of winter rape in 2005-2006

Specification	Average prod. kg/ha	Total income lei/ha	Total expenses lei/ha	Prod cost. lei/kg	Gross profit lei/ha	Rate of profit %
Economic efficiency of cultivars						
VALESCA	2505	3156	1610	0,642	1546	96,02
DIGGER	1617	2037	1576	0,974	461	29,25
KARDINAL	1318	1661	1588	1,204	73	4,59
Economic efficiency of seeding thickness						
100 bg/m ²	1870	2356	1559	0,833	797	51,12
200 bg/m ²	1868	2354	1591	0,851	763	47,95
300 bg/m ²	1703	2146	1624	0,953	522	32,14
Economic efficiency of fertilization						
N ₀ P ₀ K ₀	1245	1569	1232	0,989	337	27,35
N ₆₀ P ₀ K ₀	1772	2233	1452	0,819	781	53,78
N ₆₀ P ₆₀ K ₀	1965	2476	1718	0,874	758	44,12
N ₉₀ P ₉₀ K ₉₀	2271	2861	1963	0,864	898	45,74

Selling price: 1,26 lei/kg

The interaction between factors determined the increase of the profit rate in the case of Valesca type, which got to 126.6% in the variant with 200 b.g./m² x N₆₀P₀K₀. In the case of the Kardinal type, the rate of profit was much lower, even negative.

In the agricultural year 2006-2007 (figure 3), which was less favorable, the rate of profit was quite high. The Vectra hybrid stood out with a rate of profit of 36.19% and the Valesca cultivar with 35.22%, while the Kardinal cultivar incurred losses.

The rate of profit according to the thickness was almost equal (16,04-17,88%) in all variants.

Table 3

The economic efficiency of winter rape in 2006-2007

Specification	Average prod. kg/ha	total income lei/ha	Total expenses lei/ha	Production cost lei/kg	Gross profit lei/ha	Rate of profit %
Economic efficiency of cultivars						
VALESCA	1506	2169	1604	1,065	565	35,22
VECTRA	1521	2190	1608	1,057	582	36,19
KARDINAL	884	1273	1594	1,803	-321	-20,13
Economic efficiency of seeding thickness						
100 bg/m ²	1280	1843	1568	1,225	275	17,53
200 bg/m ²	1314	1892	1605	1,221	287	17,88
300 bg/m ²	1316	1895	1633	1,240	262	16,04
Economic efficiency of fertilization						
N ₀ P ₀ K ₀	796	1146	1244	1,562	-98	-7,87
N ₆₀ P ₀ K ₀	1293	1862	1299	1,004	563	43,34
N ₆₀ P ₆₀ K ₀	1430	2059	1730	1,209	329	19,01
N ₉₀ P ₉₀ K ₉₀	1659	2389	1975	1,190	414	20,96

Selling price: 1,44 lei/kg

The NPK fertilization determined the increase of the profit. The highest rate – 43.34% - was obtained in the variant N₆₀P₀K₀ followed by variant N₉₀P₉₀K₉₀, with 20.96%.

The interaction between factors produced economic efficiency even in the least favourable year – 2006-2007 (figure 6). In the case of cultivars Valesca and Vectra, increased productions were obtained, with a rate of profit of 80.1% in the variant Vectra x 200 b.g./m² x N₀P₀K₀ and 57,6 % in the variant Vectra x 300 b.g./m² x N₉₀P₉₀K₉₀. The Kardinal cultivar incurred losses in this agricultural year.

On an average of the three agricultural years, the economic efficiency of the cultivar was especially manifest in the Valesca type – 69.35%, while the Kardinal type incurred losses.

The seeding thickness determined the highest rate of profit in the variant with 200 b.g./m² de 33.99%, followed by the thickness of 100 b.g./m² with a rate of profit of 31.48%.

The economic efficiency of fertilization was quite good, with a rate of profit of 37.19% with the variant N₆₀P₀K₀, a rate of profit of 32.35 % for the variant N₉₀P₉₀K₉₀ and 32.14% for the variant N₆₀P₆₀K₀

Table 4

The economic efficiency of winter rape Mean values 2004-2007

Specification	Average prod. kg/ha	Total income lei/ha	Total expenses lei/ha	Production cost lei/kg	Gross profit lei/ha	Rate of profit %
Economic efficiency of cultivars						
VALESCA	2059	2718	1605	0,779	1113	69,35
DIGGER(VECTRA*)	1507	1989	1588	1,053	401	25,26
KARDINAL	1154	1523	1591	1,378	-68	-4,28
Economic efficiency of seeding thickness						
100 bg/m ²	1557	2055	1563	1,003	492	31,48
200 bg/m ²	1619	2137	1595	0,985	542	33,99
300 bg/m ²	1545	2039	1625	1,051	414	25,48
Economic efficiency of fertilization						
N ₀ P ₀ K ₀	1039	1371	1234	1,187	137	11,11
N ₆₀ P ₀ K ₀	1512	1996	1455	0,962	541	37,19
N ₆₀ P ₆₀ K ₀	1723	2274	1721	0,998	553	32,14
N ₉₀ P ₉₀ K ₉₀	1971	2602	1966	0,997	636	32,35

Selling price: 1,32 lei/kg

* VECTRA – in the year 2006 – 2007

The interaction of the studied factors showed that the most profitable variant (table 5), with a rate of profit of 105.54%, is Valesca x 200 b.g./m² x N₆₀P₀K₀.

For the cultivars Valesca and Digger the rate of profit was positive, while the rate of profit for the Kardinal cultivar can only be considered for three variants: Kardinal x 200 b.g./m² și N₆₀P₀K₀; N₆₀P₆₀K₀; N₉₀P₉₀K₉₀.

The research on the economic efficiency of winter rape shows that not all the observed cultivars were efficient, while the Kardinal type even incurred losses instead of profit.

Table 5

The economic efficiency of winter rape. Mean values 2004-2007

Sort	Denseness (b.g./m ²)	Fertilization (NPK)	Seeds production (kg/ha)	Total income lei/ha	Total expenses lei/ha	Production cost lei/kg	Gross profit lei/ha	Rate of profit %
VALESCA	100	N ₀ P ₀ K ₀	1277	1686	1207	0,945	479	39,69
		N ₆₀ P ₀ K ₀	2161	2853	1433	0,663	1420	99,10
		N ₆₀ P ₆₀ K ₀	2236	2952	1693	0,757	1259	74,37
		N ₉₀ P ₉₀ K ₉₀	2673	3528	1939	0,725	1589	81,95
	200	N ₀ P ₀ K ₀	1463	1931	1244	0,850	687	55,23
		N ₆₀ P ₀ K ₀	2288	3020	1470	0,642	1550	105,45
		N ₆₀ P ₆₀ K ₀	2582	3408	1730	0,670	1678	97,00
		N ₉₀ P ₉₀ K ₉₀	2789	3681	1976	0,708	1705	86,29
	300	N ₀ P ₀ K ₀	1328	1753	1280	0,963	473	36,96
		N ₆₀ P ₀ K ₀	2174	2865	1506	0,692	1357	90,11
		N ₆₀ P ₆₀ K ₀	2411	3183	1766	0,732	1417	80,24
		N ₉₀ P ₉₀ K ₉₀	2609	2123	2012	0,771	111	5,52

DIGGER	100	N ₀ P ₀ K ₀	966	1275	1198	1,240	77	6,43
		N ₆₀ P ₀ K ₀	1238	1634	1424	1,150	210	14,75
		N ₆₀ P ₆₀ K ₀	1449	1913	1684	1,162	229	13,60
		N ₉₀ P ₉₀ K ₉₀	1631	2153	1930	1,183	223	11,56
	200	N ₀ P ₀ K ₀	962	1270	1227	1,275	43	3,51
		N ₆₀ P ₀ K ₀	1252	1653	1445	1,154	208	14,40
		N ₆₀ P ₆₀ K ₀	1439	1899	1713	1,190	186	10,86
		N ₉₀ P ₉₀ K ₉₀	1664	2196	1959	1,177	237	12,10
	300	N ₀ P ₀ K ₀	1027	1356	1257	1,224	99	7,88
		N ₆₀ P ₀ K ₀	1417	1870	1483	1,046	397	26,10
		N ₆₀ P ₆₀ K ₀	1659	2190	1743	1,050	447	25,65
		N ₉₀ P ₉₀ K ₉₀	1909	2520	1989	1,041	531	26,70
KARDINAL	100	N ₀ P ₀ K ₀	833	1100	1201	1,441	-101	-8,41
		N ₆₀ P ₀ K ₀	1079	1424	1417	1,313	7	0,50
		N ₆₀ P ₆₀ K ₀	1264	1668	1687	1,334	-19	-1,13
		N ₉₀ P ₉₀ K ₉₀	1437	1897	1933	1,345	-36	-1,87
	200	N ₀ P ₀ K ₀	894	1180	1234	1,380	-54	-4,38
		N ₆₀ P ₀ K ₀	1502	1983	1460	0,972	523	35,83
		N ₆₀ P ₆₀ K ₀	1598	2109	1720	1,076	389	22,62
		N ₉₀ P ₉₀ K ₉₀	1677	2214	1966	1,172	248	12,62
	300	N ₀ P ₀ K ₀	928	1225	1266	1,364	-41	-3,24
		N ₆₀ P ₀ K ₀	1126	1486	1455	1,292	31	2,13
		N ₆₀ P ₆₀ K ₀	1335	1762	1752	1,312	10	0,57
		N ₉₀ P ₉₀ K ₉₀	1457	1923	1994	1,368	-71	-3,56

Selling price 1.32 lei/kg (mean values 2004-2007)

CONCLUSIONS

In the case of winter rape, if the influence of the three factors is analyzed independently, the results are not very convincing, while the interaction of the factors is very promising. The analysis of the economic efficiency of the seed production is the element which fundamentally identifies the factors which influence the increase of the technical and economic performances.

On the average, during the three experimental years, the most profitable variant turned out to be Valesca x 200 b.g./m² x N₆₀P₀K₀, with a rate of profit of 105.45%, followed by Valesca x 200 b.g./m² x N₆₀P₆₀K₀, with a rate of profit of 97,0 %. For the same variants, in the agricultural year 2004-2005 the rate of profit was 125,0 % and respectively, 117,6 %, and in the agricultural year 2005 – 2006 the rate of profit was 126,6 % and 116,3 % for the same variants, similar to the mean values for the three years. Lower rates of profit were obtained in the agricultural year 2006-2007, which was less favorable. In this year, the highest rate of profit was obtained for the variant Vectra x 200 b.g./m² x N₀P₀K₀, and from the fertilized variants, Valesca x 200 b.g./m² x N₆₀P₀K₀, with a rate of profit of 56,0 %.

The highest rate of profit for the three years was obtained by the variant Valesca, with an average of 69/35%; the thickness 200 b.g./m², with an average of 33,99 % and the fertilizer N₆₀P₀K₀, with an average of 37,19 %. The highest rates of profit for each year of experiment are the same as those for the average of three years.

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