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MORPHOLOGICAL, BIOCHEMICAL, AND PRODUCTIVITY ASPECTS OF RAPESEED GENOTYPES (*Brassica napus* L.) IN THE PEDO-CLIMATIC CONDITIONS OF THE CRIȘURILOR PLAIN

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Abstract. *Considering that rapeseed (Brassica napus L.) has a high use potential and its complex exploitation is an extremely topical research field in the context of diversification of raw material and energy sources, the present study tests the behavior of the main rapeseed genotypes recommended by specialists under temperature, humidity, and soil conditions of The Crișurilor Plain (Romania). The aim is to find optimal solutions to extend the cultivation area and increase the production capacity of this source rich in vegetable fats and proteins. A single-factor experiment with 5 varieties and hybrids of autumn rapeseed was carried out under optimal technical conditions in 4 repetitions. The following genotypes of autumn rapeseed were used as experimental variants: V1 - PR46W29 4; V2 - Maximus PT225; V3 - Maximus PT234; V4 - Sherpa; V5 - Perla. We evaluated the plants' height, number of branches per plant, the height of insertion of the first siliquae, number of siliquae per plant, the weight of 1000 seeds, hectolitre mass, seed yield, the percentage content of protein, fat, oleic acid, linoleic acid and glucosinolates in the seeds. The recorded data recommend the Crișurilor Plain for the successful cultivation of four genotypes of autumn rapeseed under optimal and highly efficient conditions.*

Keywords: *Rapeseed, genotype, hybrid, Romania*.

INTRODUCTION

Rapeseed (*Brassica napus* L.) is a member of the Brassicaceae family, which originated over 7500 years ago after the spontaneous hybridization of *Brassica rapa* and *Brassica oleracea*, and has been widely cultivated across the world for thousands of years (CHALHOUB et al., 2014; SNOWDON et al., 2007).

The crop is harvested mainly for the extraction of seed oil, and the ground meal that is being used as animal feed (WOODFIELD & HARWOOD, 2017). Rapeseed oil is the second-largest source of plant-derived oil in the world after soybean, with a production of over 70 MT in 2021/2022 (SHAHBANDEH, 2022a). The production is steadily rising, following the global upward trend of increasing oil consumption (WOODFIELD & HARWOOD, 2017). In 2020/2021, the global production of rapeseed oil raised to approximately 29.2 MT (SHAHBANDEH, 2022b). The worldwide leading producers of rapeseed in the years 2020/2021 were Canada (19.5 million metric tons), the European Union (16.3 MT), China (14.05 MT), and India (8.5 MT) (SHAHBANDEH, 2022b).

Uses

Every part of the plant is useful, even the waste. All vegetative organs, flowers, and seeds have food, medicinal, cosmetical, and industrial applications and the wastes can be recycled or used as animal fodder (RABOANATAHIRY et al., 2021). The leaves and stems can be used as vegetables and seasoning herbs, being rich in essential minerals, proteins, and vitamins. The flowers can be infused for tea, while the seeds can be used as condiments and spices. The pollen and roots are edible as well, with multiple health benefits, including cancer prevention (RABOANATAHIRY et al., 2021).

The plant is known for the high content of erucic acid and glucosinolates, which have poor nutritional values and possible negative health effects. The oil had more industrial applications until new cultivars, known under the trade name 'canola', were developed in Canada by conventional breeding, with low content of these compounds and therefore, more suitable for human and animal consumption. In English-speaking countries they are often called 'double-low' cultivars, while in Europe the terms HEAR and LEAR are used next to 'rapeseed' crops, representing varieties with high- and low-content of erucic acid, respectively. Further cultivars have been developed to modify the oil composition, such as low-linolenic and high-oleic varieties (WOODFIELD & HARWOOD, 2017). Presently, LEAR cultivars are used in the food industry, while HEAR varieties have other industrial applications, including soap production, synthetic rubbers, printing process illuminant, and biofuel (WOODFIELD & HARWOOD, 2017), pharmaceutical products, cosmetics fabrication, and pesticides (RABOANATAHIRY et al., 2021).

Rapeseed is one of the main crops used for biodiesel production in Europe, accounting for 50-70% of the European production as of 2008. It is suitable for cold climates, remaining fluid even at low temperatures, with delayed crystal formation. Rapeseed oil is biodegradable, representing a clean alternative to fuel, and it can also be blended with regular diesel fuels accelerating their decomposition. The use of rapeseed oil can reduce greenhouse gases emissions in the transport section by up to 90% compared to fossil diesel, the effect has already been observed in Europe, North America, and Canada (RABOANATAHIRY et al., 2021).

The crude oil contains undesirable substances that need to be removed to obtain a stable and edible product. As a consequence, the oil is subjected to different industrial treatments which result in a large number of byproducts, including rapeseed meal, rapeseed cake, deodorizer distillate, acid oil, soapstock, hull, and fibers, that represent a source for further high-value products and uses (JAFARIAN ASL & NIAZMAND, 2022). Isolation of valuable compounds from byproducts of rapeseed oil production is in alignment with the present concept of circular economy and complete use of crop harvest (QUINN et al., 2017). Rapeseed cakes are a possible source of phenolic compounds like sinapinic acid and protocatechuic acid, that have multiple health benefits (QUINN et al., 2017). Along with rapeseed meals, they are a protein-rich source of animal fodder and can be used as fuel, biogas substrate, or fertilizer (JAFARIAN ASL & NIAZMAND, 2022). The soapstock can be used in animal feed, biodiesel synthesis, soaps, and detergents, while deodorizer distillate can be used in biodiesel production and as a source of valuable phytochemicals with broad applications (JAFARIAN ASL & NIAZMAND, 2022).

Rapeseed is also a melliferous species, honey bee pollination increases the seed production and yield (NEDIĆ et al., 2013; XIE et al., 2011). Cultivation of rapeseed crops can prevent soil erosion, has an important impact on agricultural sustainability in semi-arid and arid climates (MA et al., 2019), and is a good pre-seed for cereals and autumn forage crops (AXINTE et al., 2006; JITĂREANU et al., 2020; MOGÂRZAN, 2012). Other uses include phytoremediation of polluted environments and commercialization as an ornamental plant (RABOANATAHIRY et al., 2021).

Rapeseed crops in Romania

In Romania, the area sown with rapeseed has fluctuated in recent years between 456 thousand ha in 2016, 598 thousand ha in 2017, 632 thousand ha in 2018, 352 thousand ha in 2019, and 342 thousand ha in 2020 (MADR - Ministerul Agriculturii Și Dezvoltării Rurale, 2020). Currently, the best growing conditions for rapeseed in Romania are considered to be the plain of Banat and Crișana, central Transylvania, the southern forest regions, southern Dobrogea, and the southern half of the Siret plain. In these areas, the best results are obtained on alluvial soils, ravenous soils, and where the snow is not blown away (AXINTE et al., 2006; MOGÂRZAN, 2012). The development of hybrids has facilitated the expansion of this crop, allowing it to be successfully cultivated in various pedo-climatic conditions. In this study, we evaluated a series of morphological, biochemical, and productivity aspects of 5 rapeseed variants and hybrids in the pedo-climatic conditions of the Crisurilor Plain in Western Romania, testing their efficiency with the prospect of expanding the cultivation area and production capacity.

MATERIAL AND METHODS

The following materials and methods were used in the experiments:

- alluvial soil with pH = 7 - 7.5, humus = 3.1 - 3.9%, clay = 33 - 35%, depth to groundwater = 50 - 60 cm, mobile Phosphorus = 13.44 mg/100g soil, and total Nitrogen = 0.16 - 0.18 mg/100g soil;
- 20 m^2 plots, L = 10 m, W = 2m, 3 m wide buffer, 2 m between repetitions and 0.5 m paths between variants (SĂNDOIU, 2012);
- seeds of *Brassica napus* L. of the Perla variety and hybrids PR46W29, Maximus PT225, Maximus PT234, and Sherpa;
- plowing was carried out at 20 - 22 cm depth, leveled, and kept free of weeds until sowing (JITĂREANU et al., 2020);
- in September before sowing, the seedbed was disked with a harrow and prepared with a combiner 3 - 4 cm deep (JITĂREANU et al., 2020);
- sowing was done in autumn, in the first decade of September, 3 cm deep;
- after sowing, the seeds were rolled with a ring roller;
- the main weeds, diseases, and pests were combated throughout the growing season with specific care work. The main weeds occurring in rapeseed crops are *Elytrigia repens* – common couch, *Amaranthus* sp. - pigweeds, *Capsella bursa pastoris* - shepherd's purse, *Chenopodium* sp. - goosefoots, *Digitaria* sp. - crabgrass, *Echinochloa crus-galli* – cockspur grass, *Galium aparine* - cleavers, *Lamium purpureum* – purple dead-nettle, *Tripleurospermum inodorum* - scentless chamomile, *Papaver rhoeas* – common poppy, Setaria sp. - foxtail, *Sinapis arvensis* - wild mustard, *Sorghum halepense* – Johnson grass, *Stellaria media* - chickweed, *Thlaspi arvense* – field pennycress, and *Veronica hederifolia* – ivy-leaved speedwell (JITĂREANU et al., 2020). The main diseases in rapeseed crops are *Alternaria brassicae* – alternaria black leaf spot, *Botrytis cinerea* - grey mold, *Erysiphe cruciferarum* – powdery mildew of crucifers, *Phoma lingam* – blackleg disease, and *Sclerotinia sclerotiorum* - white mold (AXINTE et

al., 2006; MOGÂRZAN, 2012). The main pests in rapeseed crops are *Athalia rosae* – turnip sawfly, *Brevicoryne brassicae* – cabbage aphid, *Ceutorhynchus assimilis* – cabbage seed pod weevil, *Ceutorhynchus quadridens* – cabbage stem weevil, *Ceutorhynchus napi* – rape stem weevil, *Dasineura brassicae* – brassica pod midge, *Tropinota hirta* – apple blossom beetle, *Meligethes aeneus* – common pollen beetle, and *Psylliodes chrysocephala* – cabbage-stem flea beetle (AXINTE et al., 2006; MOGÂRZAN, 2012).

Fertilization was done when preparing the seedbed with NPK complex fertilizer: N = 120 kg/ha, P = 60 kg/ha and K = 70 kg/ha (AXINTE et al., 2006; MOGÂRZAN, 2012). The single-factor experiment was performed with 5 genotypes of autumn rapeseed under normal technical conditions, in 4 replicates (SĂNDOIU, 2012). The following genotypes of autumn rapeseed were used as experimental variants:

V1 - PR46W29 4; V2 - Maximus PT225; V3 - Maximus PT234; V4 - Sherpa; V5 - Perla, V6- medium (ISTIS Catalog, 2020; Pioneer Catalog, 2015).

RESULTS AND DISCUSSIONS

Climate conditions in 2020- 2021 in Arad

The conditions of temperature, precipitation, nebulosity, and relative humidity didn't register significant differences from the multiannual average (Meteoblue Database).

Temperatures during the rapeseed growing season, i.e. September 2020 - July 2021, were similar to the multiannual average. Relative humidity, during the growing season, ranged from 40% to 80% being considered acceptable for the growth and development of rapeseed plants. Rainfall was generally sufficient during most of the growing season, but the lack of sufficient rainfall in March-April affected genotypes that were sensitive to this parameter. During the period of fruit and seed formation, there was a partial lack of atmospheric humidity in the first part of the season, but also an increase in temperature, which reduced water and thermal comfort, with implications for plant growth and development, after which the rainfall in May and part of June made the parameters optimal for a good harvest. The average wind speed from March to June was below 40 km/hour and did not affect the fall or siliquae falling of rapeseed plants.

The climatic conditions in the years 2020-2021 in the area of the experimental crops were between parameters that allowed the normal growth and development of rapeseed plants (Figures 1 and 2).

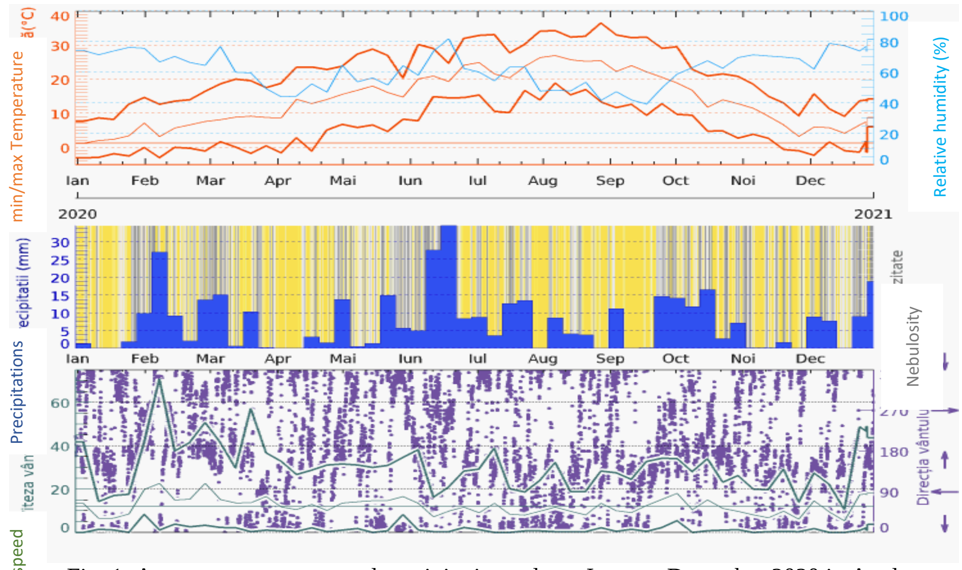

Fig. 1. Average temperature and precipitation values: January-December 2020 in Arad. (https://www.meteoblue.com- Arad Weather Archive, 2020).

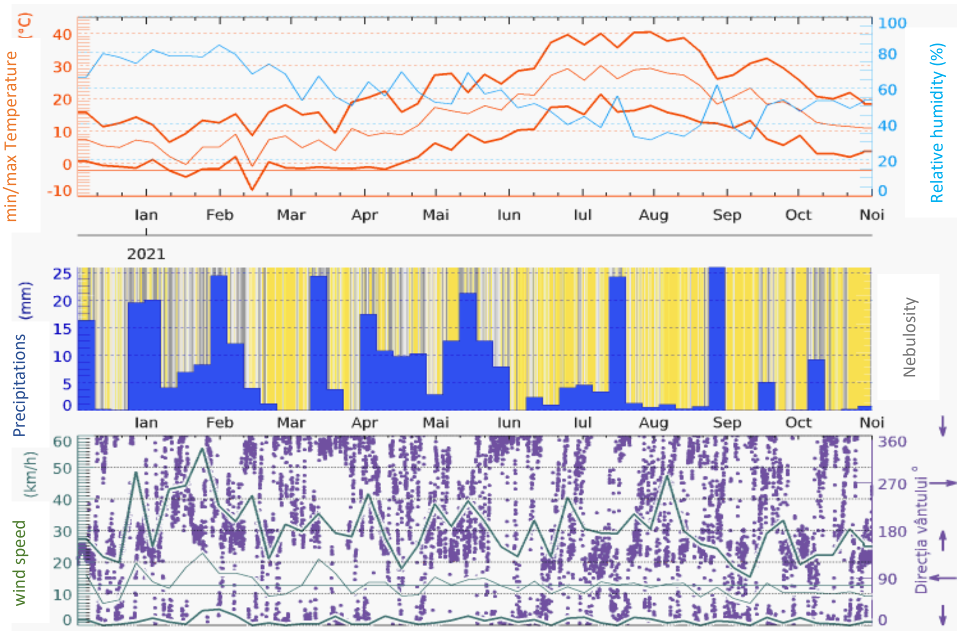

Fig. 2. Average temperature and precipitation values: January-November 2021 in Arad. (https://www.meteoblue.com- Arad Weather Archive, 2021).

The application of a cultivation technology recommended by specialists for the rapeseed crop revealed an increase in normal growth rates of the five genotypes studied.

The plant growth rate is the result of the interaction between the growth potential of the hybrid/trait grown and the influence of environmental conditions, along with the ability of the genotype to exploit the applied phytotechnical factors.

For the rapeseed variants studied, plant height ranged from 142 cm for the Perla variety to 171 cm for the Sherpa hybrid, with an average of 160 cm (control).

For the hybrids, the average plant height was 18 cm higher than for Perla (Table 1).

Table 1

Influence of climate and soil conditions on plant height for rapeseed

No.	Genotype	Plant height (cm)	Difference from the variant (cm)	Difference from the control (cm)
1	PR46W29	161	19	1
2	Maximus PT225	158	16	-2
3	Maximus PT234	168	26	8
4	Sherpa	171	29	11
5	Perla (variant)	142	-	-18
6	Control (average)	160	18	-

The number of branches on rapeseed plants averaged 14 per plant, with the Maximus PT225 and Maximus PT234 hybrids standing out positively with 16 and 15 branches per plant, respectively. The Perla variety had only 12 branches, with over 15% less than the average of the genotypes studied (Table 2).

Table 2

Influence of climate and soil conditions on the number of branches per plant for rapeseed

No.	Genotype	Number of branching (piece/plant)	Difference from the variant (piece/plant)	Difference from the control (piece/plant)
1	PR46W29	13	1	-1
2	Maximus PT225	16	4	2
3	Maximus PT234	15	3	1
4	Sherpa	14	2	0
5	Perla (variant)	12	-	-2
6	Control (average)	14	2	-

The first fruit set in rapeseed was 32.6 cm in Perla and 38.6 cm in Sherpa, with an average of 35.7 cm. The difference in first siliquae insertion between the four hybrids and the variety studied was 3.1 cm (Table 3). The number of siliquae per plant ranged from 132 pieces/plant in the Perla variety to 159 pieces/plant in the Sherpa hybrid, with the cultivated hybrids having 17 more fruits than the variety analyzed.

A good number of fruits per plant were obtained in Maximus hybrids PT234 and PR46W29 in which the siliquae were 155 pieces/plant, respectively (Table 4).

The mass of 1000 seeds was influenced by the characteristics of the genotypes studied, the soil and climatic conditions, and the cultivation technology, ranging from 5.31 g in the hybrid Maximus PT225 to 4.1 g in Perla.

The average mass of 1000 seeds in the variety and hybrids studied was 4.75 g.

Large seeds were also achieved by the hybrid Maximus PT234, where the MMB was 5.11 g. Among the hybrids studied, the lightest seeds were recorded for Sherpa and PR46W29 where the MMB was 4.42 g and 4.81 g, respectively (Table 5).

Table 3

Influence of climate and soil conditions on first siliquae insertion for rapeseed

No.	Genotype	Insertion length (cm)	Difference from the variant (cm)	Difference from the control (cm)
1	PR46W29	35,7	3,1	0
2	Maximus PT225	35,2	2,6	-0,5
3	Maximus PT234	36,3	3,7	0,6
4	Sherpa	38,6	4,0	2,9
5	Perla (variant)	32,6	-	-3,1
6	Control (average)	35,7	3,1	-

Table 4

Influence of climate and soil conditions on the number of siliquae per plant for rapeseed

No.	Genotype	Number of fruits (piece/plant)	Difference from the variant (piece/plant)	Difference from the control (piece/plant)
1	PR46W29	151	19	2
2	Maximus PT225	148	16	-1
3	Maximus PT234	155	23	6
4	Sherpa	159	27	10
5	Perla (variant)	132	-	-17
6	Control (average)	149	17	0

Table 5

Influence of climate and soil conditions on the 1000-grain mass (MMB) for rapeseed

No.	Genotype	MMB (g)	Difference from the variant (g)	Difference from the control (g)
1	PR46W29	4,81	0,71	0,06
2	Maximus PT225	5,31	1,21	0,56
3	Maximus PT234	5,11	1,01	0,36
4	Sherpa	4,42	0,32	-0,33
5	Perla (variant)	4,10	-	-0,65
6	Control (average)	4,75	0,65	-

The hectolitre mass (MH) of particular importance for silage was between 62.8 kg (Maximus PT225) and 66.6 kg (Perla), with an average of 64.1 kg (Table 6).

Table 6

Influence of climate and soil conditions on hectolitre mass (MH) for rapeseed

No.	Genotype	MH (Kg)	Difference from the variant (Kg)	Difference from the control (Kg)
1	PR46W29	65,1	-1,5	1,0
2	Maximus PT225	62,6	-4,0	-1,5
3	Maximus PT234	62,8	-3,8	-1,3
4	Sherpa	63,4	-3,2	-0,7
5	Perla (variant)	66,6	-	2,5
6	Control (average)	64,1	-2,5	-

The growth and development of rapeseed plants were good, resulting in high seed yields per unit area, averaging 4360 kg/ha.

Maximus PT225 hybrid obtained the highest seed yields, reaching 4558 kg/ha, while the Perla variety, although well adapted to the conditions encountered, achieved a yield of 3984 kg/ha, with 574 kg/ha less than the Maximus PT225.

The seed yield obtained from the 5 genotypes studied sustains the recommendation for their extension in crops in the area (Table 7).

Table 7

Influence of climate and soil conditions on seed production for rapeseed

No.	Genotype	Production (kg/ha)	Difference from the variant (kg/ha)	Difference from the control (kg/ha)
1	PR46W29	4338	354	-22
2	Maximus PT225	4558	574	198
3	Maximus PT234	4485	501	125
4	Sherpa	4438	454	78
5	Perla (variant)	3984	-	-376
6	Control (average)	4360	376	0

Rapeseed is a valuable protein source for human consumption, having a good balance of amino acid profiles, and up to 3 - 4 times higher proteins than rice and wheat (AIDER & BARBANA, 2011; PASTUSZEWSKA et al., 2000; RABOANATAHIRY et al., 2021; TAN et al., 2011).

The average protein content of analyzed seeds ranged from 20.91% in the Perla variety to 22.49% in the Maximus PT234 hybrid.

The average protein percentage in the variety and hybrids studied was 21.86% and can be considered valuable content (Table 8).

Table 8

Influence of climate and soil conditions on the percentage of protein in seeds for rapeseed

No.	Genotype	Proteins (%)	Difference from the variant (%)	Difference from the control (%)
1	PR46W29	21,73	0,82	-0,13
2	Maximus PT225	22,23	1,32	0,37
3	Maximus PT234	22,49	1,58	0,63
4	Sherpa	21,94	1,03	0,08
5	Perla (variant)	20,91	-	-
6	Control (average)	21,86	0,95	-0,95

Rapeseed is a plant whose seeds are mainly used in the extraction of edible oil and for biofuel. According to several studies, the fatty acid profile and additional compounds from rapeseed oil can justify the health benefits. Rapeseed oil consumption has positive effects on blood lipids and glucose, the cardiovascular system, and promotes fat loss. HOLL rapeseed oil (high oleic acid, low linolenic acid) is an edible oil more suited for frying than sunflower and palm oils, having better stability and oxidation resistance (RABOANATAHIRY et al., 2021).

The seeds' fat content for the genotypes tested ranged from 35.80% (Perla) to 42.79% (Maximus PT225), with an average of 40.92% (Table 9).

Rapeseed oil has the lowest saturated fatty acid content (6 - 8%) of all fatty acids in comparison with other vegetable oils (peanut – 17%, olive, and soybean – 15%, corn – 13%, sunflower – 12%), and is rich in mono- and polyunsaturated fatty acids, phytosterols and vitamins (E, K) (RABOANATAHIRY et al., 2021).

Table 9

Influence of climate and soil conditions on the percentage of fat in seeds for rapeseed

No.	Genotype	Fats (%)	Difference from the variant (%)	Difference from the control (%)
1	PR46W29	41,61	5,81	0,69
2	Maximus PT225	42,79	6,99	1,87
3	Maximus PT234	42,49	6,69	1,57
4	Sherpa	41,91	6,11	0,99
5	Perla (variant)	35,80	-	-5,12
6	Control (average)	40,92	5,12	-

The oleic acid content ranged from 21.58% in the variety Perla to 25.68% in the hybrid Maximus PT225.

Of the total fatty acids, oleic acid was present in an average of 24.56% in the genotypes studied (Table 10).

Table 10

Influence of climate and soil conditions on the percentage of oleic acid in seeds for rapeseed

No.	Genotype	Oleic acid (%)	Difference from the variant (%)	Difference from the control (%)
1	PR46W29	24,92	3,34	0,36
2	Maximus PT225	25,68	4,10	1,12
3	Maximus PT234	25,49	3,91	0,93
4	Sherpa	25,13	3,55	0,57
5	Perla (variant)	21,58	-	-2,98
6	Control (average)	24,56	2,98	-

The linoleic acid content averaged 8.2% with a plus in the hybrid Maximus PT225 where the concentration was 8.6% and a minus in the variety Perla where the concentration was 7.2% (Table 11).

Table 11

Influence of climate and soil conditions on the percentage of linoleic acid in seeds for rapeseed

No.	Genotype	Linoleic acid (%)	Difference from the variant (%)	Difference from the control (%)
1	PR46W29	8,3	1,1	0,1
2	Maximus PT225	8,6	1,4	0,4
3	Maximus PT234	8,5	1,3	0,3
4	Sherpa	8,4	1,2	0,2
5	Perla (variant)	7,2	-	-1,0
6	Control (average)	8,2	1,0	-

Glucosinolates (GLS) are the main sulfur component in rapeseed and when present in a high concentration in the rapeseed cake, they affect thyroid function, cause gastric disease in animals, and other nutritional disorders in poultry (ALEXANDER et al., 2008; FENWICK & CURTIS, 1980). GLS are harmful only when processed for animal fodder, the treatment causing the release of toxic products catalyzed by the myrosinase enzyme. The enzyme can be removed without affecting other bioactive compounds. Dietary GLS can't be assimilated by humans and other mammals, and are hydrolyzed to isothiocyanates and other cyanates that have antitumoral properties (RABOANATAHIRY et al., 2021).

The glucosinolate content in the variants studied averaged 11.6µmol/g, the most valuable genotypes being the hybrids Maximus PT225 and Maximus PT234 with a content of 11.5 µmol/g (Table 12).

Table 12

Influence of climate and soil conditions on the percentage of glucosinolates in rapeseed

No.	Genotype	Glucosinolates (µmol/g)	Difference from the variant (µmol/gr)	Difference from the control (µmol/gr)
1	PR46W29	11,6	-0,2	0,0
2	Maximus PT225	11,5	-0,3	-0,1
3	Maximus PT234	11,5	-0,3	-0,1
4	Sherpa	11,6	-0,2	0,0
5	Perla (variant)	11,8	-	0,2
6	Control (average)	11,6	-0,2	0,0

An economic analysis of the behavior of the five variants studied, under the pedo-climatic conditions of the Crișurilor Plain area, shows that they were efficient, with profits ranging between 3444 lei/ha (Perla) and 4352 lei/ha (Maximus PT225).
The results were good for both the hybrids and the variety analyzed, with an average profit of 4040 lei/ha, sustaining that the rapeseed crops were well adapted to the given conditions (Table 13).

Table 13

The influence of climate and soil conditions on economic efficiency for rapeseed

Genotype	Seed production (kg/ha)	Seed production value (lei/ha)	Profit (lei/ha)	Difference from the variant (lei/ha)	Difference from the control (lei/ha)
PR46W29	4338	6863	4004	560	-36
Maximus PT225	4558	7211	4352	908	312
Maximus PT234	4485	7095	4236	792	196
Sherpa	4438	7021	4162	718	122
Perla (variant)	3984	6303	3444	-	-596
Control (average)	4360	6899	4040	596	-

One tonne rapeseed = 1582 lei: Production cost/ha = 2859 lei;
Profit = production value - production cost of rapeseed.

CONCLUSIONS

Cultivation of the five genotypes of autumn rapeseed under the pedoclimatic conditions of Crișurilor Plain resulted in valuable morpho-physiological traits in all the variants tested. High yields were obtained in all hybrids, with a plus for the hybrid Maximus PT225, where the seed yield per unit area was 4558 kg/ha.

With yields of 3960 kg/ha, Perla proved to be a less viable variety for this crop in the study area. The average percentage of protein (21.86%) and fat (40.92%) was within good limits in all genotypes studied, with a minus in Perla compared to the hybrid variants analyzed. The percentages of oleic acid (24.56%), linoleic acid (8.2%), and glucosinolates (11.6 µmol/g) in the seeds recommend the analyzed genotypes for both human and animal consumption.

The best results from an economic point of view were obtained for the hybrid Maximus PT225 which with an income of 7211 lei/ha yielded a profit of 4352 lei/ha, followed by the hybrid Maximus PT234 with an income of 7095 lei/ha and a profit of 4236 lei/ha. The most inefficient crop variant tested, with a profit of 3444 lei/ha, was the Perla variety.

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