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EVALUATION OF WINTER RAPESEED AT THE FINAL STAGES OF THE BREEDING PROCESS WITH CONSIDERATION OF YEARLY CLIMATIC CONDITIONS

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The study aimed to determine the influence of key factors on the seed productivity of winter rapeseed genotypes under competitive variety testing conditions. The productivity of eight breeding lines and a standard cultivar was evaluated over three growing seasons (2023–2025). A total of nine genotypes were analyzed, with seed yield varying from 3.68 t/ha (KSV5/21) to 4.71 t/ha (KSV10/21). The standard cultivar *Champion of Ukraine* and the line KSV2/21 demonstrated comparable average yields of approximately 4.1 t/ha. The least significant difference ($LSD_{0.05}$) for genotype effects was 0.11 t/ha, confirming the statistical significance of differences among the studied genotypes. Variance component analysis revealed that the genotype factor accounted for the largest proportion of yield variability (69.6%), while the environmental conditions of the growing year contributed 18.7%, and other factors accounted for 11.7%. These results indicate that genotype plays a dominant role in determining yield performance under the given experimental conditions, whereas environmental variability exerts a moderate influence. Notably, approximately one-fifth of the yield variation was associated with year-specific climatic conditions, highlighting the importance of environmental factors in yield formation. However, the predominance of the genotype effect emphasizes the critical role of genetic potential and its realization in breeding programs. Among the evaluated genotypes, KSV10/21 exhibited the highest and most stable yield performance across the three years (4.71 t/ha), significantly outperforming the standard cultivar (*Champion of Ukraine*, 4.11 t/ha). This genotype can therefore be considered a promising candidate for further breeding and potential commercial deployment. The oil content of the studied material was primarily determined by genotype, indicating strong genetic control of this trait and a high level of stability across varying environmental conditions. This confirms the reliability of selecting for oil content within breeding programs targeting consistent quality traits.

Keywords: breeding, winter rapeseed, competitive variety testing, factor, yield, oil content

Introduction. Winter rapeseed (Brassica napus L.) is the second-largest oilseed crop worldwide and accounts for nearly 12% of global production of major vegetable oils. Over the past decade, rapeseed production, cultivated area, and yield have remained relatively stable (Qian Zheng et al., 2022; Mahmud Sobirjonov, 2022). Rapeseed ranks among the top three oilseed crops globally, alongside oil palm and soybean. As a result of breeding efforts, high-yielding cultivars have been developed that are free of erucic acid in the oil and contain low levels of glucosinolates in the meal. On the global market, this quality is referred to as "canola". Due to its nutritional value and health benefits, particularly its ability to regulate cholesterol levels, canola-

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quality rapeseed oil ranks among the leading edible oils worldwide. The application of advanced breeding technologies has contributed to an expansion of cultivated areas and, consequently, to significant increases in seed production and high-quality oil output since 1994. Since 2020, rapeseed has been grown in more than 66 countries, with the global cultivated area reaching approximately 35 million hectares (FAOSTAT, 2022). Over the past decade, global rapeseed production has increased by 12.5 million tons (20.9%), reaching approximately 72.3 million tons, while rapeseed oil production has increased by 15.3% to 26.3 million tons, accounting for about 35.9% of total rapeseed production.

In Ukraine, winter rapeseed ranks third among oilseed crops in terms of cultivated area, following sunflower and soybean, and consistently occupies 0.9–1.2 million hectares annually. This is driven by high demand for rapeseed as a raw material for the food industry, technical applications (including biodiesel), and other industrial sectors, as well as by its high economic return (Chekhova, 2021). One of the key approaches to increasing total seed production, alongside intensification of cultivation practices, is the introduction of new high-yielding cultivars and hybrids (Babii, 2015). Global experience in the cultivation of major crops, including rapeseed, clearly demonstrates the advantages of modern cultivars and hybrids over older population varieties (Dolgikh, 2009; Sytnik et al., 2001).

Considering ongoing climate change and significant deviations in temperature and precipitation from long-term averages, there is a growing need to evaluate genotype performance using both direct and indirect productivity indicators (Wilson et al., 2021; Sytnik, 2005).

Under winter rapeseed cultivation, productivity is influenced by a wide range of factors, particularly agroclimatic conditions, which cannot be directly controlled. Weather conditions play a critical role in overwintering success and are closely associated with the level of cultivation intensification (Zabarnyi et al., 2023). Different cultivars, hybrids, and breeding lines respond differently to environmental conditions, especially during overwintering, resulting in variability in productivity depending on the year (Tovpyha, 2025).

At present, due to significant climate change, it is increasingly difficult to reliably predict the performance of a genotype or cultivar in future years. Considering that the breeding process of winter rapeseed lasts 8–12 years—from hybridization and early selection stages to the identification of promising lines in competitive variety testing and their subsequent submission for official examination (scientific and technical evaluation) at the Ukrainian Institute for Plant Variety Examination (UIPVE)—the issue of adequately assessing the potential of available breeding material across years becomes particularly important (Moroz, 2001, 2006; Lykhochvor, 2002; Slisarchuk et al., 2014).

Breeding of new winter rapeseed cultivars and hybrids at the National Scientific Center “Institute of Agriculture of NAAS” has been conducted in the Kyiv region, which belongs to the northern Forest-Steppe zone. The climate of this region is moderately continental, characterized by relatively hot summers, mild winters, and unstable moisture supply. According to long-term data, annual precipitation in the Kyiv region ranges from 480 to 620 mm; however, significant deviations from these values are observed in individual years. Most precipitation occurs during the warm period (April–October). The mean annual air temperature is +6.0 to +7.0 °C. The average long-term temperature of the warmest month (July) is +20.0 to +22.0 °C, while that of the coldest month (January) is approximately −6.0 °C. The duration of the warm

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period with temperatures above 0 °C is 170–180 days, although it may vary between 145 and 215 days depending on the year. Despite generally favorable conditions in May, short-term cold spells and even late frosts may occur during the second and third decades of the month, temporarily affecting crop growth and development.

The impact of climate change on the geographical conditions of rapeseed cultivation (e.g., in the Kharkiv region) is a critical factor influencing plant productivity (Shulika et al., 2022). The optimization of rapeseed yield and growth duration through adaptive crop management under changing climate conditions is also highly relevant (Xinhao et al., 2022). Low-temperature stress adversely affects germination, plant growth, and phenological development, ultimately reducing productivity and altering the progression of organogenesis stages (Bhattacharya, 2022; Doherty, 2022; Hájková et al., 2021). Additionally, sowing dates significantly influence rapeseed morphology, phenology, and thermal requirements (Langangmeilu et al., 2023; Li et al., 2022). Numerous studies have also reported the response of winter rapeseed to delayed cultivation practices under varying environmental conditions (Rezaizad et al., 2025).

Moisture availability during and after flowering has a substantial effect on oil accumulation and fatty acid composition in seeds (Khalatbari et al., 2025), which has become increasingly relevant in recent years for the region where the breeding institution is located.

Thus, a critical research priority is the evaluation of seed productivity and oil content in breeding lines developed at the National Scientific Center “Institute of Agriculture of NAAS” under varying agroclimatic conditions, as well as the identification of the main factors influencing their expression. This approach will facilitate the acceleration of the breeding process by enabling early-stage selection and elimination of less promising material based on key influencing factors.

The aim of this study was to determine the influence of environmental and genetic factors on seed yield and oil content in winter rapeseed genotypes under competitive variety testing, with particular emphasis on their stability in relation to the environmental index.

Materials and Methods. The following research methods were applied: measurement-weight, analytical, calculation-comparative, statistical, analysis of variance (ANOVA), and regression analysis (Dospekhov, 1985; Moroz, 2006; Slisarchuk, 2014; Kyrychenko, 2010).

The research material consisted of breeding lines of winter rapeseed evaluated in competitive variety trials during 2022–2025. Experimental plots had an accounting area of 20 m² and were arranged in four replications using a randomized design.

The study was conducted within the breeding crop rotation system of the National Scientific Center “Institute of Agriculture of NAAS” during 2022–2025. The natural and climatic conditions of the region are characterized by unstable moisture supply, frequent fluctuations in temperature and precipitation during the growing season, which significantly affect crop development and soil fertility formation.

The soil of the experimental site is classified as typical chernozem, coarse-silty light loam developed on loess parent material, with an arable layer of 0–30 cm, slightly acidic soil reaction (pH 6.1), and moderate humus content (3.2%).

The main factors studied in the experiment included the environmental index, the effect of the growing year on seed yield and oil content, and the genotype (cultivar/line).

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Seed yield was determined by weighing harvested seeds from each plot and converting the data to t/ha at a standard moisture content of 10%. Oil content and erucic acid content in seeds were determined under laboratory conditions using an infrared analyzer.

Chromatographic analysis was performed using a gas chromatograph (Agilent 7820A GC System) equipped with a flame ionization detector (FID) and a DB-FFAP capillary column (30 m × 0.32 mm × 0.25 μm). Helium was used as the carrier gas at a flow rate of 2.2 mL/min. Combustion gases included hydrogen and air. The injector temperature was set at 250 °C, the FID temperature at 300 °C, and the sample injection volume was 1 μL.

Results and Discussion. Considering that the expression of a varietal trait is influenced by a wide range of factors, the productivity of eight breeding lines and a standard cultivar in competitive variety testing over the last three years was analyzed to clearly determine the effect of the main factor, namely the growing year.

Given the considerable deviations in temperature regime and precipitation levels observed over the last five years, breeders face the challenge of identifying the most stable breeding material for submission as a candidate cultivar.

The study period (autumn 2022–summer 2025) was generally characterized by insufficient moisture supply, while air temperatures exceeded the long-term average values. Data on air temperature regime and precipitation averaged over 2022–2025, recorded by the meteorological station of the National Scientific Center "Institute of Agriculture of NAAS" in Chabany settlement, Kyiv Region, are presented in Figures 1 and 2.

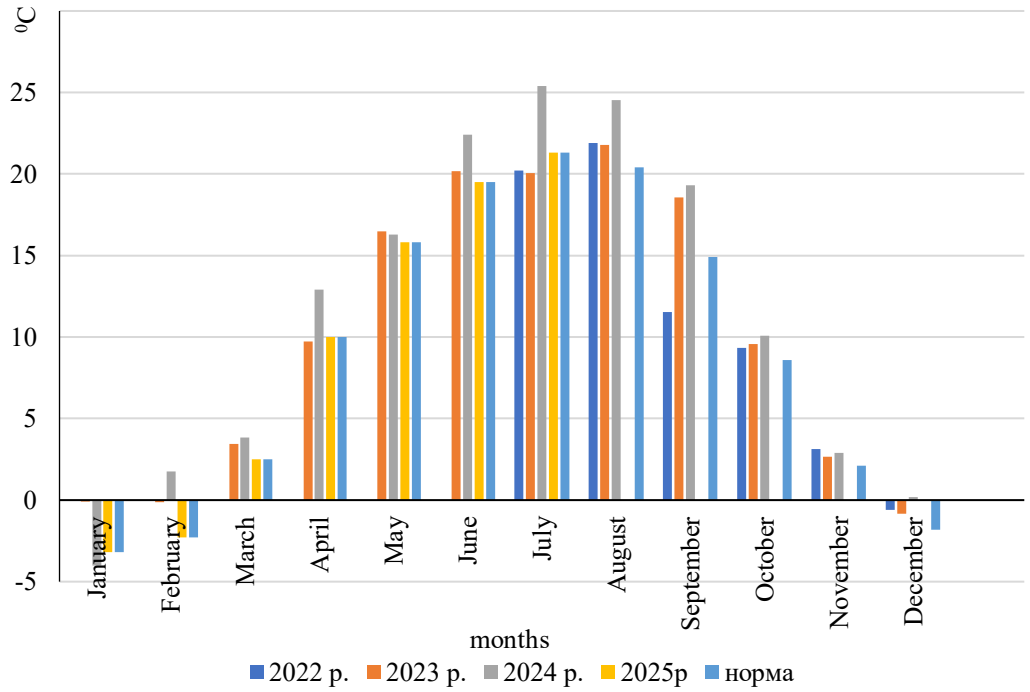

Fig. 1. **Air temperature during the growing season of winter rapeseed, Chabany settlement (Kyiv Region), average for 2022–2025**

Source: developed by the author

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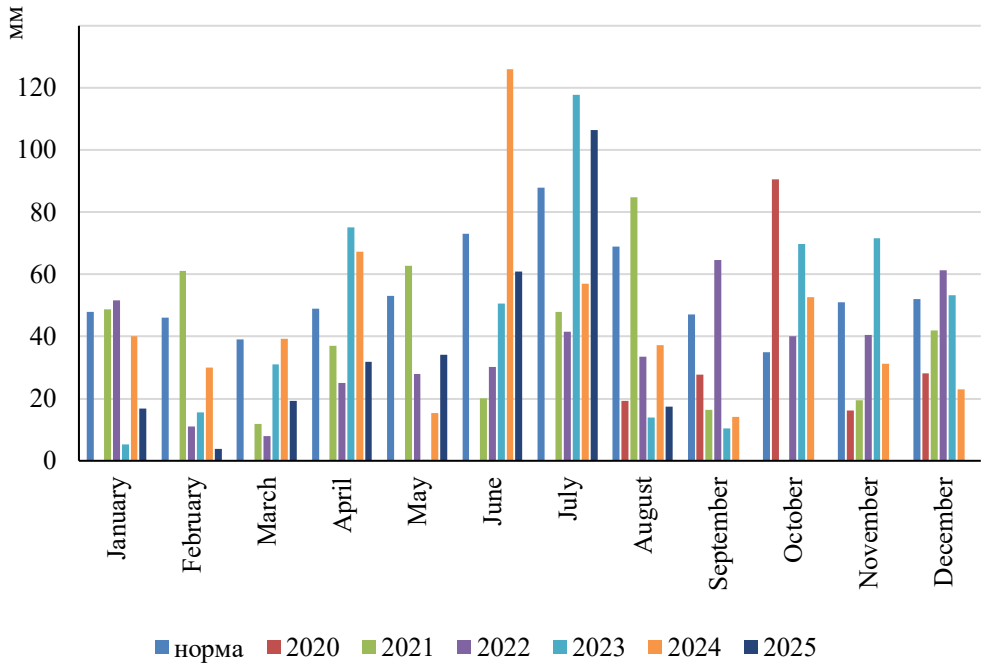

Fig. 2. **Precipitation during the growing season of winter rapeseed, Chabany settlement (Kyiv Region), average for 2022–2025**

Source: developed by the author

In most years of the study, mean monthly air temperatures significantly exceeded the long-term averages for the respective months, particularly from May to September in 2023–2024, which adversely affected pollination and, consequently, the productivity of winter rapeseed plants.

The agroclimatic conditions of 2022–2025, in terms of precipitation, were generally unfavorable for winter rapeseed. Insufficient rainfall during autumn periods limited the development of a well-established root system (root collar diameter did not exceed 5 mm). In addition, atmospheric and soil drought during June–July contributed to a high level of pod abortion in winter rapeseed, which negatively affected yield structure and overall productivity. In particular, the lack of precipitation in July significantly reduced yield performance due to a decrease in thousand seed weight and the number of well-filled seeds per pod.

To assess the contribution of major factors to the productivity of winter rapeseed genotypes in competitive variety trials, analysis of variance (ANOVA) was applied (Pokudin, 1973; Yurchuk et al., 2021; Eberhart et al., 1966).

The results indicate variability in yield performance among breeding lines depending on the environmental conditions of the study year. The lowest yield was recorded in 2024, whereas significantly higher values were obtained in 2023 and 2025 (Table 1). For the factor “year,” the least significant difference ($LSD_{0.05}$) was 0.07 t/ha, indicating that the differences in average yield between years were statistically significant: 0.36 t/ha between 2024 and 2023, and 0.30 t/ha between 2024 and 2025. The contribution of the “year” factor to the total variation in yield was 18.7%, indicating that approximately one-fifth of the observed yield was determined by the environmental conditions of the growing year.

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Table 1

Results of analysis of variance (ANOVA) of winter rapeseed breeding lines in competitive variety trials for seed yield and oil content (2023–2025)

Factor of influence	Seed yield and oil content									$LSD_{0.05}$ for factors	Contribution of factors, %	Overall $LSD_{0.05}$
Seed yield, t/ha												
Year	Yield performance across the years of study (average for the variety trial)									0.07	18.7	0.20
	2023			2024			2025					
	4.33			3.97			4.27					
Genotype	Yield performance of lines in variety trials (average over the years of testing)									0.11	69.6	
	1*	2 KKSV2/21	3 KKSV3/21	4 KKSV4/21	5 KKSV5/21	6 KKSV6/21	7 KKSV7/21	8 KKSV8/21	9 KKSV10/21			
	44.11	44.10	44.54	33.94	33.68	44.67	44.02	33.92	44.71			
Other	–										11.7	
Seed oil content, %												
Year	Oil content across the years of study (average for the variety trial)									0.17	-0.02	0.51
	2023			2024			2025					
	46.43			46.43			46.43					
Genotype	Oil content of breeding lines in variety trials (average over the years of testing)									0.29	95.23	
	1*	2 KKSV2/21	3 KKSV3/21	4 KKSV4/21	5 KKSV5/21	6 KKSV6/21	7 KKSV7/21	8 KKSV8/21	9 KKSV10/21			
	444.5	448.1	448.6	443.8	445.5	448.7	446.5	446.8	445.4			
Residual factors	–										44.84	

Notes: * – standard cultivar: Champion of Ukraine.
Source: developed by the author

The contribution of "other" factors, which include sources not explicitly accounted for in the primary analysis (e.g., experimental error, factor interactions, and local environmental conditions), amounted to 11.7%. These factors can therefore be considered minor, confirming the high methodological quality of the experiment and the reliability of the obtained results.

Over the years of study, the average seed yield of winter rapeseed breeding lines ranged from 3.68 t/ha (KSV5/21) to 4.71 t/ha (KSV10/21). The standard cultivar Champion of Ukraine and the line KSV2/21 showed similar average yields of approximately 4.1 t/ha. The least significant difference ($LSD_{0.05}$) for the factor "genotype" was 0.11 t/ha, representing the threshold for determining significant differences between breeding lines and the standard cultivar. It was established that the genotype factor had the greatest contribution to the total variation in yield, accounting for 69.6%. This indicates a strong genetic control of seed yield expression in the breeding material and highlights the importance of selecting appropriate initial material to achieve maximum efficiency in breeding programs.

The most stable and high-yielding genotype over the three-year study period was KSV10/21 (4.71 t/ha), which significantly outperformed the standard cultivar (Champion of Ukraine, 4.11 t/ha).

The difference between the maximum and minimum average yield values was 1.03 t/ha (4.71–3.68 t/ha), representing a substantial range for field trials and indicating considerable genetic variability among the studied genotypes.

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The overall $LSD_{0.05}$ value was 0.20 t/ha, which serves as a general threshold for comparing any two mean values across the entire dataset. This enables the reliable selection of superior genotypes for further testing and the identification of promising candidates for variety registration. In this context, application No. 2025040043 has been submitted for official scientific and technical examination at the Ukrainian Institute for Plant Variety Examination (UIPVE) for the winter rapeseed cultivar Pluton (KSV10/21), dated October 27, 2025.

Further research should focus on high-yielding genotypes, particularly KSV3/21 and KSV6/21. Considering the significant influence of the year factor, it is recommended to evaluate genotype adaptability under variable environmental conditions.

The analysis of factors influencing oil content in seeds of winter rapeseed breeding lines showed that oil content was predominantly determined by the genotype factor (95.23%), indicating strong genetic control of this trait, whereas other factors accounted for only 4.84% of the variation. The factor "year" had no significant effect on oil accumulation in seeds.

To determine the effects of the "year" and "genotype" factors on oil content formation, an analysis of variance (ANOVA) of experimental data obtained during 2023–2025 was performed.

On average across the years of study, the oil content was 46.43%. The analysis of variation across years revealed no significant differences, as the mean values in 2023, 2024, and 2025 were identical (46.43%). The differences between years did not exceed the least significant difference ($LSD_{0.05}$ = 0.17), indicating that the effect of the "year" factor on this trait was statistically insignificant.

In contrast, a significant effect of the genotype factor was observed. The average oil content among the genotypes ranged from 43.8% (KSV4/21) to 48.7% (KSV6/21). The range of variation was 4.9%, which substantially exceeded both the $LSD_{0.05}$ for the genotype factor (0.29) and the overall $LSD_{0.05}$ (0.51), confirming the statistical significance of differences among genotypes.

The contribution of factors to trait variation showed that genotype played a dominant role, accounting for 95.23% of the total variability, whereas the influence of the year was negligible and statistically insignificant (–0.02%).

Oil content values for each genotype were identical across the three years (2023–2025), indicating the absence of temporal variation and demonstrating high stability of this trait. The mean values fully corresponded to the annual data.

The highest oil content was recorded in KSV6/21 (48.7%), KSV3/21 (48.6%), and KSV2/21 (48.1%). Intermediate values (45.5–46.8%) were observed in KSV8/21, KSV7/21, KSV10/21, and KSV5/21. The lowest oil content was found in KSV4/21 (43.8%) and the standard cultivar Champion of Ukraine (44.5%).

The difference between the minimum (43.8%) and maximum (48.7%) values was 4.9%, representing a considerable range for breeding material. Thus, all genotypes exhibited stability across years, while the difference between the best and the least performing genotype approached 5%.

Additionally, an evaluation of winter rapeseed genotypes at the final stages of the breeding process was conducted based on stability and plasticity parameters of productivity. Standard cultivars were assessed using stability and plasticity indices derived from yield data over the preceding three years.

To characterize the breeding lines according to the studied traits, stability parameters were calculated, including the regression coefficient (b_i) and the variance of

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deviations from regression (S_i^2). A higher value of the regression coefficient indicates a stronger response of the genotype to environmental changes. The magnitude of variation is characterized by the variance (S_i^2): the lower its value, the more stable the genotype with respect to the trait.

Table 2 presents the results of the evaluation of plasticity (b_i) and stability (S_i^2) of winter rapeseed genotypes based on seed yield during 2023–2025. The methodology is based on genotype–environment interaction analysis, allowing the assessment of genotype response to environmental variability and their ability to maintain stable productivity.

Table 2

Plasticity and stability parameters of winter rapeseed genotypes based on seed yield

№	Genotype name	Yield, t/ha				Plasticity (b_i)	Stability (S_i^2)
		2023	2024	2025	Mean		
1	Champion of Ukraine (St.)	3.81	4.02	4.51	4.11	1.1	0.0
Конкурсне сортовипробування							
2	KSV2/21	4.28	3.98	4.05	4.10	0.9	0.0
3	KSV3/21	4.53	4.23	4.87	4.54	2.8	0.1
4	KSV4/21	4.11	3.8	3.91	3.94	1.1	0.0
5	KSV5/21	3.89	3.56	3.58	3.68	0.9	0.0
6	KSV6/21	4.64	4.38	4.98	4.67	2.6	0.1
7	KSV7/21	4.19	3.85	4.02	4.02	1.4	0.0
8	KSV8/21	4.03	3.65	4.08	3.92	2.3	0.1
9	KSV10/21	4.92	4.29	4.92	4.71	3.6	0.1
	Means	4.56	4.40	4.58	4.51		
	Environmental index	0.048	–0.116	0.067			

Source: developed by the author

The average seed yield of the studied genotypes over the years was 4.51 t/ha, ranging from 3.68 to 4.71 t/ha. The highest average yield was recorded for KSV10/21 (4.71 t/ha), followed by KSV6/21 (4.67 t/ha) and KSV3/21 (4.54 t/ha), indicating their high productive potential. The lowest yield level was observed in KSV5/21 (3.68 t/ha).

The assessment of ecological plasticity (b_i) revealed substantial differences among genotypes. The highest plasticity coefficients for seed yield were recorded in KSV10/21 (b_i = 3.6), KSV3/21 (b_i = 2.8), and KSV6/21 (b_i = 2.6), characterizing them as intensive genotypes capable of markedly increasing productivity under improved growing conditions. In contrast, KSV2/21 and KSV5/21 (b_i = 0.9) showed a weaker response to environmental changes and can be classified as more environmentally stable genotypes.

The stability parameter (S_i^2) in most of the studied genotypes was close to zero, indicating a high stability of seed yield expression; a similar response was also observed in the standard cultivar, despite the negative environmental index recorded in 2024. Low values of stability variance (0.1) in KSV3/21, KSV6/21, KSV8/21, and KSV10/21 indicate a slightly greater dependence of their productivity on environmental conditions, which is typical of high-yielding intensive genotypes.

Analysis of the environmental index showed that the most favorable conditions for yield formation occurred in 2025 (I = 0.067), whereas 2024 (I = −0.116) was characterized by less favorable growing conditions. In 2023 (I = 0.048), the conditions were close to average.

The results indicate substantial genetic differentiation among winter rapeseed genotypes in terms of productivity, plasticity, and stability. The most promising

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genotypes, combining high yield with the ability to respond effectively to improved growing conditions, were KSV10/21, KSV6/21, and KSV3/21. These genotypes are recommended for further breeding use and potential commercial deployment.

Differences in seed yield and oil content across years have also been reported in other studies. For instance (Zareei Siahbidi et al. 2020) demonstrated that the effect of the year (climate) significantly influenced phenology, seed yield, and yield components. Yield reduction due to delayed sowing varied across years and largely depended on climatic conditions, particularly autumn temperatures, which strongly affect overwintering. As a result, seed yield decreased by 24.4% and 38.9% due to delayed sowing in the first and second years, respectively.

In the present study, the primary factor determining seed yield in winter rapeseed was the genotype (69.6% contribution), whereas the year factor accounted for 18.7%, and other factors only 11.7%. This confirms the importance of selecting appropriate breeding material to achieve maximum performance while minimizing the influence of environmental variability. Similar findings were reported by (Rezaizad et al. 2025), whose combined ANOVA results revealed significant differences among rapeseed lines in the number of pods per plant, plant height, thousand seed weight, and grain yield, suggesting variable genotype responses to sowing dates and environmental conditions.

Likewise, the genotypes evaluated in this study indicate that environmental conditions contributed approximately one-fifth of yield variability, while genotype remained the dominant factor (69.6%). This supports the conclusion that seed yield is a genetically controlled trait with relatively high stability under varying environmental conditions, reflecting the robustness of the experimental design and the minimal influence of uncontrolled factors.

The formation of oil content in the studied material was predominantly determined by genotype, indicating strong genetic control of this trait and stable expression across different years. These findings enable a more informed selection of genotypes for production based on their genetic potential for oil content, which is essential for improving product quality.

Conclusions. 1. The primary factor determining seed yield in winter rapeseed was genotype (69.6%), while the contribution of the year factor was 18.7%, and other factors accounted for 11.7%.

2. The most stable and high-yielding genotype over the three-year period was KSV10/21 (4.71 t/ha), which significantly outperformed the standard cultivar (Champion of Ukraine, 4.11 t/ha).

3. Oil content did not vary significantly across the three years of study (2023–2025). The most promising genotypes in terms of oil content were KSV6/21, KSV3/21, and KSV2/21.

4. The high contribution of the genotype factor (95.23%) to oil content indicates that genetic characteristics are the main source of variation, whereas environmental conditions had minimal influence. The variation in oil content among genotypes (43.8%–48.7%) exceeded the threshold of statistical significance ($LSD_{0.05}$ = 0.29), enabling the identification of high-potential genotypes for breeding and production.

5. Based on the comprehensive evaluation of productivity, plasticity, and stability, the most promising genotypes for further breeding and practical application are KSV10/21, KSV6/21, and KSV3/21, as they combine high yield potential with favorable adaptive responses to environmental conditions..

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ОЦІНКА РІПАКУ ОЗИМОГО НА ЗАВЕРШАЛЬНИХ ЕТАПАХ СЕЛЕКЦІЙНОГО ПРОЦЕСУ

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Виявити вплив факторів на насіннєву продуктивність зразків озимого ріпаку в конкурсному сортовипробуванні. Проаналізовано продуктивність 8 зразків в конкурсному сортовипробуванні і стандарту за 2023-2025 роки ріпаку озимого. Наведено 9 зразків в яких врожайність коливається від 3,68 т/га (КСВ5/21) до 4,71 т/га (КСВ10/21). Сорт Чемпіон України (стандарт) та лінія КСВ2/21 мають схожу середню врожайність близько 4,1 т/га. Статистична значущість (НІР05 для фактора) для зразків становить 0,11 т/га. Чітко прослідковується, що частка фактору в урожаї насіння становить 18,7%, а на фактор сорту припадає – 69,6%, тоді як на всі інші фактори лише – 11,7%. Таким чином п'яту частину у врожайності формує фактор умов року вирощування. Отже основним фактором, що визначає рівень врожайності в цьому експерименті, є сорт (69,6% впливу). Це підтверджує важливість правильного вибору вихідного матеріалу для досягнення максимальних результатів в селекційній роботі. Найбільш стабільним і врожайним перспективним зразком на протязі 3-років є КСВ10/21 (4,71 т/га), який значно переважає сорт-стандарт (Чемпіон України з показником 4,11 т/га). Формування вмісту олії у досліджуваному матеріалі визначалося переважно сортовими особливостями, що свідчить про високу генетичну зумовленість ознаки та стабільність її прояву в різних роках досліджень.

Ключові слова: селекція, ріпак озимий, конкурсне сортовипробування, фактор, урожайність, олійність

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