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# The ecological plasticity and stability of high-oleic sunflower varieties (*Helianthus annuus* L.) in terms of their major fatty acid content

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**Purpose.** To determine the role of varietal genetic characteristics, growing conditions, and their interaction in the formation of the fatty acid (FA) composition of oil, as well as to assess the adaptive capacity and stability of the synthesis of major fatty acids in high-oleic (HO) sunflower varieties. **Methods.** Biochemical (gas chromatography) and statistical methods (analysis of variance, correlation and regression analyses). **Results.** An assessment of the effects of soil and climatic growing conditions, as well as genotype, on the fatty acid (FA) composition of sunflower oil revealed that varietal affiliation was the most influential factor in determining variations in oleic and linoleic acid content, accounting for 66% of total variation. Weather conditions of the year contributed 11% to the variability of oleic acid content, while the interaction of factors “location × year” explained an additional 11%, highlighting the role of environmental variability in the realization of the genetic potential of the varieties. The highest ecological plasticity for oleic acid content was observed in the varieties ‘AM PRESTIGE’ and ‘P64GE233’, which combined high ecological plasticity coefficients ($b_i$) with low stability variance ($W_i$), allowing them to be classified as intensive-type genotypes. For linoleic acid content, the varieties ‘AM KLP 25’, ‘IR Polysk’, and ‘IR Legat’ exhibited the greatest plasticity. The content of palmitic acid was largely determined by the genotype factor (64%) and the interaction “location × year”, whereas stearic acid content was predominantly influenced by weather conditions (79%). A strong negative correlation was identified between oleic and linoleic acid contents ($r = -0.93$; $R^2 = 0.87$). **Conclusions.** HO sunflower varieties are characterized by a high level of genetically determined stability of fatty acid composition, while simultaneously maintaining the ability to effectively realize their potential for enhanced oleic acid synthesis under favorable growing conditions. The assessment of ecological plasticity and stability revealed that the varieties ‘AM PRESTIGE’ and ‘P64GE233’ can be classified as intensive types with respect to oleic acid content, whereas the varieties ‘IR Polysk’, ‘AM KLP 25’, and ‘IR Legat’ demonstrated intensive responses for linoleic, palmitic, and stearic acid contents. The absence of extensive-type genotypes indicates stable expression of the HO phenotype across all studied varieties, regardless of growing conditions.

***Keywords:*** *sunflower varieties; fatty acid composition; effects of growing factors; adaptive capacity; statistical analysis.*

## Introduction

The sunflower (*Helianthus annuus* L.) is the fourth most important source of vegetable oil, after soya, palm and rapeseed. It accounts for up to 12% of global edible oil production. Sunflower oil is primarily used for food purposes and is considered a premium commodity on the international oil market [1]. It contains more than ten fatty acids, including the four main ones: saturated palmitic acid (C16:0) and stearic acid (C18:0), monounsaturated oleic acid (C18:1), and polyunsaturated linoleic acid (C18:2) [2]. Traditional sunflower oil is naturally rich in linoleic acid, accounting for around 70% of the total oil content, while oleic acid accounts for around 20%. The growth of the edible fats market is accompanied by a growing demand for both standard types of oil and vegetable oils with a modified fatty acid (FA) composition.

Compared with traditional sunflower oil, high-oleic (HO) sunflower oil contains over 70%

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oleic acid, while polyunsaturated fatty acid content is low. Sunflower oil with a high oleic acid content is a promising substitute for palm oil in food technology [4]. Thanks to its high oxidative stability, this oil is more heat-resistant during frying and heating, less prone to rancidity, and has a longer shelf life. It contains no trans fatty acids, enhancing its health benefits [5].

The genetic characteristics of plants are the most important factor in determining the FA composition of oil. However, environmental conditions, particularly the level of water supply during plant growth, also significantly influence the fatty acid content and characteristics of sunflower oil. Seed yield and oil content in sunflowers are the main indicators that are sensitive to a lack of moisture during flowering and reproductive development [6]. Air temperature is also a key environmental factor that influences the FA composition of seed oil. One mechanism by which seeds adapt to adverse conditions is to reduce the level of unsaturated fatty acids. The fatty acid composition of the oil is determined by temperature conditions during the physiological ripening period, which regulate the activity of the oleate desaturase enzyme (FAD2-1). There is a non-linear relationship between oleic acid content and minimum night-time temperature [7]. In traditional varieties, the difference in oleic acid content between regions at different latitudes can be 25–30%. However, the influence of latitude on oleic acid content is significantly less pronounced among HO genotypes carrying the *Pervenets* mutation, with a reduction of just 8–10%. This influence is almost nonexistent in HO varieties with the *NM1* mutation, which has been identified in nearly isogenic sunflower lines and is associated with the oversynthesis of oleic acid [8].

Research findings [8] suggest that the FA composition of oil is formed through the combined influence of genetic factors and environmental conditions, with genotype playing a leading role. However, the extent to which this occurs varies significantly depending on environmental parameters. The authors prove that the variability of unsaturated fatty acids is determined not only by direct genetic control but also by a complex three-factor interaction of "mutation × genetic background × environment", with temperature conditions – particularly minimum night-time temperatures during the seed-filling period – significantly influencing FA synthesis. The results presented in [6] confirm that the factors "genotype", "environment" and their interaction all made a statistically significant contribution to the formation of the fatty acid profile. Particular emphasis is placed on the influence of the water regime, specifically drought, which increases the proportion of saturated fatty acids. A review of the literature suggests that genotype determines the fundamental potential of the fatty acid profile, but its phenotypic expression is a dynamic process influenced by climatic conditions, agroecological factors, and their interaction [9].

The "genotype × growing conditions" interaction is a common research topic in crop breeding and agricultural crop studies, as different genotypes respond differently to changes in environmental conditions [10]. The method of analysis of variance (ANOVA) is used to quantitatively assess the contribution of genotype, environment and their interaction to the formation of the traits under study. This method allows the sources of variation to be structured and their relative significance to be assessed [11]. The results obtained by the authors [11] demonstrate the analytical value of this approach. It allows for a well-founded interpretation of the role of each factor in trait formation and enables a shift from descriptive genotype comparisons to structured analyses of sources of variation. Therefore, ANOVA is not merely a formal procedure for testing significance; it is also a tool for determining the quantitative contribution of individual factors to the overall structure of trait variation.

The adaptive properties of varieties in different environments are characterised by indicators of ecological plasticity and stability. These reflect the plants' ability to respond to changes in growing conditions while maintaining a relatively stable level of productivity. Ecological plasticity ($b_i$) is determined by the regression coefficient of the trait under study relative to the environmental index. This index is calculated based on the mean values of all genotypes studied under the relevant growing conditions. The value of $b_i$ reflects the genotype's ability to alter the expression level of the trait in response to variations in environmental factors.

Genotype stability is assessed by the magnitude of deviations in the observed values of a trait from the regression line, which characterises how predictable its expression is under varying environmental conditions. According to Wricke Model, genotypes that combine high ecological plasticity with low ecovalence values ($W_i$) are considered to be intensive, indicating their ability to realise their yield potential effectively under favourable conditions without significant loss of stability [12, 13].

*The aim of the study* is to determine the influence of genotype, growing conditions, and their interaction on the FA composition of oil, and to evaluate the adaptive capacity of annual sunflower varieties in terms of their major fatty acid content.

## Materials and methods

The research, which examined five high-oleic annual sunflower varieties, was conducted during 2024–2025: 'AM KLP 25', 'P64GE233', 'AM PRESTIGE', 'IR Polysk' and 'IR Legat'. These varieties were tested in field trials at seven research stations of the Ukrainian Institute for Plant Variety Examination across the Dnipropetrovsk, Kirovohrad, Vinnytsia, Sumy, Odesa and Poltava regions, to assess their suitability for cultivation in Ukraine.

The content of the main fatty acids (oleic, linoleic, palmitic and stearic) in the oil of the studied sunflower varieties was determined by gas chromatography, in accordance with the approved methodology, immediately after harvesting [14].

The coefficient of significance of the deviations in air temperature and precipitation from long-term monthly averages during the study period was calculated using the following formula:

$$C_s = \frac{X_i - \overline{X}}{\sigma}$$

where: $Cs$ is coefficients of significance of deviation; $\overline{X}$ is the indicator value under current weather conditions; $X_i$ is the long-term monthly average indicator value; σ is the standard deviation.

The deviation coefficient values are interpreted according to the following scale: $Cs$ = 0–1: conditions close to long-term averages.

$Cs$ = 1–2: significantly different conditions.

$Cs > 2$: conditions close to extreme [15].

A three-factor analysis of variance was conducted to determine the influence of various factors on the fatty acid content in HO sunflower varieties: factor 1 – variety genotype (genotype); factor 2 – soil and climatic conditions at the research site (research site); and factor 3 – climatic conditions during the sunflower cultivation growing season (year). The proportions of each factor's influence on the fatty acid content of sunflower oil were determined using an analysis of variance with the trial version of the STATISTICA 12.0 computer programme (trial version) [16].

The linear regression method was applied to determine the nature and strength of the relationship between the fatty acid content in sunflower oil [17]. Pearson linear pairwise correlation analysis was applied to assess the strength and direction of the relationship between individual components of the fatty acid composition [18]. These analyses were performed using MS Excel tools and functions.

The ecological plasticity of the dominant fatty acid composition in sunflower seeds was determined in accordance with the Eberhart and Russell model [19]. The Wricke stability model [13] was used to evaluate the stability of the varieties. The trial version of PTC Mathcad Prime 3.1 software (trial version) was used to calculate the regression coefficients ($b_i$) and Wricke's ecovalence ($W_i$).

## Research results

Calculated coefficients of significance of deviations for air temperature and precipitation suggest that weather conditions varied significantly throughout the sunflower growing season at the research sites (Figures 1 and 2).

During April–May, it was noted that temperature conditions at most observation points deviated from the long-term average by a factor of $Cs$ = 0–1, indicating conditions close to the long-term average. At the same time, reduced precipitation at a number of stations during this period was indicated by coefficients of $Cs$ = 1–2, suggesting significantly different moisture conditions and the potential for limitations to the initial growth of plants.

During the flowering period (July–August), which is considered a key stage in establishing oil-yield potential, significantly different temperature conditions to the long-term average ($Cs$ = 1–2) were observed at most research sites. In some years, these conditions were close to extreme ($Cs > 2$). The lack of rainfall during this period exacerbated the plants' water stress, contributing to the enhanced expression of genotype-specific adaptive mechanisms.

During the seed-filling phase, which directly influences the intensity of fatty acid synthesis, temperature conditions at several locations were close to the long-term average ($Cs$ = 0–1), while moisture conditions differed significantly ($Cs$ = 1–2). This combination of temperature and limited water availability is crucial for achieving the desired ratio of oleic to linoleic acids, especially in high-oleic varieties [21].

Thus, contrasting weather conditions during key stages of sunflower development resulted in varying temperature and moisture regimes. This justifies the need for further quantitative assessment of how individual factors and their interactions contribute to the fatty acid composition of seeds.

The results of the analysis of variance revealed how the main factors influenced the

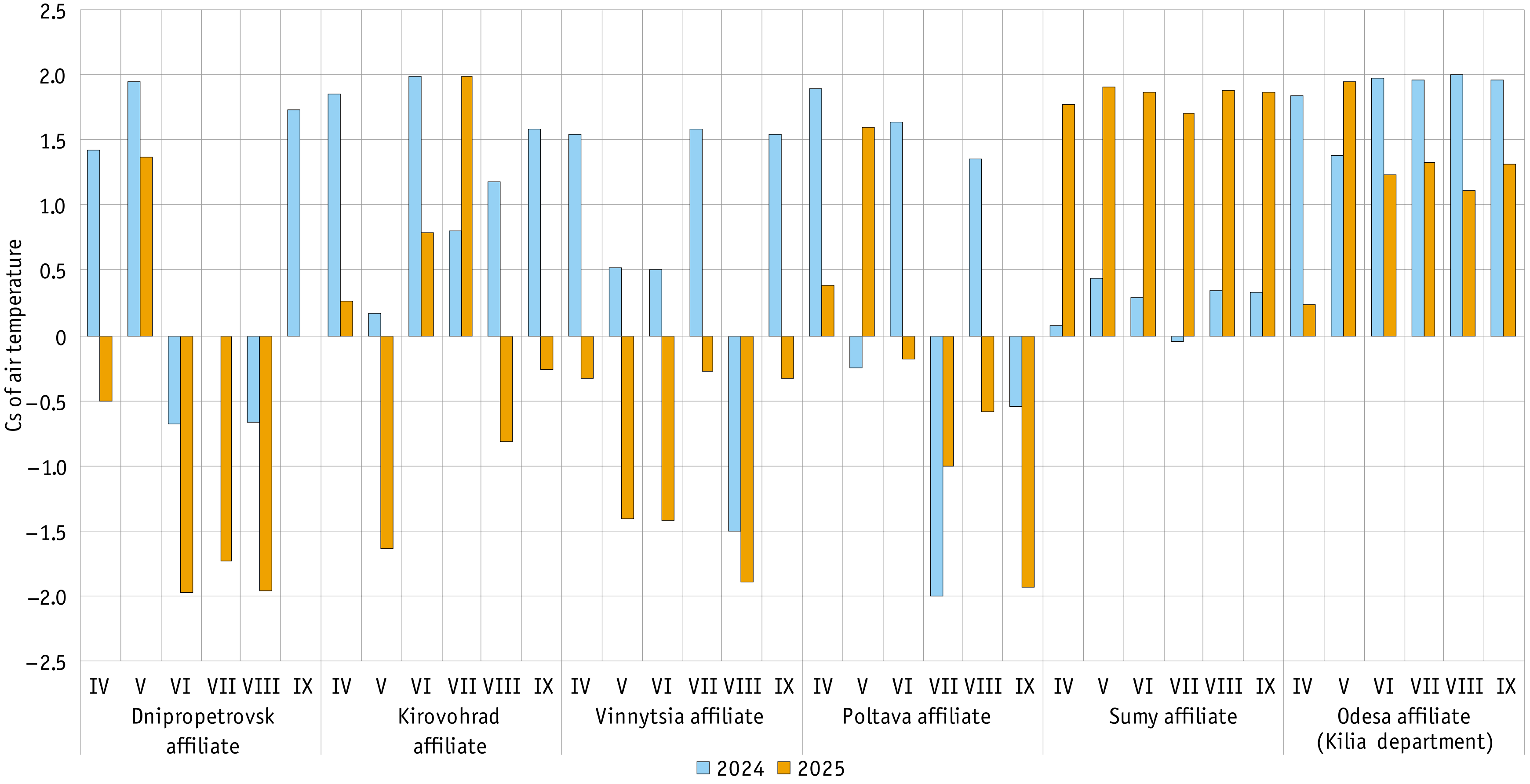

Fig. 1. Coefficients of significance of deviations of air temperature from long-term monthly averages at research stations, 2024–2025

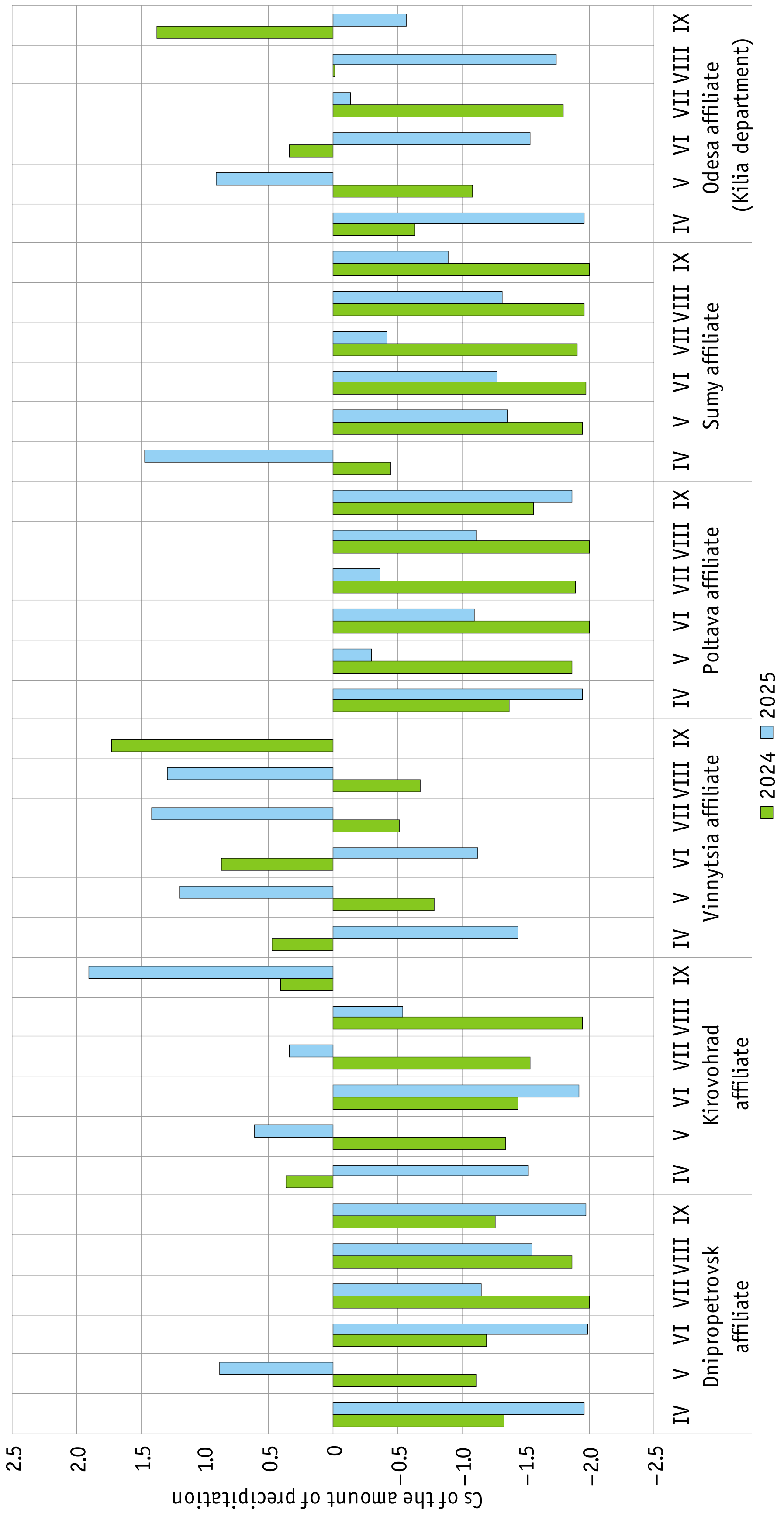

**Fig. 2. Coefficients of significance of deviations of precipitation from multi-year average monthly indicators at research points, 2024–2025**

variation in the content of key fatty acids (oleic, linoleic, palmitic and stearic acids) in oil from five sunflower varieties with a high oil content (Table 1).

*Table 1*

**Mean square of deviations (MS) and percentage contribution of factors to the content of oleic, linoleic, palmitic, and stearic acids**

| Factor | Oleic acid | | Linoleic acid | | Palmitic acid | | Stearic acid | |
|---|---|---|---|---|---|---|---|---|
| | MS | % | MS | % | MS | % | MS | % |
| Genotype | 2945.7 | 66 | 2284.0 | 66 | 5.9 | 64 | 2,3 | 3 |
| Research site | 138.3 | 3 | 210.0 | 6 | 1.1 | 12 | 1,2 | 2 |
| Year | 491.0 | 11 | 21.7 | 1 | 0.4 | 4 | 54,1 | 79 |
| Genotype × Research site | 126.5 | 3 | 133.2 | 4 | 0.4 | 4 | 0,3 | 0 |
| Genotype × Year | 106.8 | 2 | 181.8 | 5 | 0.3 | 3 | 0,4 | 1 |
| Research site × Year | 476.3 | 11 | 406.8 | 12 | 0.8 | 8 | 10,0 | 15 |
| Genotype × Research site × Year | 164.3 | 4 | 209.8 | 6 | 0.4 | 5 | 0,4 | 0 |
| Errors | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0,0 | 0 |
| $LSD_{0.05}$ | 0.3 | | 0.2 | | 0.3 | | 0.3 | |

Genotype was the most significant factor determining oleic acid levels, accounting for 66% of the variation. This suggests that the oleic acid content of the studied sunflower varieties is predominantly influenced by genetic factors.

It was found that weather conditions during the growing season accounted for 11% of the variation in the trait, whereas the combination of soil and climatic factors associated with the geographical location of the research sites only accounted for 3%. An important component of the analysis is assessing factor interactions. The largest share of the interactions was accounted for by the “research site × year” combination, reaching 11%. This indicates that fluctuations in oleic acid content depend significantly on the specific conditions of Ukraine’s soil and climate zones, as well as on annual variability in weather conditions. The other interactions, namely “genotype × year”, “genotype × research site” and “genotype × research site × year’, did not exceed 4%. These low values indicate that the studied hybrids have limited ability to adapt to external conditions.

According to the analysis of variance results, the main factor contributing to variation in linoleic and oleic acid content in HO varieties was genotype, accounting for 66% of variation (Table 1). Annual climatic conditions contributed minimally, accounting for only 1% of the variation, while the soil and climatic conditions at the research site accounted for 6%.

The interaction between the “research site × year” factors was also significant, accounting for 12% of the variation in linoleic acid content. The effects of the other interactions ranged from 4% to 6%, indicating that they played a moderate but statistically significant role in formation the fatty acid profile of the varieties under study.

It has been determined that there is a strong inverse correlation between oleic and linoleic acid content, indicating the leading role of genotype in shaping the fatty acid profile while not ruling out the significant influence of growing conditions and other environmental factors [22]. Correlation analysis also revealed a strong inverse relationship between oleic and linoleic acid content in the studied HO sunflower varieties ($r = –0.93$).

Regression analysis revealed a clear negative linear correlation between oleic and linoleic acid levels in sunflower seeds. The coefficient of determination ($R^2$) is 0.8687, indicating that approximately 87% of the variation in linoleic acid content can be explained by changes in oleic acid content. This suggests a strong, stable inverse relationship between these two indicators of fatty acid composition (Fig. 3).

The observed relationship is consistent with the known biochemical mechanism of converting oleic acid to linoleic acid via the enzyme desaturase, which explains the opposite trends in their accumulation [23].

The genotype factor was found to contribute most significantly to variability in palmitic acid content in the sunflower hybrids studied, accounting for 64% of total variation (Table 1). Soil and climatic conditions at the study sites accounted for approximately 12% of the total variability in fatty acid (FA) content, while annual weather conditions influenced this indicator by 4%. Of the interactions studied, the most significant was the combination of the “study site × year” factors, indicating that under unfavourable soil and climatic conditions, the compensatory effect of weather factors in a given year can create conditions that allow sunflower varieties to demonstrate their adaptive potential regarding palmitic acid content.

The results of the correlation analysis revealed a strong inverse relationship between oleic and palmitic acid content ($r = –0.82$). By

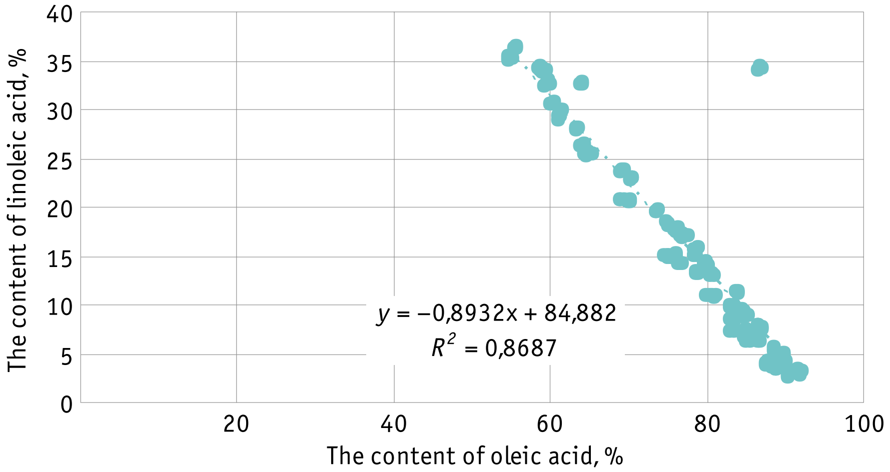

**Fig. 3. Regression relationship between the content of oleic and linoleic acids in high-oleic sunflower varieties**

contrast, a strong positive correlation was found between linoleic and palmitic acid content ($r$ = 0.85).

Regression analysis confirmed the presence of a clear negative linear relationship between palmitic acid and oleic acid. The coefficient of determination ($R^2$) is 0.6701, indicating that approximately 67% of the variation in palmitic acid content is attributable to changes in oleic acid concentration (Fig. 4).

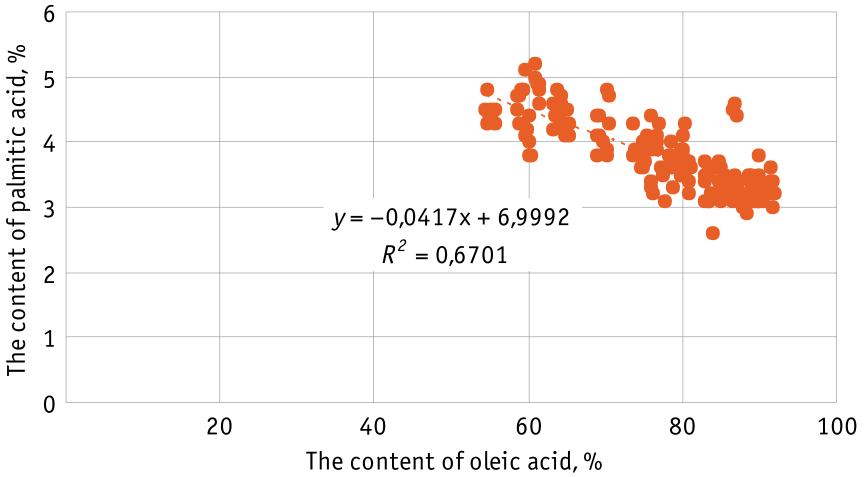

**Fig. 4. Regression relationship between the content of oleic and palmitic acids in the HO sunflower varieties**

At the same time, a consistent positive linear relationship was observed between palmitic acid and linoleic acid, as evidenced by $R^2$ = 0.7257. This level of determination indicates a strong, statistically significant correlation between these fatty acid components (Fig. 5).

According to the results of study [24], a strong negative correlation was observed between the content of oleic and linoleic acids under optimal growing conditions and during water stress. The authors also noted a strong negative correlation between palmitic and oleic acids, as well as a pronounced positive correlation between palmitic and linoleic acids. In contrast, data obtained for local Tunisian sunflower varieties [25] revealed a significant negative correlation between linoleic and palmitic acids.

Taken together, these results indicate that the content of oleic, linoleic, and palmitic acids, as well as the nature of the relationships between them, are influenced not only by genotypic characteristics but are also significantly modified depending on growing conditions.

Unlike the other fatty acids studied in HO-type sunflowers, stearic acid content was primarily determined by weather conditions during the year in question, accounting for 79% of the variation (see Table 1). The genetic characteristics of the variety accounted for just 3% of the variation in this parameter, whereas soil and climatic conditions at the research site accounted for approximately 2%.

Of the factor interactions, the “experimental site × year” combination was found to be the most significant, explaining 15% of the varia-

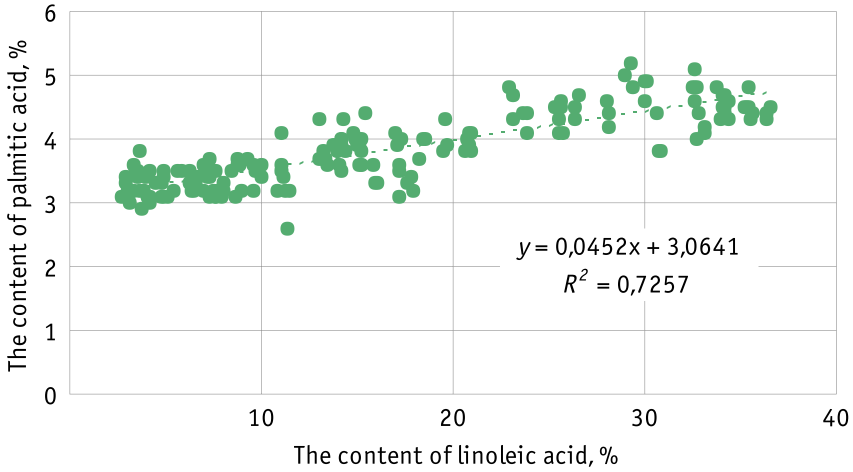

**Fig. 5. Regression relationship between the content of linoleic and palmitic acids in the HO sunflower varieties**

tion. In contrast, the "genotype × year" interaction accounted for just 1%. The other interactions among the studied factors had a significant but very low influence on the formation of stearic acid content in HO-type sunflowers.

Based on the results of two-year studies of sunflower genotypes under various growing conditions [6], the authors determined that the palmitic acid content was most strongly influenced by the interaction of the "genotype × growing conditions" factors (28.8%). Stearic and oleic acids were predominantly controlled by growing conditions (33.4% and 34.4%, respectively), while linoleic acid depended more on genotype (30.7%).

In addition, it has been established that arid conditions significantly reduce the oleic acid content of sunflower oil. The authors attribute this effect to the activity of the $\Delta^9$-desaturase enzyme, which becomes active around eight days after flowering and coincides with an increase in oil biosynthesis. As this enzyme catalyses the desaturation of stearic acid, it is thought to be responsible for the accumulation of oleic acid. Further desaturation of oleic acid to linoleic acid is catalysed by the Δ-12-desaturase enzyme, which also plays a role in determining the oleic acid content. Furthermore, it has been demonstrated that under water stress, the concentration of saturated fatty acids, such as palmitic and stearic acids, increases considerably, suggesting their potential involvement in plant drought tolerance mechanisms.

Our studies have revealed a moderate inverse correlation ($r = -0.40$) between the accumulation of oleic and stearic acids in sunflower varieties. Regression analysis of the relationship between the content of these two acids in the sunflower samples studied revealed a weak but distinct negative linear trend (Fig. 6).

The resulting regression equation shows that an increase in the proportion of oleic acid tends to be accompanied by a decrease in the concentration of stearic acid. With a coefficient of determination of $R^2 = 0.1606$, only around 16% of the variation in stearic acid content can be explained by changes in oleic acid levels. This suggests a weak linear relationship and that other factors,

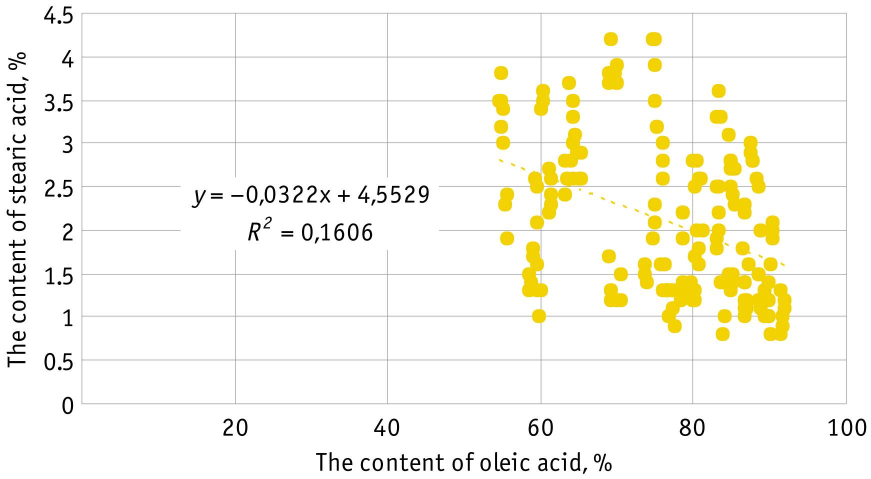

**Fig. 6. Regression relationship between oleic and stearic acids content in HO sunflower varieties**

particularly genotypic characteristics and growing conditions, have a significant influence.

The pathways of fatty acid biosynthesis in sunflower seeds, along with the mechanisms that regulate them, have been well characterised at molecular and biochemical levels [27]. Meanwhile, statistical “product–substrate” analysis enables us to evaluate the impact of genetic differences and environmental conditions on the fatty acid composition of sunflower varieties.

According to [28], the oleic acid content of sunflower varieties was significantly reduced under drought conditions, while the linoleic acid content increased. It was also noted that the stearic acid content decreased under water-deficient conditions. A decrease in stearic acid content was also observed under drought conditions [29]. The differences observed in changes to the fatty acid composition of sunflowers under drought conditions, as described in various studies, may be due to the use of different varieties, as well as the application of drought stress at different stages of plant growth and development.

The observable effects of the environment and the “genotype × growing conditions” interaction can be attributed to significant differences in the experimental conditions. These include the location of the experimental sites, the years in which the experiments were conducted and the weather conditions. These factors led to variations in the fatty acid content of different plant varieties. The presence of a significant “genotype × growing conditions” interaction indicates that varieties respond differently to environmental conditions. This makes it possible to assess the adaptive characteristics and stability of genotypes in terms of major fatty acid content.

The results of the regression analysis showed that the varieties ‘AM PRESTIGE’ and ‘P64GE233’ exhibited high ecological plasticity in terms of oleic acid content. Meanwhile, based on linoleic acid content, the varieties ‘AM KLP 25’, ‘IR Polysk’ and ‘IR Legat’ were found to be plastic. Taking the obtained Wricke ecovalence values ($W_i$) into account, these varieties were classified as intensive, indicating their ability to realise their genetically determined potential for corresponding fatty acid content under favourable growing conditions (Fig. 7).

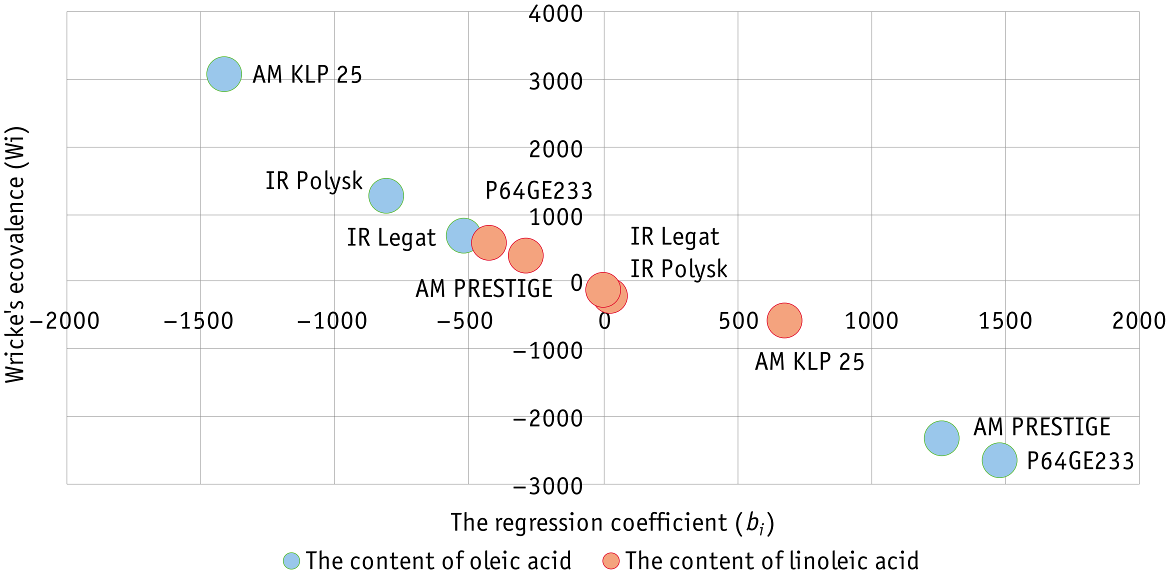

**Fig. 7. Ecological plasticity and stability of sunflower varieties based on their oleic and linoleic acid content**

Based on their palmitic and stearic acid content, the varieties ‘IR Polysk’, ‘AM KLP 25’ and ‘IR Legat’ are classified as intensive-type varieties with high ecological plasticity. This indicates their ability to respond adequately to changes in growing conditions and synthesise these fatty acids effectively (Fig. 8).

The results obtained for the classification of the studied sunflower varieties as intensive types, based on their major fatty acid content, are consistent with the conclusions of the correlation and regression analyses. The identified patterns confirm the existence of correlations between the fatty acid composition of the oil and the genotypic characteristics of the varieties, as well as the influence of weather and soil-climatic growing conditions [30, 31].

The stability of the fatty acid content was assessed based on particularly negative values of Wricke ecovalence. Analysis revealed that high-yielding sunflower varieties with high levels of major fatty acids are characterised by a high degree of stability. This indicates their ability

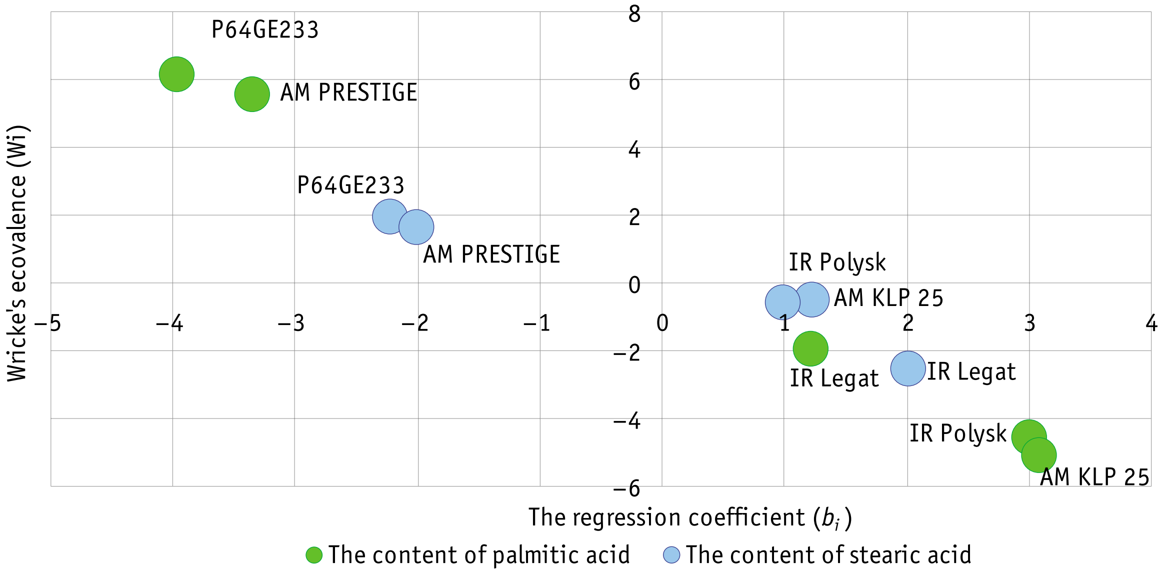

**Fig. 8. Ecological plasticity and stability of HO sunflower varieties based on palmitic and stearic acid content**

to ensure consistent trait expression under variable environmental conditions.

Among the sunflower varieties studied, no varieties could be classified as extensive in terms of their major fatty acid content. This is likely due to the significant influence of the genetic component on the formation of the studied indicators, particularly the high oleic acid content, which defines high-oleic sunflower varieties. The results suggest that, if the crops are adequately isolated, the maximum oleic acid content will remain stable and sufficient for classifying these varieties as high-oleic, despite variations in growing conditions.

## Conclusions

Two-year studies conducted under various soil and climatic conditions established that the fatty acid composition of oil from annual sunflower varieties depends on the combined influence of their genotypic characteristics and growing conditions. Analysis of variance revealed the key role of the genotype factor, accounting for 66% of the variation in oleic and linoleic acid content. This confirms the crucial importance of varietal characteristics in determining these traits in sunflower varieties. However, the influence of annual weather conditions, as well as their interaction with soil and climatic conditions at the research sites, was also significant, particularly during the critical flowering and seed-filling phases, which determine the intensity of fatty acid synthesis.

Correlation and regression analyses confirmed the presence of strong inverse relationships between oleic and linoleic acid content, and between oleic and palmitic acid content. These results are consistent with known biochemical mechanisms of metabolism. Stearic acid content was characterised by increased sensitivity to seasonal weather conditions, indicating the significant role of environmental factors in its accumulation.

An assessment of ecological plasticity and stability revealed that the ‘AM PRESTIGE’ and ‘P64GE233’ varieties belong to the intensive type in terms of oleic acid content. Meanwhile, the ‘IR Polysk’, ‘AM KLP 25’, and ‘IR Legat’ varieties belong to the intensive type in terms of linoleic, palmitic, and stearic acid content, combining high adaptability with stable trait expression. The absence of extensive genotypes indicates that the high-oleic type is expressed stably, regardless of variations in growing conditions, provided that technological requirements are met.

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**Присяжнюк Л. М., Кирильчук А. М., Смульська І. В., Гринів С. М., Король Л. В., Павлюк Н. В., Мельник С. І., Дудка Т. В.** Екологічна пластичність і стабільність високоолеїнових сортів соняшнику (*Helianthus annuus* L.) за показником вмісту основних жирних кислот. *Plant Varieties Studying and Protection*. 2026. Т. 22, № 1. С. --- https://doi.org/10.21498/2518-1017.22.1.2026.357578

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**Мета.** Установити роль генетичних особливостей сорту, умов вирощування та їхньої взаємодії у формуванні жирнокислотного (ЖК) складу олії, а також визначити адаптаційну здатність і стабільність синтезу основних жирних кислот у високоолеїнових (ВОЛ) сортів соняшнику однорічного. **Методи.** Біохімічні (газова хроматографія), статистичні (дисперсійний, кореляційно-регресійний аналіз). **Результати.** За результатами оцінювання впливу ґрунтово-кліматичних умов вирощування та генотипу на ЖК склад олії соняшнику встановлено, що найбільш вагомим чинником, який на 66% визначав зміни у вмісті олеїнової та лінолевої кислот, була належність до певного сорту. Погодні умови року зумовлювали 11% у варіаціях вмісту олеїнової кислоти, а взаємодія факторів «пункт досліджень × рік» – ще 11%, що підкреслює роль екологічної мінливості в реалізації генетичного потенціалу сортів. Максимальну екологічну пластичність за вмістом олеїнової кислоти зафіксовано в сортів ‘АМ ПРЕСТИЖ’ та ‘П64ГЕ233’. Вони поєднували високі значення екологічної пластичності ($b_i$) з низькими показниками стабільності ($W_i$), що дало змогу класифікувати їх як генотипи інтенсивного типу. За вмістом лінолевої кислоти пластичними виявилися ‘АМ КЛП 25’, ‘ІР Полиск’ та ‘ІР Легат’. Уміст пальмітинової кислоти значною мірою залежав від фактора генотипу (64%) та взаємодії чинників «пункт досліджень × рік», тоді як стеаринової – від погодних умов (79%). Між вмістом олеїнової та лінолевої кислот встановлено тісний обернений кореляційний зв’язок ($r = -0{,}93$; $R^2 = 0{,}87$). **Висновки.** ВОЛ сорти соняшнику характеризуються значною генетично зумовленою стабільністю ЖК складу й водночас здатністю ефективно реалізовувати свій потенціал до підвищеного синтезу олеїнової кислоти за сприятливих умов вирощування. Оцінювання екологічної пластичності та стабільності показало, що сорти ‘АМ ПРЕСТИЖ’ і ‘П64ГЕ233’ є інтенсивними за вмістом олеїнової кислоти, тоді як ‘ІР Полиск’, ‘АМ КЛП 25’ та ‘ІР Легат’ – за вмістом лінолевої, пальмітинової і стеаринової. Водночас відсутність екстенсивних генотипів свідчить про стабільну реалізацію ВОЛ типу всіх досліджуваних сортів, незалежно від умов вирощування.

***Ключові слова:*** *сорти соняшнику; жирнокислотний склад; вплив факторів вирощування; адаптаційна здатність; статистичний аналіз.*

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