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# ANALYSIS OF PROTEIN AND OIL CONTENT IN HYBRIDS DEVELOPED ON THE BASIS OF INTRODUCED SOYBEAN VARIETY SPECIMENS

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**Abstract**
The article presents an analysis of the protein and oil content in hybrids developed on the basis of introduced soybean variety specimens. According to the obtained results, the O-3, O-4, O-5, O-6, and O-8 families were identified as promising sources for increasing protein content, while the O-1 and O-2 families were considered suitable breeding donors for increasing oil content. In general, the total protein + oil content in all selected families exceeded 60%, indicating their value as promising genotypes.

**Keywords:** Soybean, seed, biochemical composition, protein, oil, breeding trait, donor, breeding material.

## Introduction

In soybean breeding, the biochemical composition of seeds, particularly protein and oil content, is considered one of the major breeding traits. In the breeding of Glycine max, the following standards are regarded as desirable for cultivar development.

Selection requirements for soybean seed protein and oil content are as follows: protein content of 30–34% indicates a low protein level, while oil content of 15–

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17% indicates a low oil level. In soybean crops, the average protein content should be 35–40%, and the average oil content should be 18–20%. High and desirable levels for breeding programs are considered to be 41–45% protein and 21–23% oil. Very high donor genotypes are characterized by 46–50% protein and 24–26% oil content.

In soybean breeding, protein and oil content are generally negatively correlated; therefore, an optimal balance between these traits is selected. In high-protein varieties, the optimal combination is considered to be 42–45% protein and 18–20% oil, whereas in high-oil varieties, 20–23% oil and 36–40% protein are regarded as desirable. Universal varieties should contain approximately 40–42% protein and 20–22% oil.

According to standards accepted in international breeding programs such as those applied by organizations including ICRISAT, USDA, and CIMMYT, soybean genotypes with protein ≥ 40% are considered good, protein ≥ 42% high, oil ≥ 20% good, oil ≥ 22% high, and protein + oil ≥ 60% are regarded as highly valuable genotypes.

Thus, for high-quality soybean cultivars, protein content of 40–45% and oil content of 20–23% are considered the most optimal parameters. These indicators provide the best balance for food, feed, and processing industries.

## Purpose of the Research

The purpose of the study was to create breeding materials with a complex of valuable economic traits through the selection and evaluation of hybrids obtained from introduced soybean variety specimens.

## Materials and Methods

The research materials consisted of hybrids developed from introduced soybean varieties originating from South Korea, Kazakhstan, Serbia, and Krasnodar. The protein and oil content in seeds of the selected soybean families were analyzed using the Infraskan-3150 device for biochemical composition assessment. In our studies, the biochemical composition of soybean seeds, namely protein and

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oil content, was determined in the selected families using the Infraskan-3150 analyzer.

## Results and Discussion

According to the data obtained, the O-3, O-4, O-5, O-6, and O-8 families exhibited protein content higher than 40% (41.5%, 41.3%, 41.4%, 41.4%, and 41.3%, respectively), showing superiority over the standard variety Orzu (40.1%) by 1.2–1.4%. This indicates that the selected families possess high protein content according to international standards.

[Mi 13.05.26 21:48] Aziza Saidova: Regarding oil content, the O-1 and O-2 families were identified as materials with high oil content, showing 25.1% and 22.8%, respectively. In the remaining families, oil content ranged from 20.6% (O-5) to 21.6% (O-4), which corresponds to the category of good-quality families.

**Table Biochemical Composition of Seeds in Selected Soybean Families Families**

| Families | Origin of Families | Protein,% | Oil, % | Total, % |
|---|---|---|---|---|
| **Families based on paired hybridization** | | | | |
| O-1 | Baraka x $CH_{30}$(-969) | 36,8 | 25,1 | 61,9 |
| O-2 | Evrika x $CH_{30}$(-969) | 37,7 | 22,8 | 60,5 |
| O-3 | Madina x $CH_{30}$(-969) | 41,5 | 21,4 | 62,9 |
| O-4 | Viktoriya x $CH_{30}$(-969) | 41,3 | 21,6 | 62,9 |
| O-5 | Baraka x Selekta 302 | 41,4 | 20,6 | 62,0 |
| O-6 | Viktoriya x Selekta 302 | 41,4 | 21,5 | 62,9 |
| **Families based on backcross hybridization** | | | | |
| O-7 | [KO18 x $CH_{30}$(-969)] x $CH_{30}$(-969) | 38,1 | 24,4 | 62,5 |
| O-8 | US80 (-699) x $CH_{30}$(-969)] x $CH_{30}$(-969) | 41,3 | 21,3 | 62,6 |
| | Orzu (Standard variety) | 40,1 | 18,1 | 58,2 |

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## Conclusion

Based on the analysis of seed biochemical composition in the selected soybean families, superiority in protein content was identified in the O-3 family (43.5%), O-8 family (42.5%), O-7 family (42.3%), and O-5 family (42%). Superiority in oil content was observed in the O-3 family (20.69%), O-4 family (20.76%), and O-2 family (20.19%).

Therefore, the O-3, O-4, O-5, O-6, and O-8 families are considered promising donors for increasing protein content, while the O-1 and O-2 families are suitable donors for increasing oil content in soybean breeding programs. Overall, the total protein + oil content exceeded 60% in all selected families, indicating that they represent valuable genotypes.

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