THE VARIABILITY OF THE CHARACTERS OF THE PRODUCTION AND THE QUALITY TO AN ASSORTMENT OF SOYBEAN *GLYCINE MAX* (L.) VARIETIES AND EARLY LINE AT S.C.D.A. TURDA COLLECTION

VARIABILITATEA CARACTERELOR DE PRODUCȚIE ŞI DE CALITATE LA UN SORTIMENT DE SOIURI ŞI LINII TIMPURII DE SOIA *GLYCINE MAX* (L.) AFLATE ÎN COLECȚIA S.C.D.A. TURDA

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***Abstract**: The results presented in this study were obtained after measurements and laboratory analysis done on two comparative cultures of orientation in the S.C.D.A. Turda collection in the year 2007. The analysis was done on crop production obtained per hectare, on protein and oil content, in view of the elaboration of a genitors list for a new selection cycle and perspective line in order to promote them in next stages of the breeding process.*

***Rezumat**: Rezultatele prezentate în acest studiu s-au obținut în urma măsurătorilor şi analizelor de laborator efectuate la două culturi comparative de orientare aflate în colecția S.C.D.A., Turda, în anul 2007. Au fost analizate producția de boabe obținută la hectar, conținutul de substanțe proteice şi grăsimi, în vederea întocmirii listei de genitori pentru un nou ciclu de selecție şi a liniilor de perspectivă, în vederea promovării lor în etapele următoare ale procesului de ameliorare.*

***Key words:** soybean production, protein content, oil content, perspective lines, grain quality*
***Cuvinte cheie**: producția de soia, conținutul de proteine, conținutul de grăsimi, linii de perspectivă, calitatea semințelor.*

INTRODUCTION

The importance of soybean culture consist in the high grain content in protein (33-49%), vitamins (B_1, B_6, B_{12}), but also enzymes. It is very difficult to find another plant that in 3-4 months synthesizes such amount of valuable substances, this being the reason for its being called "the plant of the future". Soybean protein is superior to other vegetal protein because it provides a whole scale of essential aminoacids (7-10% of grain protein total content, especially lisine).

One of the main means to get high and constant productions on agricultural plants is the use in the cultures varieties and hybrids with high yield capacity.

Soybeans grain quality is a polygenic characteristic, controlled by the additive gene action. Soybean protein grain content fluctuates depending on genotype, maturity group, environment conditions. Precocious varieties have higher protein content (35-45%) against late varieties (30-40%).

Utilizing biologic material which owns valuable gene for diverse characters and features had in view in the process of plants breeding, using modern selection methods, numerous breeders from our country (SCDA Turda, ICCPT Fundulea, etc.), created many varieties and hybrids, with elevated potential of production and high quality, adjusted to environment conditions from Romania.

Through the genetic progress obtained, the new varieties and hybrids created in the last years, have exceed by 5-10 % the old creations, as much as the production level is concerned, but also in regard to physiological characteristics, useful substance content, etc.

In order to obtain better genotypes regarding some characters and characteristic which improve productive potential, to assure as much as possible the production stability and to rise genotypes quality, plant breeding is a continuous process, in which, with each cycle a genetic progress is added for one or many characters and valuable characteristics.

MATERIAL AND METHOD

In 2007, at S.C.D.A. Turda, we organized two soybean comparative cultures of orientation, with Romanian and foreigner varieties (C.C.1) and with perspective lines (C.C.2). Each comparative culture was organized in three repetitions, the plot surface being 10 m^2.

The comparative cultures were sown on April 28 with the seeder SPC-401, conceived and realized at Agricultural Research Station Turda, and the plots were harvested on October 8. At the harvest, the production from each plot was weighed and the humidity of the sample was determined. The production was calculated again at 13% humidity. With the occasion of the harvest, samples were taken to determine seeds qualitative coefficients.

In order to find out the protein and oil content, the samples were ground with the laboratory mill; the protein and oil content were determined with an ULTRARAPID analyzer, DICKEY-JOHN mark, INSTALLAB type with printer, in three repetitions. The experimental data were processed through variance analysis.

RESULTS AND DISCUSSION

The variance analysis for production, the protein and oil content presented in table 1 and 2 indicate significant values of the genotypes variance, in the case of those three analysed characters. The reduced values of error variance for protein and oil content, in the case of the both experimental systems, indicates elevate degree of accuracy for analysis.

Table 1

The variance analysis for production, protein and oil content to a comparative culture with Romanian, foreign genotypes and new soybean lines create at S.C.D.A. Turda (Turda, 2007)

The variability cause	Freedom degree	Production		Protein content		Oil content	
		s^2	Signification	s^2	Signification	s^2	Signification
Total	74	73599,1		1,3		0,9	
Repetition	2	2177,6		15,5		15,6	
Genotypes	24	159787,3	**	2,6	**	1,4	**
Error	48	33480,9		0,1		0,1	

Table 2

The variance analysis for production, protein and oil content to a comparative culture with new soybean lines created at S.C.D.A. Turda (Turda, 2007)

The variability cause	Freedom degree	Production		Protein content		Oil content	
		s^2	Signification	s^2	Signification	s^2	Signification
Total	74	41589,2		1,3		1,1	
Repetition	2	17377,5		15,4		23,9	
Genotypes	24	81116,0	**	2,5	**	1,4	**
Error	48	22834,6		0,1		0,1	

Tablel 3

The capacity of production, protein and oil content to an assortment of Romanian and foreign genotypes and perspective lines create at S.C.D.A. Turda

(Turda, 2007)

Current number	Genotype	Average output (kg/ha)	Average content of protein (%)	Average content of oil (%)
1.	DIAMANT (Mt)	1337.7	38.2	21.3
2.	PERLA	1572.3	37.8	23.0***
3.	AGAT	1748.7**	36.2^{ooo}	22.6***
4.	SAFIR	1823.7**	36.5^{ooo}	23.0***
5.	OPAL	1974.0***	36.1^{ooo}	23.3***
6.	ONIX	1959.7***	36.8^{ooo}	23.9***
7.	FELIX	1778.0**	37.0^{ooo}	23.0***
8.	CRUSADER	2060.3***	34.8^{ooo}	24.1***
9.	EVANS	1748.0**	37.1^{ooo}	22.8***
10.	BOLYI 44	1572.7	35.8^{ooo}	23.4***
11.	BOLYI 45	1776.7**	35.5^{ooo}	23.2***
12.	BOLYI 56	1851.7**	35.3^{ooo}	23.5***
13.	BOROSTYAN	1752.7**	37.0^{ooo}	22.9***
14.	BOROKA	1342.7	37.1^{ooo}	23.9***
15.	BOBITA	2233.7***	34.9^{ooo}	23.3***
16.	B.S.31	2170.0***	35.6^{ooo}	24.4***
17.	ATLAS	1623.0	37.1^{ooo}	23.1***
18.	T95-7614	1682.0*	36.1^{ooo}	24.5***
19.	T97-8532	1764.7**	37.4^{oo}	24.2***
20.	T95-7531	1766.3**	37.7^{o}	23.1***
21.	T91-8136	1489.7	37.0^{ooo}	23.4***
22.	T97-8474	1854.0**	36.2^{ooo}	23.3***
23.	T97-8025	2130.3***	37.6^{o}	22.6***
24.	T22-4545	1902.0***	37.6^{o}	23.6***
25.	T93-9100	1615.7	36.3^{ooo}	24.1***
	DL(P=5%)	300.3	0.5	0.4
	DL(P=1%)	401.0	0.7	0.5
	DL(P=0.1%)	523.2	0.9	0.7

Table 4

The capacity of production, protein and oil content to an assortment of perspective lines created at S.C.D.A. Turda
(Turda, 2007)

Current number	Genotype	Average output (kg/ha)	Average content of protein (%)	Average content of oil (%)
1.	DIAMANT (Mt)	1510.7	38.0	21.9
2.	T93-9113	1622.0	36.4^{ooo}	23.9***
3.	T95-7460	1732.7	36.7^{ooo}	22.5*
4.	T91-8142	1574.7	36.5^{ooo}	24.0***
5.	T96-8871	1714.3	38.8***	23.0***
6.	T96-9135	1625.3	37.1^{ooo}	23.6***
7.	T97-8221	1658.0	36.2^{ooo}	23.9***
8.	T97-8063	1596.7	36.9^{ooo}	23.3***
9.	T97-8269	1606.3	36.4^{ooo}	24.3**
10.	T97-8076	1670.3	37.4^{oo}	24.1***
11.	T95-7354	1736.7	36.9^{ooo}	23.3***
12.	T97-8248	1525.7	36.3^{ooo}	24.2**
13.	T97-8569	1588.0	35.5^{ooo}	22.9***
14.	T98-153	1561.3	37.8	22.4*
15.	T20-2073	1856.7**	37.1^{ooo}	23.7***
16.	T21-2798	2029.3***	37.3^{ooo}	22.4*
17.	T21-3022	1556.0	38.6**	22.6**
18.	T21-2728	1980.0***	36.5^{ooo}	23.2***
19.	T21-2889	1676.3	36.5^{ooo}	23.2***
20.	T21-2847	1959.7***	37.4^{oo}	23.7***
21.	T21-2972	1900.3**	39.5***	22.8***
22.	T21-2519	1980.0***	36.1^{ooo}	23.1***
23.	T21-3136	1703.3	37.0^{ooo}	23.2***
24.	T21-2974	1540.3	36.7^{ooo}	22.5**
25.	T97-8029	1944.0***	37.4^{oo}	22.1
	DL(P=5%)	258.0	0.4	0.4
	DL(P=1%)	331.2	0.5	0.6
	DL(P=0.1%)	432.1	0.7	0.7

On a first analysis, the production data from table 3 and 4, for those two comparative cultures, indicates a capacity of production lowered for the studied genotypes. Having in mind that year 2007 was in its first part (January-June) excessively droughty, and the fact that the most consistent precipitations were registered barely at the end of July and in August, we estimate that the results of production are satisfactory in the meteorological conditions registered in 2007.

In the first comparative culture, the most consistent productions were registered at the Diamant (Mt) and Boroka varieties, these being the earliest from this culture; for this reason, they were the most strongly affected by drought and high temperatures in the course of July.

Among homologated varieties created at Turda Agricultural Research Station, most elevated productions were registered at the Opal and Onix varieties (1974.0 kg/ha and 1959.7 kg/ha respectively), and among the foreign varieties, at Bobita, B.S.31 and Crusader (2233.7 kg/ha, 2170.0 kg/ha and 2060.3 kg/ha); among the perspective lines we observed for the production capacity T97-8025 (2130 kg/ha); T22-4545 (1902 kg/ha) and T97-8474 (1854 kg/ha).

In the second comparative culture with perspective lines, the most elevated productions were registered at T21-2798 (2029 kg/ha), T21-2728(1980 kg/ha), T21-2519 (1980 kg/ha), T21-2847 (1959.7 kg/ha) and T97-8029 (1944 kg/ha).

Regarding the protein content at the first comparative culture (data presented in table 3), this presented amplitudes between 38.2% (Diamant) and 34.8 (Crusader). With close values to the witness was Perla (37.8%) variety and the perspective lines T97-8025 (37.6% - also remarked for the production capacity), T22-4545(37.6% - remarked likewise for the production capacity).

Bobita, B.S.31 and Crusader varieties, noticed for high production capacity, had low percent for the protein content (34.9%, 35.6% and 34.8%).

Regarding the protein content of the perspective lines, two exceeded very significantly on the protein content of the witness: T21-2847 (39.5%) and T96-8871(38.8%). In the case of T21-3022 line, the protein content was 38.6% (distinctively significant positive against the control variant); we must remark the fact that in the case of T21-2972 line, production is significantly better than the one of the control.

In case of the comparative culture with perspective lines, average oil content was held between 21.3% (Diamant-Mt) and 24.5% (T95-7614). In both comparative cultures, the control was exceeded by most genotypes studied for oil content. Among the remarked genotypes for protein content, Crusader (24.1%) achieved high production, but the protein content was the lowest in the comparative culture with Romanian and foreign varieties; the same thing can be told about B.S. 31 variety.

Among perspective lines with high values of oil percents were T97-8248, T97-8269, T97-8076 and T91-8142. It must be underlined that our results confirm the speciality literature (Thorne and Fehr, 1970; Dencescu et al., 1982; Wilcox and Shibles, 2001) in what the negative correlation between protein and oil content is concerned, just in several cases, at all the three characters studied they registered high values: T97-8025, T22-4545, T21-2972.

The future researches will try to establish a correlation between some plant characters and favourable agronomic traits.

CONCLUSIONS

1. In the climate conditions of the year 2007, the production capacity of varieties and perspective lines production created at Turda Agricultural Research Station, was on the same level as the foreign varieties with the same vegetation period.

2. The protein and oil content was influenced by genotypes vegetation period, and in most cases at productive genotypes, the protein content was significantly statistically more reduced.

3. Between the protein and oil content, to the most varieties an antagonistic relation can be found.

4. Some of the perspective lines (T97-8025, T22-4545 and T21-2972) had high values for all three agronomic traits that we had studied.

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