

THE BEHAVIOR OF SOME SOYBEAN VARIETIES IN THE PEDOCLIMATIC CONDITIONS FROM THE CENTER OF MOLDAVIA

Alexandra LEONTE¹, Simona-Florina ISTICIOAIA¹, Diana POPA¹, Oana MÎRZAN¹

e-mail: Andra29nt@yahoo.com

Abstract

Soybeans is an important source of protein because the amount of protein in a hectare of soybeans is higher than in any other crop. It has a wide range of uses, and it can be used in many areas: for food production, for food and as fuel. Considering the growing interest, in recent years, for this crop, at the ARDS Secuieni a number of ten soybean varieties have been experimented, Carla TD, Larisa, Caro TD, Ilinca TD, Bia TD, Ada TD, Teo TD, Miruna TD, Felicia TD, Onix, creations of the Agricultural Research and Development Station Turda, in order to establish their adaptability to the pedoclimatic conditions of the area. On average, the factors studied greatly influenced soybean production, which varied widely, from 2687 kg/ha, to Felicia TD variety to 3409 kg/ha to Larisa variety. Regarding the correlation between soybean production and the protein production obtained, it is observed that there is a direct correlation, the correlation coefficients calculated being statistically assured and interpreted as very significant.

Key words: soybean, adaptability, production, agricultural years

Soybeans is a appreciated and demanded crop worldwide, due to its ecological plasticity (Cealac V., Budac A., 2013). In the present there is little information on the zoning of European varieties as well as their classification into maturity groups according to country and region. The classification of soybean genotypes into maturity groups is done after the vegetation period, except for China and Japan where the beginning of flowering is taken into account (Yuesheng W. *et al*, 2006). Cultivated and used for various purposes almost 5,000 years ago, is considered the miracle plant of the twentieth century, soy still focuses its attention on the importance and wide diversity for his uses (Sin G.H., 2000).

Romania is one of the few European countries that has good conditions for soybean cultivation. For the success of the soybean cultivation, in addition to beneficial climate and soil conditions, technological solutions must be found to increase the crop productivity (Walker E.R. *et al*, 2010; Bellaloui N. *et al*, 2015).

Due to the growth of the world's population, in the coming years an increase in interest in soybean cultivation is expected, is considered the main source of vegetable protein worldwide (Conner T. *et al*, 2004).

From an agronomic point of view, the species has many advantages, among which we emphasize its ability to adapt to vast growing

conditions (Heiffig L.S. *et al*, 2006; Akond M. *et al*, 2013; Balbinot Junior A.A. *et al*, 2015) and his ability to fix atmospheric nitrogen.

In the present, the objectives of soybean cultivation are focused on creating varieties suitable for human consumption, with high productivity, early maturity, high tolerance to diseases and pests and good agronomic traits (Gaynor L.G. *et al*, 2011).

The soybean amelioration program at A.R.D.S. Turda has as a priority objective the creation of early, productive varieties, with a good stability of production, well adapted to the conditions of the area (Mureșanu E. *et al*, 2014).

In the present paper is presented results regarding the behavior of some Romanian soybean varieties, creations of A.R.D.S. Turda, obtained on the basis of multiannual testing in comparative crops in order to recommend in culture the best adapted soybean varieties for the area of Central Moldavia.

MATERIAL AND METHOD

The research was conducted between 2018 and 2019 at the A.R.D.S. Secuieni and aimed to establish the adaptability to the pedoclimatic conditions in Central Moldova of a number of ten Romanian soybean varieties, creations of A.R.D.S. Turda, namely: Onix (2002), Carla TD (2013), Larisa (2014), Caro TD (2015), Ilinca TD (2015),

¹ ¹ Agricultural Research – Development Station Secuieni, Romania

Bia TD (2015), Ada TD (2016), Teo TD (2017), Miruna TD (2017) and Felicia TD (2018).

The comparative culture was placed in the experimental field of the unit, on a typical faeoziom (chernozem) cambic soil, with medium texture, characterized as well supplied with phosphorus (P2O5 - 39 ppm) and mobile potassium (K2O - 161 ppm), moderately supplied with nitrogen, the soil nitrogen index being 2.1, weakly acid, with pH values (in aqueous suspension) of 6.29 and poorly fertile, with a humus content of 2.3%.

The fertilization was done with doses of 45 kg/ha a.s. of nitrogen, phosphorus and potassium, applied before the preparation of the germinativ bed. Sowing was carried out at the optimal time for this area. The prior plant had been wheat, and the sowing density was 50 germinating grains/m².

The cultivation technology specific to the conditions in the Central of Moldavia was respected. The data obtained were processed and interpreted statistically according to the method of analysis of variance (Ceapoiu N., 1968).

Seed quality analyzes were performed in the laboratory using the NIR DA 7250 analyzer equipped with A.R.D.S. Secuieni.

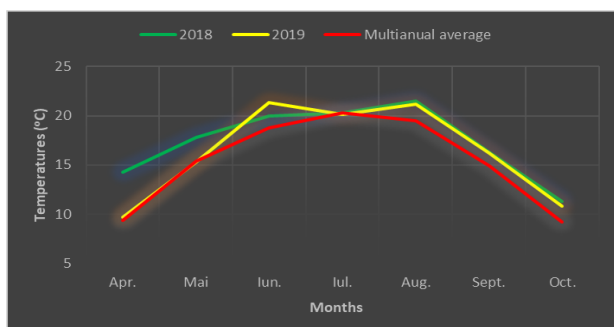


Figure 1 Graph of temperatures recorded during soybean crop vegetation at the A.R.D.S. Secuieni

Throughout the entire vegetation period of the soybean crop, from sowing to physiological maturity, the deviation from the multiannual average varied between 1°C (2019) and 2°C (2018). In terms of temperatures, the soybean vegetation period in the year of experimentation, compared to the multiannual average was characterized as very warm in year 2018 and warm in 2019 (figure 1).

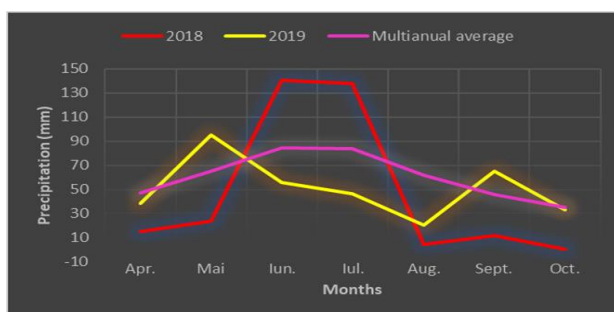


Figure 2 Graph of precipitation recorded during soybean crop, at the A.R.D.S. Secuieni

In terms of rainfall throughout the vegetation period of soybean cultivation, deviations from the multiannual average were varied, their distribution was ununiformed, and extremely ununiform on the phenophase of growth and development of the plant (figure 2).

RESULTS AND DISCUSSIONS

The experimental results obtained at soybeans, in the analyzed period, indicate a significant difference of soybean production depending on the cultivated variety.

On average, in the two years of experimentation, the factors studied influenced the soybean production, which ranged from 2687 kg/ha (Felicia TD) to 3521 kg/ha (Bia TD). Among the studied variants, compared to the witness (Onix variety), the Larisa variety achieved a significant production increase and the Bia TD variety achieved a distinctly significant production increase, which indicates a high adaptability of the varieties to the pedoclimatic conditions of the area. Compared to the Onix variety, the Carla TD and Felicia TD varieties achieved production differences, which were statistically assured and interpreted as significantly negative (table 1).

Table 1
Productions recorded at soybean varieties in the pedoclimatic conditions at A.R.D.S. Secuieni

Variety	Prod kg/ha	Relative production %	Dif. kg/ha	Semnif.
Carla TD	2728	89	-329	o
Larisa	3409	112	352	*
Caro TD	3277	107	220	
Ilinca TD	3197	105	140	
Bia TD	3521	115	464	**
Ada TD	3374	110	317	
Teo TD	3056	100	1	
Miruna TD	3227	106	170	
Felicia TD	2687	88	370	o
Onix - Mt.	3057	100	-	-
DL (kg/ha)	5%	318		
	1%	436		
	0.1%	593		

Regarding the number of pods per plant, compared to the witness (Onix), one variety achieved a significant increase in production (Bia TD) and two other varieties achieved very significant production increases (Carla TD and Miruna TD). At the varieties Carla TD, Bia TD and Miruna TD, a number of pods per plant superior to the witness (Onix) were obtained, these being statistically assured and interpreted as very significant.

Regarding the weight of the grains on plant, it varied in very large limits from 10.2 gr. grains/pl. (Ada TD) up to 34.4 gr. grains/pl.

Compared to the witness (Onix), very significant increases were obtained at the varieties Carla TD, Bia TD and Miruna TD (table 2).

Table 2
Soybean productivity elements,
average 2018-2019

Variety	Nr. pods/pl.	Nr. grain/pl.	Gr. grain/pl.
Carla TD	76.6 ***	145.9 ***	25.7 ***
Larisa TD	49.7	102.4 °	15.9 °°
Caro TD	32.3 °°°	70.8 °°°	10.9 °°°
Ilinca TD	43.1 °°	94.3 °°°	15.2 °°°
Bia TD	60.3 *	146.8 ***	23.4 ***
Ada TD	34 °°°	71.7 °°°	10.2 °°°
Teo TD	33.4 °°°	64.1 °°°	9.9 °°°
Miruna TD	71.1 ***	184.4 ***	34.4 ***
Felicia TD	37.1 °°°	79.7 °°°	11.1 °°°
Onix	53.5 Mt.	111.4 Mt.	17.4 Mt.
DL 5%	5.7	6.9	1
DL 1%	7.8	9.5	1.4
DL 0.1%	10.6	12.9	1.9

The number of pods per plant was directly correlated with the weight of the grains per plant, as well as with the number of grains per plant, the correlation coefficients (r) being statistically assured and interpreted as distinctly significant (figure 3).

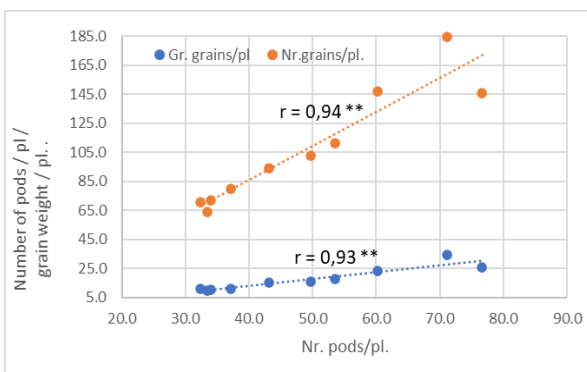


Figure 3 Correlation between the number of pods/pl /grain weight/pl. and the number of grains/pl.

The mass of one thousand grains in the studied varieties varied in very large limits, from 141.5 gr (Felicia TD) to 176.9 gr (Miruna TD), and the hectolitre mass varied between 75,8 kg/hl (Carla TD) and 77.5 kg/hl (Teo TD) (figure 4).

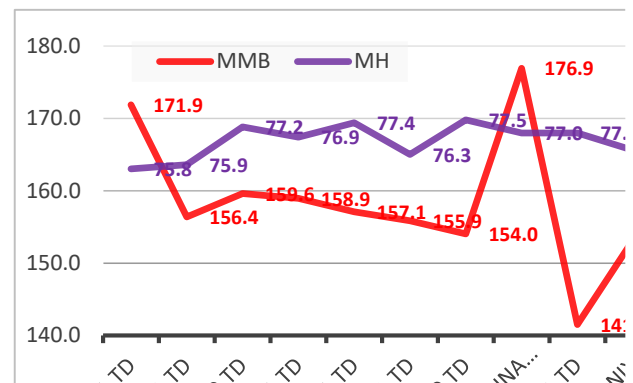


Figure 4 The mass of a thousand grains and the hectolitre mass

From the results obtained, it is observed that between the soybean production and the protein production obtained, there is a direct correlation, the calculated correlation coefficients were ensured statistically and interpreted as very significant.

Between the soybean production and the oil and starch production obtained, there is a direct correlation, the calculated correlation coefficients were statistically assured and interpreted as been very significant (figure 5).

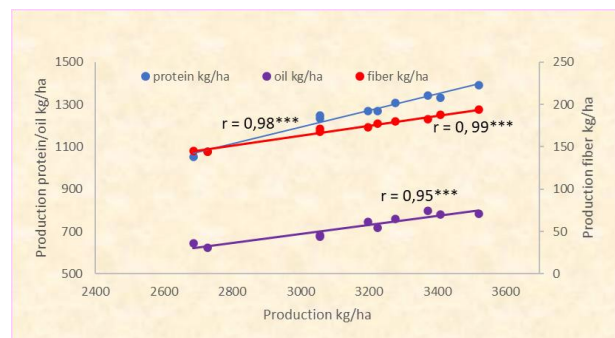


Figure 5 Correlation between soybean seed production kg/ha and the quality of soybean production

CONCLUSIONS

The average production of the ten soybean varieties experienced at A.R.D.S Secuieni varied in large limits, being between 2687 kg/ha at Felicia TD and 3521 kg/ha for the Bia TD variety.

Regarding the average production recorded by the ten soybean varieties studied in the period 2018-2019, the witness, the Onix variety, recorded a production of 3057 kg/ha, and the lowest productions were recorded in the case of Carla TD varieties (2728 kg/ha) and Felicia TD (2687 kg/ha), with a significant negative difference.

Higher production increases, compared to the witness (Onix), were achieved at only two varieties, Larisa TD (3409 kg/ha), which was statistically significant, and Bia TD (3521 kg/ha),

statistically assured and interpreted as distinctly significant.

The physical indices of the seed (MH and MMB) varied depending on the soybean variety, being higher in the case of MH of 77.5 Kg/hl for the Teo TD variety and respectively 176.9 g for the Miruna D variety in the case of MMB.

Soybeans is a crop that produces high yields of protein, oil and fiber, which are directly correlated with grain production.

REFERENCES

- Akond M., Bobby R., Bazzelle R., Clark W., Kantartzi S.K., Meksem K., 2013** – *Effect to two row spaces on several agronomic traits in soybean [Glycine max (L.) Merr.]*. Atlas Journal of Plant Biology, 1: 18-23.
- Balbinot Junior A.A., Procopio S.O., Debiasi H., Franchini J.C., Panison F., 2015** – *Semeadura cruzada em cultivares de soja com tipo de crescimento determinado*. Semina: Ciencias Agrarias, 36: 1215-1226.
- Bellaloui N., Bruns H.A., Abbas H.K., Mengistu A., Fisher, D.K., Reddy, K.N., 2015** – *Effects of row-type, row-spacing, seeding rate, soil-type, and cultivar differences on soybean seed nutrition under US Mississippi Delta conditions*. PLoS ONE, 10: 1-23.
- Cealac V., Budac A., 2013** – *Cultura soiei*. Î.S.F.E.-P. „Tipografia Centrala”, Chișinău, pag. 5-10.
- Ceapoiu N., 1968** – *Metode statistice aplicate în experiențele agricole și biologice*. Edit. Agro - Silvică, București.
- Conner T., Paschal E.H., Barbero A., Johnson E., 2004** – *The challenges and potential for future agronomic traits in soybeans*. AgBioForum, 7, (1&2): 47 - 50.
- Gaynor L.G., Lawn R.J., James A.T., 2011** – *Agronomic studies on irrigated soybean in southern NSW. b. Broadening options for sowing date*. Crop and Pasture Science, 62: 1067-1077.
- Heiffig L.S., Camara G.M.S., Marques L.A., Pedrosa D.B., Piedade S.M.S., 2006** – *Fechamento e índice de área foliar da cultura da soja em diferentes arranjos espaciais*. Bragantia, 65: 285-295
- Mureșanu E., Rezi Raluca, Bădulescu Adina, 2014** – *Carla TD și Larisa TD, noile soiuri de soia create la S.C.D.A. Turda*. Anale INCDA Fundulea, LXXXII: 139 - 147.
- Sin Gh., 2000** – *Tehnologii moderne pentru cultura plantelor de câmp*. Editura Ceres, București.
- Walker E.R., Mengistu A., Bellaloui N., Koger C.H., Roberts R.K., Larson J.A., 2010** – *Plant population and row-spacing effects on maturity group III soybean*. Agronomy Journal, 102: 821-826.
- Yuesheng W., Qin J., Gai J., He G., 2006** – *Classification and Characteristic of Maturity Groups of Chinese Landraces of Soybean (Glycine max (L.) Merr.)*. Genetic Resources and Crop Evolution, 53(4): 803 - 809.