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THE BEHAVIOR OF SOME LOCAL AND FOREIGN COWPEA GENOTYPES IN THE CONDITIONS OF CLIMATE CHANGES IN THE SOUTH OF OLTENIA

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Abstract

*The research was carried out in the period 2021-2022 at the Research Development Station for Plant Culture on Sands Dăbuleni, Romania with the objective of the behavior of 16 cowpea genotypes (Vigna unguiculata L. Walp), in the conditions of sandy soils in the south of Oltenia. The obtained results highlighted the specificity of the cowpea for thermohydric stress, the plant tolerating very well the specific microclimate created by the recent climate changes. Thus, the tested cowpea genotypes recorded at plant maturity a number of 7.7-15.7 pods/plant and grain production values in the range of 1413.5-3065.5 kg/ha, highlighting a distinct correlation significant between the two components (r = 0.703**). The cowpea lines 27-B-3a, 27/2 and 25-A1-3 stood out, with the highest grain productions (2928.6-3065.5 kg/ha).*

Key words*: sandy soil, cowpea genotypes, physiology, productivity, quality.*

INTRODUCTION

Native to Africa, cowpea (*Vigna unguiculata* L. Walp.) is a diploid annual crop (2n = 22), herbaceous, predominantly self-pollinated (approx. 95%) that belongs to the *Leguminosae* family (Boukar et al., 2020), being one of the most important leguminous crops, because its seeds are rich in proteins, minerals and vitamins, components that give high value to food and feed (Sombié et al., 2018; Karuwal et al., 2021). The cowpea is considered to be the "queen of areas with psamosols", because through the biological properties of the plant it can promote a system of sustainable agriculture in areas affected by drought and with poorly productive lands, the plant making good use of the ecological conditions of the area of sandy soils (Zăvoi, 1967; Bashiru et al., 2018; Draghici et al., 2018).

The economic importance of the cowpea is highlighted by the plant's valuable properties, namely: resistance to drought, the particular contribution to increasing the content of organic matter in the sands, the symbiotic fixation of atmospheric nitrogen, a good precursor in crop rotation and, last but not least, important source of protein for the population in disadvantaged areas (Marinica, 1994; Matei et al., 2015; Draghici, 2018; Ciurescu et al., 2020). The quality of the production, highlighted by a rich content of essential plant-type nutrients such as carbohydrates, fibers, minerals and vitamins, recommends cowpea as a healthy, low-cost alternative/supplement to animal proteins (Nunes et al., 2022; Ciurescu et al., 2022).

Due to its special biological and morphological characteristics (very strong root system, with a high absorption power, waxy layer on the leaves), the cowpea can make good use of poorly productive lands in the category of sandy soils, having a high tolerance to thermal and water stress conditions (Rivas et al., 2016; Omolayo et al., 2021; Sánchez-Navarro et al., 2021). In recent climate change, drought has become a limiting factor for a wide range of crops, especially in temperate regions, as a result of high evaporation and evapotranspiration processes throughout the year (Körner et al., 2010; Beshir et al., 2016; Bonea & Urechean, 2020; Draghici et al., 2022). In this sense, it should be borne in mind that the development of plants and implicitly their production in a certain area is the result of the complex interaction between climatic and edaphic factors (Gheorghe et al., 2009; Bonea, 2020; Partal & Paraschivu, 2020). Compared to other leguminous plants, such as the bean (*Phaseolus vulgaris* L.), the cowpea is a plant with low requirements for water and nutrients, being successfully included in a farming system specific to sandy soils, which ensures profitability and protection the environment (Costa et al., 2011; Paraschivu & Cotuna, 2021).

MATERIALS AND METHODS

The research was carried out in the period 2021-2022 at the Research and Development Station for Plant Culture on Sands Dabuleni, Romania, with the objective of the behavior of sixteen cowpea genotypes (*Vigna unguiculata* L. Walp) in the conditions of the sandy soils of southern Oltenia, among which eleven Romanian genotypes and five genotypes from China. The experiment was organized according to the randomized block method in three repetitions, under irrigation conditions, on a sandy soil with low natural fertility, poorly supplied in total nitrogen (0.03-0.06%), well supplied in extractable phosphorus (47.1-79 ppm), low to medium supplied in exchangeable potassium (58.7-94.1 ppm) and with a moderately acidic soil reaction (pH_{H2O} =5.92-6.55), values within the fertility limits of soils from Romania, established by Davidescu et al. (1981).

The cowpea genotypes were sown in the first decade of May, at a distance of 70 cm between the rows, ensuring a density of 20 germinable seeds/m^2. The nutrition regime of the plant was achieved by fertilization with $N_{60}P_{60}K_{60}$. During the vegetation period, the following determinations were made: biology, biometrics, physiology and productivity of the plant, as well as the quality of production at harvest. In the flowering phase of the plant, the leaf surface was determined using the Area Metter 300 device and the physiological processes of the plant, respectively: photosynthesis rate, transpiration rate, stomatal conductance, with the LC Pro SD device.

The chlorophyll content of the leaf was determined with the CCM 200 Plus device. At harvest, the quality of the cowpea (protein and fat) was analyzed by the Perten method. The results were calculated and analyzed by the method of analysis of variance (ANOVA) and with the help of mathematical functions.

RESULTS AND DISCUSSIONS

The evolution of the climatic conditions recorded during the cowpea vegetation period (May-August) highlighted the increased drought phenomenon compared to the multiannual average temperature, by increasing the air temperature by 1.14 ^{0}C and recording a precipitation deficit of 84.81 mm (Table 1).

Table 1. Climatic conditions recorded at the weather station* of RDSPCS Dabuleni during the growing season of cowpea

Climate conditions 2021-2022	May	June	July	August	May-August
Average temperature (^{0}C)	17.95	22.3	25.45	24.85	22.64
Minimum temperature (^{0}C)	1.2	10.2	12.5	9.8	1.2
Maximum temperature (^{0}C)	31.8	39.6	41.6	41.2	41.6
Rainfall (mm)	46.7	50.8	15.9	29.2	142.6
Relative air humidity (%)	58.8	65.75	52.9	53.3	57.69
Multiannual average temperature (1956-2021) (^{0}C)	17.65	21.73	23.61	22.99	21.5
The sum of multiannual precipitation (mm)	63.26	70.47	55.06	38.62	227.41
Deviation of the 2021-2022 average temperature from the multiannual average temperature	0.3	0.57	1.84	1.86	1.14
Deviation of precipitation 2021-2022 compared to multiannual precipitation	-16.56	-19.67	-39.16	-9.42	-84.81

**AgroExpert from Adcon Telemetry SRL Romania*

The temperature regime and that of precipitation, in interaction with the very low relative humidity of the air, with values in the range of 52.9-65.75% and an average of 57.69%, generated an arid microclimate in the area of sandy soils in the south of Oltenia. In these conditions, the cowpea is an alternative to soybean and bean crops in areas with sandy soils, as a result of the resistance to drought due to both the very strong root system, with a great absorption power, and the waxy layer on the leaves and the number of stomata in the leaf which varies between 280-327 stomata/mm^2 on the upper face (Zăvoi, 1967; Matei et al., 2015).

Although it is a plant with good tolerance to drought, the yield of the cowpea plant can be affected, when soil water stress occurs during the reproductive stage of the plant (Oliveira et al., 2017; Moussa et al., 2021; Omolayo et al., 2021). In order to avoid the negative effects of water stress, it was necessary to supplement the water requirement by applying 2-3 waterings, with norms of 250 m^3 water/ha, during the period of flower bud formation and pod formation.
From germination to the end of the vegetation period, all the vital processes of the cowpea plant took place under high temperature conditions, over 10^0C.
During 2021-2021, the growing season of the sixteen bean genotypes lasted 82-97 days, with a heat requirement of 1,858.8-2,241.4^{0}C, depending on the genotype (Table 2).
The relations of plants with the heat factor are manifested starting with the germination phase of the seeds, and by the way the temperatures are directed in the first phases of vegetation, the growth and development periods of the plant and the level of production are influenced (Rățoi et al., 2014; Bonea, 2020).
The earliness of the plant is an important objective of the creation of varieties in areas subjected to aridification, in order to avoid periods of drought from the moment of flowering of the plants (Burzo, 2014; Bashiru et al., 2018).
Compared to the control variety, *Jiana*, all the cowpea genotypes taken in the study showed earliness in the range of 5-11 days, in 2021 and 8-20 days, in 2022.
The increase of 0.5^{0}C in the average air temperature for the period May-August 2022, compared to the same period in 2021, led to the registration of an early ripening of the pods, between 6-22 days, depending on the genotype.

Table 2. Analysis of the vegetation period recorded for cowpea genotypes in the climatic conditions of southern Oltenia

No. crt.	Genotypes	Year 2021		Year 2022		Average 2021-2022		Deviation 2022 from 2021	
		Vegetation period (days)	Thermal resources (∑^{0}C)	Vegetation period (days)	Thermal resources (∑^{0}C)	Vegetation period (days)	Thermal resources (∑^{0}C)	Days	(∑^{0}C)
1	Jiana	100	2,304	93	2,178.8	96.5	2,241.4	-7	-125.2
2	31-E2-2a	95	2,172	85	1,986.6	90	2,079.3	-10	-185.4
3	27/2	93	2,120	76	1,756.7	84.5	1,938.35	-17	-363.3
4	27-B-3a	93	2,120	84	1,968.2	88.5	2,044.1	-9	-151.8
5	32-B-3a	91	2,071	85	1,977.5	88	2,024.25	-6	-93.5
6	27-A4	92	2,096	77	1,719.4	84.5	1,907.7	-15	-376.6
7	25-A1-3	89	2,017	80	1,792.8	84.5	1,904.9	-9	-224.2
8	25-A2-4	91	2,071	79	1,775.1	85	1,923.05	-12	-295.9
9	25-B1-3	94	2,145	85	1,986.6	89.5	2,065.8	-9	-158.4
10	25-D1-4	97	2,226	75	1,674.5	86	1,950.25	-22	-551.5
11	25-D1-5	90	2,043	76	1,674.5	83	1,858.75	-14	-368.5
12	China T1	91	2,071	76	1,692.9	83.5	1,881.95	-15	-378.1
13	China T2	91	2,071	73	1,664.5	82	1,867.75	-18	-406.5
14	China T3	96	2,199	75	1,719.4	85.5	1,959.2	-21	-479.6
15	China T4	91	2,071	77	1,775.1	84	1,923.05	-14	-295.9
16	China T5	92	2,096	76	1,756.7	84	1,926.35	-16	-339.3
Average		92.9	2,118.3	79.5	1,818.7	86.2	1,968.5	-13.4	-299.6
Minimum		89	2,017	73	1,664.5	82	1,858.8	-22	-551.5
Maximum		100	2,304	93	2,178.8	96.5	2,241.4	-6	-93.5

The growth and development of cowpea plants was differentiated according to genotype (Table 3). Thus, average plant height values between 55.1-122 cm were recorded, with a maximum in the *Jiana* variety (control), compared to which all other genotypes recorded height differences statistically assured as distinct and very significantly negative.
Also, the leaf surface index recorded lower values in all studied genotypes, compared to the control variety, the differences being significantly and distinctly significantly negative. The productivity of the plant was highlighted by the number of pods, which varied between 7.7-15.7 pods/plant, with 8.5-10.9 grains in the pod and a pod length of 11-16.7 cm. Regarding the formation of pods per plant, from the assortment of cowpea genotypes tested, high values were recorded, between 12.6-15.7 pods/plant for the genotypes *27-B-3a*, *27/2*, *27-A4*, *25-D1-5*, which significantly and distinctly outperformed the *Jiana* variety.
Similar results were obtained by Pandiyan et al. (2020), by cultivating 28 cowpea genotypes in

the Vellore region, India, highlighting a very high variability of the plant's morphological and productivity characters.

Photo 1. Jiana variety

Photo 2. Genotypes *25-A1-3* and *27-B-3a*

The leaf surface index correlated significantly positively with the height of the plant and significantly negatively with the number of pods/plant (Figure 1), which confirms that a luxuriant leaf apparatus prevents the penetration of sunlight at the level of the flower vexil, an essential condition in the process of pollen fertilization and implicitly of the plant's productivity. Research conducted in southern China on a number of 41 cowpea genotypes sown at different dates revealed that the development and erect bearing of the plant play a decisive role in the obtained bean production (Gong et al., 2023).

Table 3. Variability of some growth and development parameters of the cowpea plant, depending on the genotype

No	Genotypes	Plant height (cm)	Leaf surface index	No. Pods/ plant	No. Seeds/ pods	Pod length (cm)
1	Jiana (control)	122.0	8.8	7.7	9.1	14.6
2	31-E2-2a	63.4^{000}	4.5^{00}	10.5	9.9	14.8
3	27/2	70.5^{000}	5.1^{0}	13.1*	9.0	12.6
4	27-B-3a	53.4^{000}	4.3^{00}	15.7**	9.3	11.0^{0}
5	32-B-3a	53.9^{000}	5.2^{0}	8.7	8.9	16.2
6	27-A4	66.1^{000}	4.9^{0}	12.8*	8.7	16.1
7	25-A1-3	54.8^{000}	4.5^{00}	11.2	8.5	13.0
8	25-A2-4	54.5^{000}	4.3^{00}	10.2	9.9	13.8
9	25-B1-3	66.5^{000}	4.1^{00}	9.3	9.9	12.6
10	25-D1-4	78.0^{00}	4.6^{00}	11.0	9.6	12.4
11	25-D1-5	36.5^{000}	4.8^{0}	12.6*	9.5	12.6
12	China T1	38.0^{000}	3.8^{00}	9.6	10.1	16.7
13	China T2	33.5^{000}	3.9^{00}	9.3	10.9*	16.6
14	China T3	27.5^{000}	4.0^{00}	8.3	9.1	13.8
15	China T4	32.7^{000}	5.0^{0}	10.9	9.6	13.1
16	China T5	30.5^{000}	4.3^{00}	8.1	8.5	12.4
	LSD 5%	23.4	3.0	4.3	1.6	2.8
	LSD 1%	32.4	4.1	5.9	2.2	3.9
	LSD 0.1%	44.7	5.7	8.2	3.0	5.4

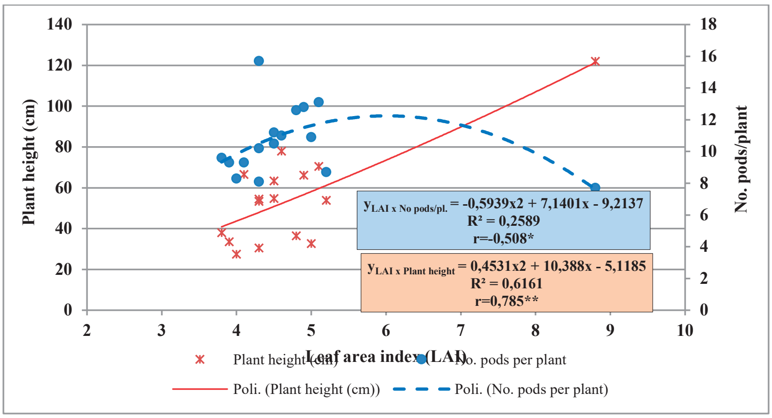

Figure 1. Correlations between leaf area index with plant height and number of pods/plant in 16 cowpea genotypes

The results regarding the physiology of the cowpea plant revealed a diurnal variation of the physiological processes of photosynthesis, transpiration and stomatal conductance, closely related to changes in environmental factors, especially solar radiation and temperature, recorded at leaf level with the LC Pro SD device (Tables 4 and 5).

Table 4. Climatic conditions at the leaf surface determined with the LC Pro SD device

Climatic conditions	9 o'clock			11 o'clock			11 o'clock		
	Average	Minimum	Maximum	Average	Minimum	Maximum	Average	Minimum	Maximum
Solar radiation active in photosynthesis (μmol/m²/s)	1,567.1	1,530	1,590	1,972.4	1,940	2,006	1,979.5	1,911	2,035
Temperature (^{0}C)	30.0	25	32.3	35.4	32	37.1	38.9	36.6	40.6
Atmospheric pressure (hPa)	1,019	1,019	1,019	1,019.1	1,019	1,020	1,017.4	1,017	1,018

Table 5. Diurnal variation of physiological processes recorded in cowpea genotypes

Cowpea genotypes	Plant photosynthesis rate (μmol CO_2/m²/s)			Plant transpiration rate (mmol H_2O/m²/s)			Stomatal conductance (mol/m²/s)			Chlorophyll (CCI units)
	9 o'clock	11 o'clock	15 o'clock	9 o'clock	11 o'clock	15 o'clock	9 o'clock	11 o'clock	15 o'clock	9 o'clock
Jiana	20.99	11.93	5.16	1.50	2.26	0.73	0.13	0.10	0.02	45.30
31-E2-2a	24.20	20.95	16.63	2.64	5.16	5.52	0.17	0.27	0.22	78.20
27/2	20.26	26.63	21.52	3.22	5.89	6.27	0.22	0.34	0.24	65.90
27-B-3a	25.13	22.72	23.11	4.47	5.86	6.97	0.35	0.31	0.28	52.30
32-B-3a	23.89	24.00	22.68	3.61	6.31	7.47	0.23	0.35	0.32	53.77
27-A4	17.83	24.56	19.27	3.28	6.44	6.91	0.21	0.34	0.25	63.20
25-A1-3	20.08	25.45	14.58	3.11	6.52	8.20	0.19	0.33	0.33	54.70
25-A2-4	22.40	22.64	14.27	3.58	6.84	6.38	0.22	0.34	0.19	55.63
25-B1-3	25.96	25.34	13.83	4.19	7.10	6.54	0.29	0.34	0.19	73.53
25-D1-4	18.81	26.82	20.24	2.69	7.52	7.86	0.14	0.38	0.26	75.23
25-D1-5	13.68	10.98	12.64	2.85	4.38	5.45	0.15	0.14	0.15	82.47
China T1	28.03	22.09	8.49	4.16	8.65	5.23	0.26	0.47	0.13	72.07
China T2	17.70	22.94	15.37	2.99	6.73	6.85	0.15	0.30	0.19	58.17
China T3	13.87	14.66	21.25	2.40	4.76	8.82	0.11	0.18	0.25	74.20
China T4	13.96	23.36	17.40	3.66	6.65	9.81	0.20	0.30	0.34	38.60
China T5	19.79	20.92	15.48	3.81	7.25	8.95	0.22	0.35	0.30	47.73
Average	*20.41*	*21.62*	*16.37*	*3.26*	*6.14*	*6.75*	*0.20*	*0.30*	*0.23*	*61.94*
Minimum	*13.68*	*10.98*	*5.16*	*1.50*	*2.26*	*0.73*	*0.11*	*0.10*	*0.02*	*38.60*
Maximum	*28.03*	*26.82*	*23.11*	*4.47*	*8.65*	*9.81*	*0.35*	*0.47*	*0.34*	*82.47*

The photosynthesis process recorded differentiated values according to the cowpea genotype, with a daily average of 20.41 μmol CO_2/m²/second at 9 o'clock, 21.62 μmol CO_2/m²/second at 11 o'clock and 16.37 μmol CO_2/m²/second at 3 p.m., when the temperature and radiation active in photosynthesis, recorded at leaf level, showed maximum values (temperature = 36.6-40.6^{0}C; radiation active in photosynthesis = 1,911-2,035 μmol/m²/ second. *Jiana, 31-E2-2a, 25-B1-3* and *China T1* cowpea genotypes, recorded a downward trend of CO_2 assimilation throughout the day, with a minimum at 3 p.m., while regulating the plant's transpiration process by reducing water losses at leaf level. Some cowpea genotypes (*27-B-3a, China T3*) maintained their intensive photosynthesis process even at temperatures above 40^{0}C, but the optimal microclimate conditions for the development of physiological processes in most genotypes were achieved at 11 o'clock, when temperatures of 32-37.1^{0}C, a solar radiation of 1,940-2,006 μmol/m²/second and an atmospheric pressure of 1,019-1,020 hPa were recorded.

Regarding the chlorophyll content index (CCI), determined at 9 o'clock with the CCM 200 Plus device, it showed differences according to the analyzed genotype, with the maximum in the *25-D1-5* genotype (CCI = 82.47) and the minimum in the *China T4* genotype (CCI = 38.6). Similar results for chlorophyll content were obtained in South Africa by Gerrano et al. (2022), on a number of 20 cowpea genotypes originating from South Africa, Nigeria and Kenya, obtained from the gene bank collections of the Agricultural Research Council - Vegetables, Industrial and Medicinal Plants (ARC-VIMP), showing values of CCI = 6.23-87.97. The physiological and metabolic changes are due to the differential accumulation in the root and leaves of metabolites, in particular proline, galactinol and a quercetin derivative, which can significantly influence a progressive acclimatization of the cowpea plant to stress stress during the day (Goufo et al., 2017). The degree of stomatal opening is an important indicator of plant response to thermohydric stress. Stomatal closure is an important drought tolerance mechanism, and cowpea can be considered a conservative species, that is, one that prioritizes the maintenance of water status rather than the photosynthetic rate (Oliveira, 2017).

The results obtained in our experiment revealed distinctly significant positive correlations between stomatal conductance and photosynthesis and transpiration processes recorded in cowpea (Figure 2). The rate of carbon penetration into plant increased with the increase in the degree of opening of the stomata, the relationship being established by a polynomial equation of the end degree, whose correlation coefficient is positive.

Extrapolating the functional connection between the degree of stomatal opening and the transpiration process, an upward trend of water loss was highlighted, along with the increase in stomatal conductance values. Similar results, which showed that the decrease in photosynthetic rate of cowpea plant could be attributed to the decrease in stomatal conductance observed under drought stress conditions were obtained in USA by Omolayo et al., (2021). This author showed that compared to a good water supply, drought condition significantly decreased plant height, leaf area and number, fresh and total dry mass and net photosynthesis of cowpea genotypes.

The grain production obtained when harvesting the 16 cowpea genotypes taken in our study, presented values between 1,413.5-3,065.5 kg/ha, with an average of 2,207.2 kg/ha (Table 6). The statistical analysis of the obtained results highlighted to *27/2*, *27-B-3a*, *32-B-3*, *25-A1-3a*, *25-A2-4* cowpea genotypes, which recorded significant distinctly production differences, between 1,001.6 and 1,620.6 kg/ha, compared to the control variety (*Jiana*).

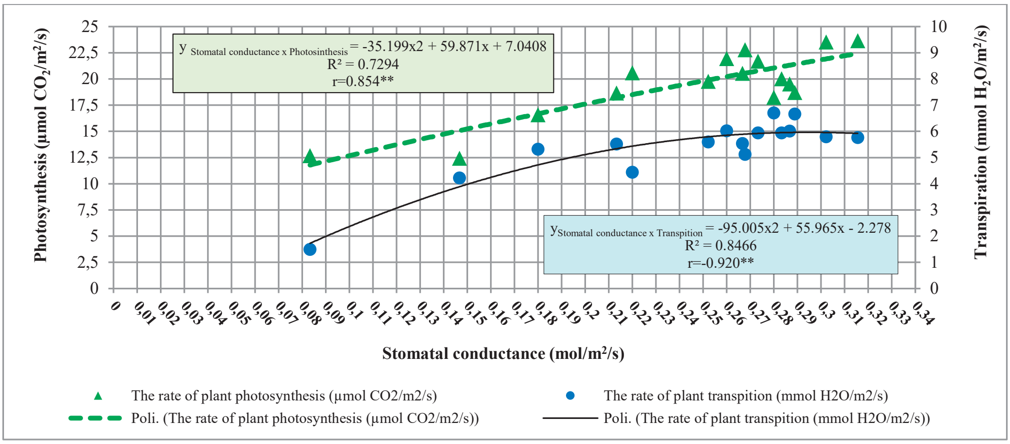

Figure 2. Correlations between stomatal conductance and the physiological processes of plant photosynthesis and transpiration in 16 cowpea genotypes

The results presented graphically in Figure 3 express the functional link between the number of pods and the cowpea production obtained, highlighting a distinctly significant positive correlation (r = 0.703**).
Similar research was conducted in South Africa by Gerrano et al. (2022) and the results obtained show that the number of pods/plant is a major agronomic trait influencing the production potential of cowpea.

Table 6. Production results obtained with the cowpea genotypes tested under the conditions of the sandy soils in the south of Oltenia

No. crt.	Cowpe genotypes	Grain Yield		Difference from the control	
		kg/ha	%	kg/ha	Significance
1	Jiana	1,444.9	100	Control	Control
2	31-E2-2a	2,327.4	161.1	882.5	-
3	27/2	2,928.6	202.7	1,483.7	**
4	27-B-3a	3,065.5	212.2	1,620.6	**
5	32-B-3a	2,446.5	169.3	1,001.6	*
6	27-A4	2,325.4	160.9	880.5	-
7	25-A1-3	2,954.4	204.5	1,509.5	**
8	25-A2-4	2,458.7	170.2	1,013.8	*
9	25-B1-3	1,992.1	137.9	547.2	-
10	25-D1-4	1,579.4	109.3	134.5	-
11	25-D1-5	2,335.4	161.6	890.5	-
12	China T1	2,008.8	139.0	563.9	-
13	China T2	1,413.5	97.8	-31.4	-
14	China T3	1,873.1	129.6	428.2	-
15	China T4	2,244.1	155.3	799.2	-
16	China T5	1,916.7	132.7	471.8	-
		LSD 5%		913.4	
		LSD 1%		1,265.0	
		LSD 0.1%		1,745.2	

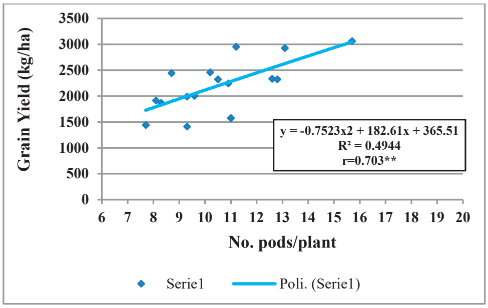

Figure 3. Correlation between number of pods/plant and grain yield obtained in 16 cowpea genotypes

The protein deficit in less developed areas, as a result of the rapid growth of the human population and the demand for animal protein, results in the use of legumes, including cowpea, as a source of protein in traditional grain-based diets. Cowpea seeds, leaves (fresh and dry) and green pods provide high levels of protein, carbohydrates, lipids, vitamins, dietary fiber, minerals, polyunsaturated fatty acids and other nutrients (Belete & Mulugeta, 2022).
Cowpea bean quality analysis revealed different values of biochemical components, depending on the genotype (Figure 4). Thus, the crude protein content of the grain was between 19.3% in the *China T2* genotype and 22.55% in the *25-D1-5* genotype, with an average of the genotypes of 20.97%. The fat content showed the highest value in the *Jiana* genotype (4.85%), and the minimum of 2.7% in the *27-A4* genotype. Similar results were obtained in Nigeria, on 1,541 lines from cowpea germplasm, the percentage of proteins being differentiated in the range of 16-31% (Boukar et al., 2011).

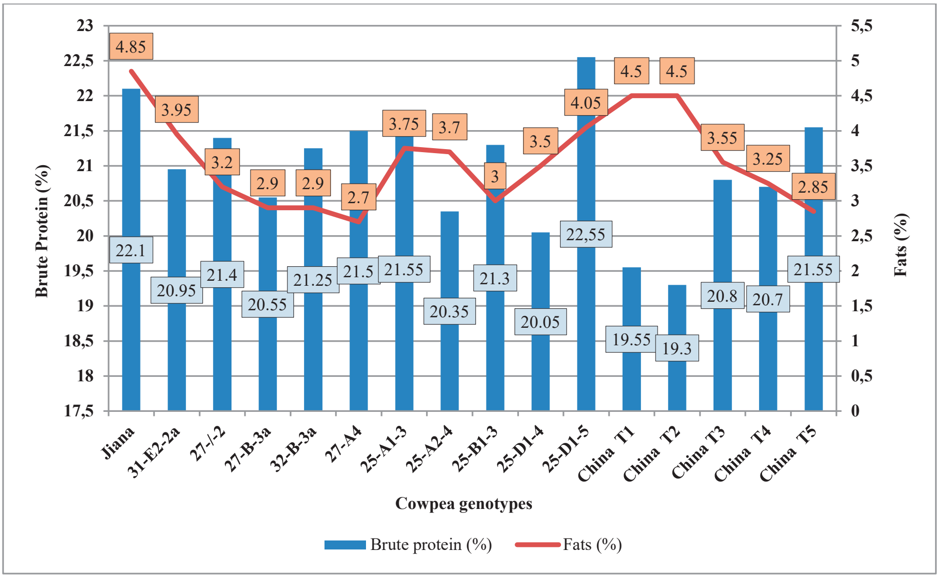

Figure 4. Grain production quality recorded in some cowpea genotypes

CONCLUSIONS

In the conditions of the sandy soils in Romania, the vegetation period of the 16 cowpea genotypes took place during 82-97 days, with a thermal requirement of 1,858.8-2,241.4^{0}C, depending on the genotype.

The results regarding the physiology of the cowpea plant revealed a diurnal variation of the physiological processes of photosynthesis, transpiration and stomatal conductance, closely related to changes in environmental factors, especially solar radiation and air temperature.

In the conditions of the sandy soils in the south of Oltenia, the cowpea production obtained varied between 1,413.5 and 3,065.5 kg/ha, depending on the genotype.

The following genotypes were highlighted: *27/2, 27-B-3a, 32-B-3, 25-A1-3a, 25-A2-4,* which recorded production differences of 1001.6-1620.6 kg/ha compared to the control variety (*Jiana*), statistically assured as significantly and distinctly significantly positive.

Between the number of pods and the grain yield obtained in cowpea genotypes, a distinctly significant positive correlation was revealed (r = 0.703**).

The crude protein content of the cowpea bean showed values between 19.3 and 22.55%, depending on the genotype.

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