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BEHAVIOR OF NEW COWPEA LINES IN SANDY SOIL CONDITIONS IN SOUTHERN OLTENIA

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INTRODUCTION

Native to Central Africa, cowpea (*Vigna unguiculata* L. Walpers) is a leguminous plant with high drought tolerance and wide ecological plasticity, being the main grain legume for the African population (Emongor, 2007). With a deep root system, a waxy layer on the leaves, and a good strategy to avoid desiccation of the leaf apparatus by closing the stomata, cowpea can take advantage of drought conditions with good results (Omolayo et al., 2021). Considered a key crop in the effort to achieve food security and a crop suitable for a climate change scenario, the conservation of genetic biodiversity in cowpea is essential under current conditions, given the increasing drought in the world and the need for protein (Nunes et al., 2022; Hyun et al., 2025). Among leguminous plants, cowpea is emerging as an alternative for drought conditions, with its resistance attributed to rapid germination, a waxy leaf layer, increased photosynthesis, and a well-developed root system (Nunes et al., 2022). Also, cowpea is a plant that is not demanding on soil conditions and an essential source of protein for climatically disadvantaged areas (Matei et al., 2015), making good use of poor sandy soils. The creation of new cowpea genotypes is of essential importance, given the implications of the dry climate during the reproductive stages of the plant, which led to an increase in hundred-seed weight and seed protein, while starch content decreased, indicating a change in resource allocation under stress conditions (Pudel et al., 2025). These findings suggest that breeding a drought-resistant cowpea genotype across multiple stages is necessary to increase yield.

MATERIALS AND METHODS

The research was carried out in 2024-2025 to compare the performance of seven new cowpea lines created at the Research and Development Station for Plant Culture on Sands, Dăbuleni, in comparative competition culture with the *Dolja* variety. The biological material was obtained in 2020 through repeated individual selection within a natural hybrid cowpea population. The links of the improvement process were covered, namely: selection field, control field, comparative orientation culture, and comparative competition cultures. The studies were carried out in sandy soil with low natural fertility, being poorly supplied in total nitrogen (0.025-0.03%) and exchangeable potassium (39.48-49.11 ppm), moderately supplied in organic carbon (0.69-0.67%), well supplied in extractable phosphorus (92.16-105.5 ppm) and with a weak alkaline reaction (pH H₂O = 7.93–7.99). Sowing of cowpeas was carried out depending on the stability of the air temperature at 12-15 °C, ensuring a sowing density of 20 germinating grains/m². The water consumption of the cowpea plant during the vegetation period (May-August) was met through precipitation (137.7 mm) and 4-5 waterings at a rate of 250 m³ water/ha. The experimental results were analyzed using the analysis of variance (ANOVA) method and mathematical functions.

RESULTS AND DISCUSSIONS

Observations on the progression of vegetation phenophases in the assortment of cowpea genotypes

Cowpea genotype	Sprouting - first true leaf		First leaf - 3 true leaves		3 true leaves - shoot formation		Shoot formation - flower stem formation		Flowering stems - flowering, pod formation		Pod formation - Maturity (>80%)		Vegetation period (emergence-maturity)	
	Days	(Σ °C)	Days	(Σ °C)	Days	(Σ °C)	Days	(Σ °C)	Days	(Σ °C)	Days	(Σ °C)	Days	(Σ °C)
	<i>Dolja</i>	10.5	167.1	11	243.2	8	190.1	19	483.3	14	370.6	22.5	585.8	85
LD 1/2020	10	158.9	13	272.2	6.5	152.8	14.5	371.6	17.5	448.3	20.5	540.2	82	1944.0
LD 2/2020	9	140.7	14	293.4	7	165.9	14	361.8	12.5	337.8	25.5	659.0	82	1958.6
LD 3/2020	9	142.8	13.5	280.5	6	142.2	13	327.9	13.5	357.2	23.5	608.7	78.5	1859.3
LD 4/2020	9	148.3	12	273.6	7.5	152.9	15	377.6	14.5	395.0	24.5	623.3	82.5	1970.7
LD 5/2020	9.5	156.1	11.5	228.8	9	215.8	9	228.7	16	417.3	17.5	450.4	72.5	1697.1
LD 6/2020	9	148.3	10	198.9	10	240.7	10.5	268.4	13.5	350.1	16.5	431.4	69.5	1637.8
LD 7/2020	9.5	156.9	10.5	221.8	7	168.2	19	478.6	17.5	473.4	18	463.2	81.5	1962.1
Average daily air temperature (°C)	16,1		21,1		23,4		25,4		26,5		25,9		23,8	

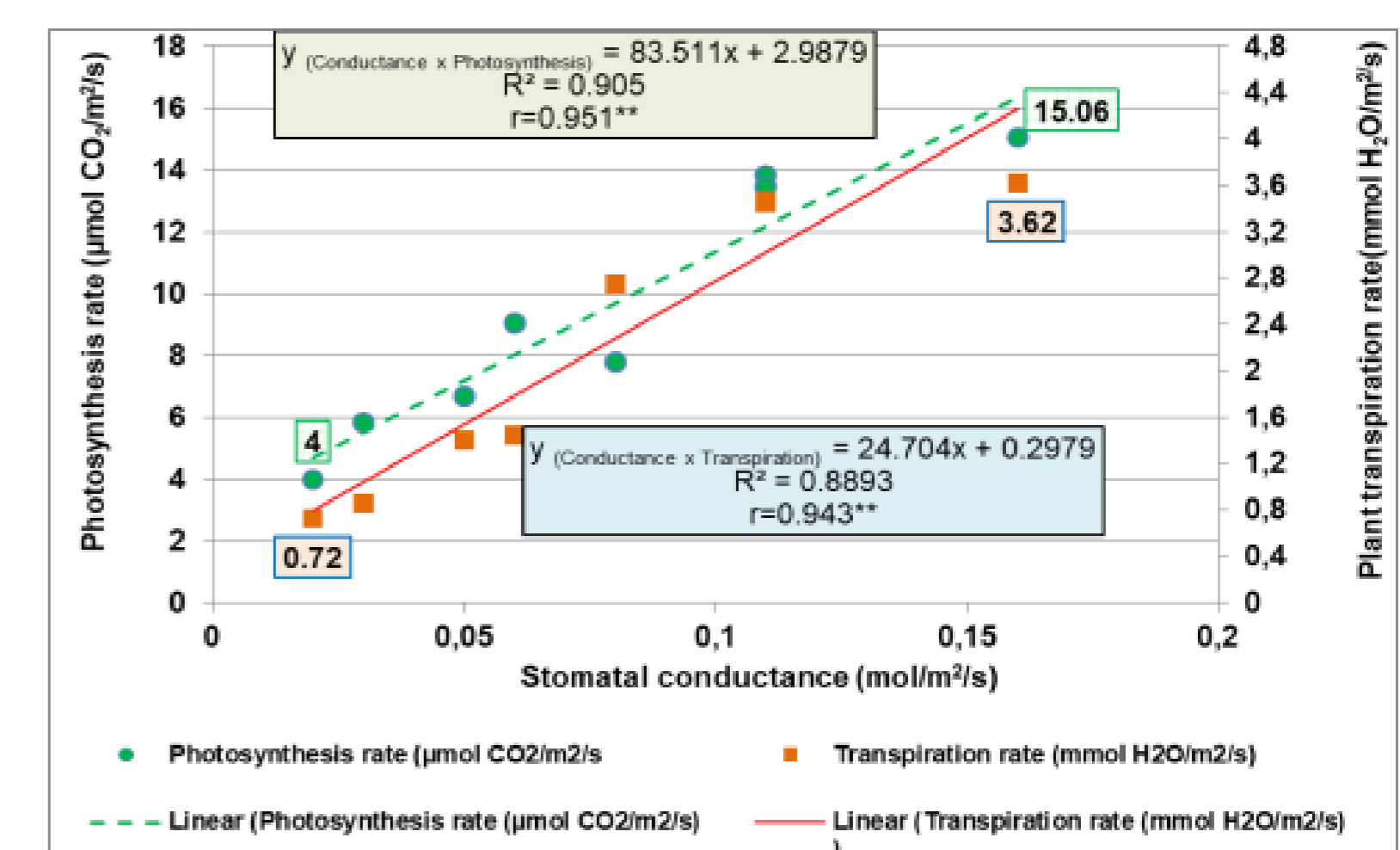


Analysis of morphological and productivity characters in cowpea genotypes

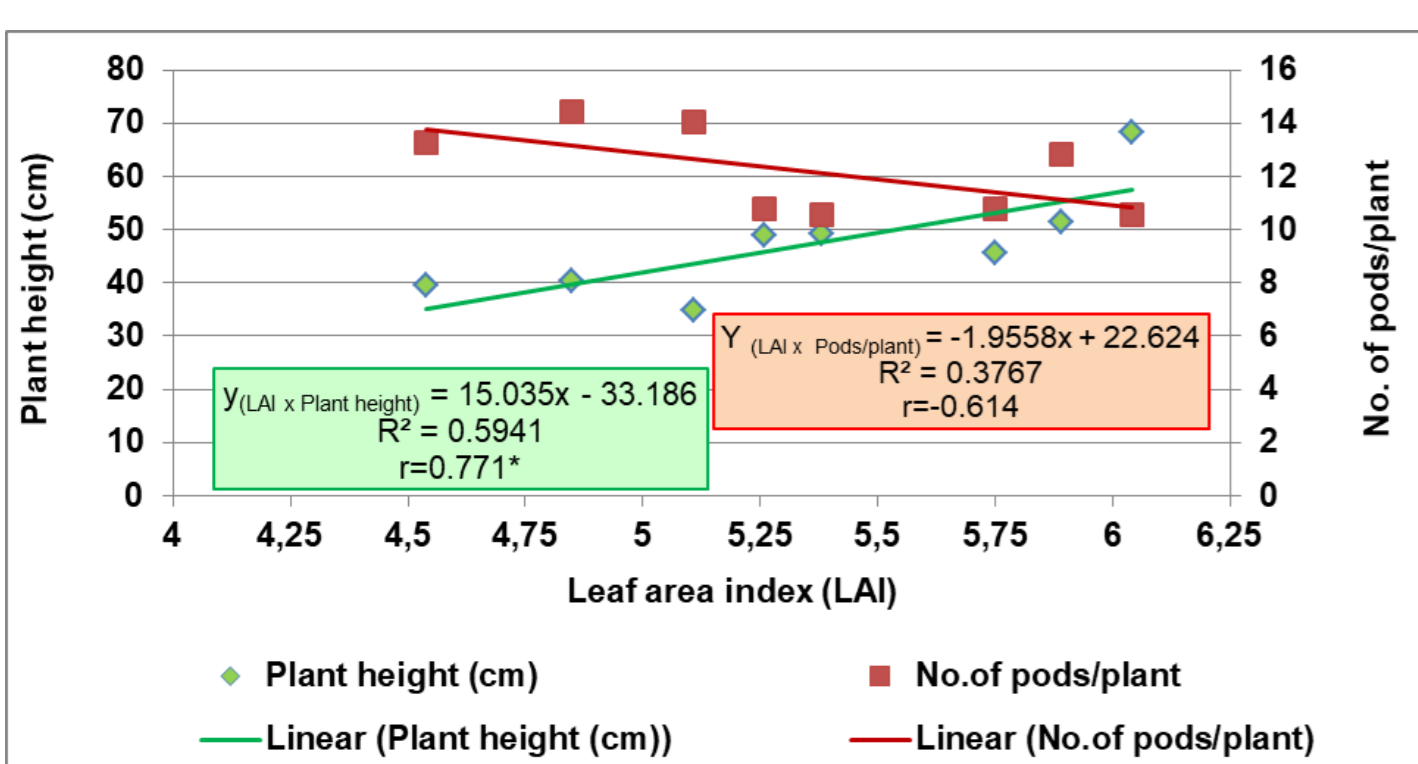
Cowpea genotype	Plant height (cm)		Leaf Area Index (ISF)		Number of pods/plant		Number of beans in pods		Pod length (cm)	
	Value	Difference from the control	Value	Difference from the control	Value	Difference from the control	Value	Difference from the control	Value	Difference from the control
	<i>Dolja</i> (Control)	68.2	Ct.	6.04	Ct.	10.55	Ct.	8.95	Ct.	11.39
LD 1/2020	51.4	-16.0	5.89	-0.26	12.80	2.25	7.79	-1.17	11.24	-0.15
LD 2/2020	45.7	-22.0 ⁰	5.75	-0.40	10.80	0.25	9.08	0.13	14.53	3.14*
LD 3/2020	40.4	-27.8 ⁰	4.85	-1.31 ⁰	14.45	3.90**	8.33	-0.63	13.52	2.13
LD 4/2020	49.2	-19.0	5.38	-0.78	10.55	0.00	6.98	-1.98	10.48	-0.91
LD 5/2020	39.6	-28.6 ⁰	4.54	-1.62 ⁰	13.25	2.70*	8.03	-0.92	11.73	0.33
LD 6/2020	34.9	-33.300 ⁰	5.11	-1.05	14.05	3.50*	9.00	0.05	12.70	1.31
LD 7/2020	48.9	-19.30	5.26	-0.89	10.80	0.25	8.50	-0.45	12.94	1.55
LSD 5%	21.55		1.31		2.47		2.28		2.91	
LSD 1%	31.82		1.93		3.64		3.37		4.30	
LSD 0.1%	49.19		2.98		5.63		5.20		6.65	

Statistical analysis of the quantity and quality of bean production obtained in cowpea lines

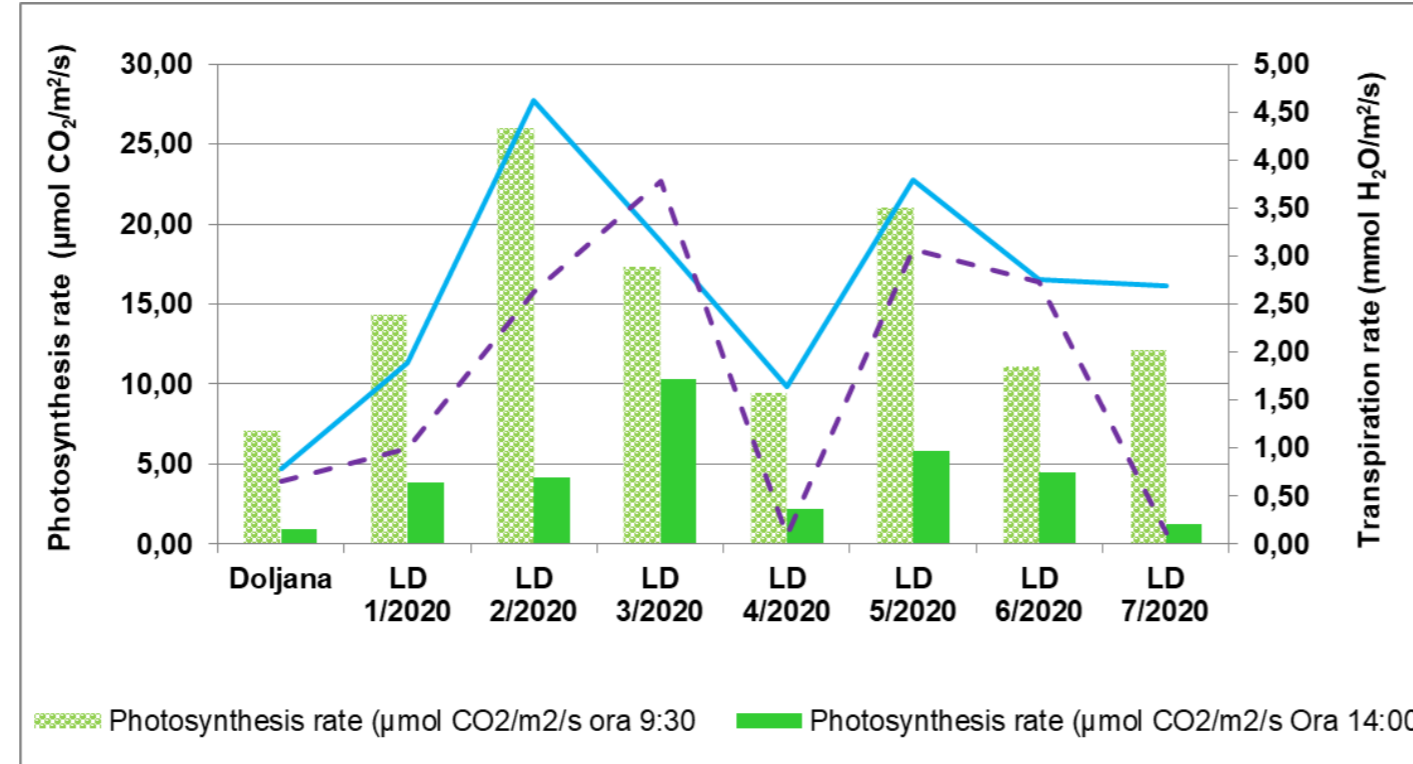
Cowpea genotype	Grain production (kg/ha)		Thousand-seed weight		hectoliter weight (kg/ht)		Crude protein (%)	
	Value	Difference from the control	Value	Difference from the control	Value	Difference from the control	Value	Difference from the control
	<i>Dolja</i> (Control)	1163.10	Ct.	104.5	Ct.	75.6	Ct.	24.64
LD 1/2020	1182.55	19.45	164.0	59.5**	68.1	-7.6 ⁰	26.19	1.59*
LD 2/2020	1460.35	297.25	141.0	36.5*	72.9	-2.7	24.50	-0.10
LD 3/2020	1937.98	774.88**	155.0	50.5**	72.0	-3.6	26.37	1.77*
LD 4/2020	1206.48	43.38	153.0	48.5**	68.3	-7.3 ⁰	23.92	-0.69
LD 5/2020	1718.51	555.41*	144.0	39.5*	74.8	-0.8	26.72	2.12*
LD 6/2020	2007.11	844.01**	166.0	61.5**	68.5	-7.1 ⁰	26.35	1.75*
LD 7/2020	1224.81	61.71	146.0	41.5**	71.9	-3.8	24.91	0.31
LSD 5%	452.74		32.5		5.5		1.59	
LSD 1%	668.60		48.0		8.1		2.34	
LSD 0.1%	1033.47		74.1		12.5		3.62	



Correlations between stomatal conductance and photosynthesis and transpiration processes recorded in cowpea (n=8)



Correlations between the leaf area index recorded in the flowering phase of broad cowpeas with plant height and the number of pods per plant (n=8)



Diurnal variation of physiological processes in the studied cowpea genotypes

CONCLUSIONS

The vegetation period of the new cowpea lines lasted 69.5-82.5 days, with a total thermal resource in the air of 1637.9-1970.7°C, and the LD 5/2020 and LD 6/2020 lines stood out by being 12.5-15.5 days earlier than the *Dolja* variety. Compared to the control variety, the new cowpea lines recorded lower plant height and leaf index and better fruiting. The leaf area index, recorded in the flowering phase of the cowpea, was positively correlated with plant height and negatively correlated with the number of pods/plant. The intensity of photosynthesis and transpiration processes was positively correlated with stomatal conductance. The lines with the best production results (1718.51-2007.11 kg/ha) were highlighted: LD 3/2020, LD 5/2020 and LD 6/2020, which stood out significantly and distinctly from the *Dolja* variety cowpea. The grain production obtained from the assortment of cowpea genotypes studied was significantly positively correlated with the number of pods/plant (r=0.838**) and significantly negatively correlated with the leaf area index (r=-0.754*). From the point of view of production quality, the cowpea lines LD 1/2020, LD 3/2020, LD 5/2020 and LD 6/2020 were characterized by a high crude protein content in the grain (26.19-26.72%), with differences of 1.59-2.2% compared to the control variety, which were statistically significant.

ACKNOWLEDGEMENTS

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