RESEARCH REGARDING THE INFLUENCE OF GENOTYPE X EPOCH OF SOWING X DISTANCE BETWEEN ROWS ON SEEDS YIELD AT *RICINUS COMMUNIS* L. (CASTOR BEAN)

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Abstract

The researches were organized in 2018-2019 at the Moldoveni Agricultural Society, Neamt County. Analyzing the influence of the distance between rows at castor bean, it results that at greater distances yield deficits are obtained, so when the plant nutrition area is increased, the branching is stronger and the yield obtained from the main raceme decreases, increasing instead the production of secondary racemes. The results obtained on average over the two years of experimentation show us that the highest production was obtained for the variant sown at 70 cm between rows (1460 kg / ha), which indicates that castor bean responds favorably at this distance. The average productions obtained in the analyzed period were directly influenced by the experienced technological factors. These varied in limits between 1036 kg / ha (Rivlas x the fourth epoch x 100 cm between rows) to 1650 kg / ha (Christian x the second epoch x 70 cm between rows).

Key words: yield, castor bean, technological factors

Castor bean (*Ricinus communis* L.) oil is distinct from other vegetable oils, mainly because it consists of up to 90% of a hydroxylated fatty acid called ricinoleic acid (Severino L.S. *et al*, 2012), and it has many applications in the chemical industry, including biodiesel production (Baldwin B.S., Cossar R.D., 2009).

The castor bean plant is tolerant to drought and adapted to many cropping conditions (Babita M. *et al*, 2010; Carvalho E.V. *et al*, 2010). The optimization of row spacing and in-row plant density is a simple procedure with a low cost but has a significant influence on yield (Severino L.S. *et al*, 2006a; Severino L.S. *et al*, 2006b; Severino L.S. *et al*, 2012) and is essential to maximize seed production (Cox W.J., Cherney J.H., 2011). A high plant density may result in overgrown plants (Carvalho E.V. *et al*, 2010) and subsequent lodging, whereas a low plant population may favor weed infestation, late flowering, long lateral branches, and wide stems, which impair mechanical harvesting (Lopes F.F.M. *et al*, 2008; Severino L.S. *et al*, 2006b; Severino L.S. *et al*, 2012). Light interception by plants strongly influences the crop yield when other environmental factors are favorable, and it is modified by the plant spatial distribution in a given area (Severino L.S. *et al*, 2006a; Severino L.S. *et al*, 2006b; Severino L.S. *et al*, 2012).

MATERIAL AND METHOD

A factorial experiment was organized in 2018-2019 at the Moldoveni Agricultural Society, Neamt County, using a subdivided plotsin three replications. The experiments aimed to identify the genotype with the highest adaptability to climatic conditions in the area of influence and establish the optimal time to sow and the distance between the rows.

Factor A: Genotype, with 4 graduations:
a1 – Dragon variety;
a2 – Rivlas variety;
a3 – Cristian variety;
a4 – Teleorman variety.

Factor B: Epoch of sowing, with 4 graduations:
b1 - sown in the first decade of April;
b2 - sown in the second decade of April;
b3 - sown in the third decade of April;
b4 - sown in the first decade of May.

Factor C: The nutrition space, with 3 graduations:
c1 - 50 cm between rows;
c2 - 70 cm between rows;
c3 - 100 cm between rows.

The obtained results were processed and

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interpreted statistically according to the method of analysis of variance.

Table 1

The influence of the interaction between genotype x sowing season x distance between rows on castor bean bean production, average years

Variety	Epoch of sowing	Distance between rows (cm)	Production (kg/ha)	%	Diff. (kg/ha)	Sign
Dragon	1st epoch	50	1446	98.13	-28	
		70	1492	101.26	19	
		100	1371	93.09	-102	ooo
	2nd epoch	50	1534	104.13	61	**
		70	1623	110.19	150	***
		100	1421	96.44	-53	o
	3rd epoch	50	1399	94.96	-74	oo
		70	1488	101.03	15	
		100	1286	87.27	-188	ooo
	4th epoch	50	1249	84.76	-225	ooo
		70	1338	90.82	-135	ooo
		100	1135	77.06	-338	ooo
Rivlas	1st epoch	50	1346	91.37	-127	ooo
		70	1392	94.49	-81	ooo
		100	1272	86.32	-202	ooo
	2dn epoch	50	1434	97.36	-39	
		70	1524	103.43	51	*
		100	1321	89.67	-152	ooo
	3rd epoch	50	1299	88.20	-174	ooo
		70	1389	94.26	-85	ooo
		100	1186	80.50	-287	ooo
	4th epoch	50	1149	77.99	-324	ooo
		70	1238	84.06	-235	ooo
		100	1036	70.30	-438	ooo
Cristian	1st epoch	50	1472	99.94	-1	
		70	1518	103.07	45	*
		100	1398	94.90	-75	oo
	2dn epoch	50	1561	105.94	88	***
		70	1650	112.00	177	***
		100	1447	98.25	-26	
	3rd epoch	50	1426	96.78	-48	o
		70	1515	102.84	42	*
		100	1312	89.08	-161	ooo
	4th epoch	50	1275	86.57	-198	ooo
		70	1365	92.63	-109	ooo
		100	1162	78.88	-311	ooo
Teleorman	1st epoch	50	1418	96.25	-55	oo
		70	1464	99.38	-9	
		100	1344	91.21	-130	ooo
	2dn epoch	50	1506	102.25	33	
		70	1596	108.32	123	***
		100	1393	94.56	-80	ooo
	3rd epoch	50	1371	93.09	-102	ooo
		70	1461	99.15	-13	
		100	1258	85.39	-215	ooo
	4th epoch	50	1221	82.88	-252	ooo
		70	1310	88.95	-163	ooo
		100	1108	75.19	-366	ooo
Average			1373	100	Ct.	
LSD AXBXC (kg/ha)			5%=41.33; 1%=57.20; 0.01%=79.94			

RESULTS AND DISCUSSIONS

The average productions obtained in the analyzed period were directly influenced by the experienced technological factors. These varied in limits between 1036 kg/ha (Rivlas x 4th epoch of sowing x 100 cm between rows) to 1650 kg/ha (Christian x 2nd epoch of sowing x 70 cm between rows) *(table 1).*

The production increases obtained for the variants sown in the second epoch and at the distance of 70 cm between the rows were between 51 - 177 kg/ha, statistically assured and interpreted as significant and very significant *(table 2).*

On average, over the two years of experimentation, the average height of plants in the Dragon variety in the version sown in the first x 50 cm was 133 cm, but by increasing the distance between rows the height of the plant increases to 173 cm. Also for the Dragon variety, the average length of the main raceme ranged from 25.4 cm (4th epoch x 100 cm) to 39.9 cm (2nd epoch x 70 cm), the average number of capsules / plant was between 36 - 48 and the average number of seeds / plant varied between 109 - 144 *(table 2).*

During the experimented period, on average for the two years, it can be observed that the varieties Rivlas, Cristian and Teleorman obtained the highest number of capsules per plant in the variant sown in the second epoch x 70 cm (47, 52 and 55), and the lowest number of capsules / plant in the variant sown in the 4th epoch x 100 cm (35, 38 and 40) *(table 2).*

Table 2

Biometric measurements performed during the growing season on experienced castor bean varieties, average years

Variety	Epoch of sowing	Distance between rows (cm)	Plant height (cm)	Main racem insert height (cm)	Length of the main raceme (cm)	Branches	No capsule /pl.	Nr. seeds. / pl
Dragon	1st epoch	50	133	79.8	29.1	0	44	132
		70	149	81.5	28.1	0	45	135
		100	163	81	27.6	2	42	126
	2nd epoch	50	153	78.5	29	0	46	137
		70	164	89.3	39.9	0	48	144
		100	173	91.5	28.9	2	43	129
	3rd epoch	50	145	77	27.2	0	43	129
		70	155	82.1	30.8	0	45	136
		100	168	88.5	26.8	1	40	120
	4th epoch	50	140	73.5	25.7	0	39	117
		70	149	76.4	26.6	0	42	125
		100	162	85.5	25.4	0	36	109
Rivlas	1st epoch	50	136	86.3	24.6	0	42	127
		70	151	88.6	27	0	44	131
		100	166	93.4	25.9	1	41	122
	2nd epoch	50	153	88.6	28.6	0	45	135
		70	164	92.3	35.9	0	47	142
		100	174	93.9	27.8	2	42	125
	3rd epoch	50	147	82.5	27.6	0	42	124
		70	157	87.6	31.5	0	44	131
		100	170	91.3	25.4	0	38	115
	4th epoch	50	142	79.3	25.1	0	38	113
		70	151	73.6	31.8	0	41	121
		100	164	82.6	24.6	0	35	104
Cristian	1st epoch	50	143	66.2	29.2	0	47	140
		70	141	69	28.6	0	48	144
		100	170	71.7	25.8	1	45	134
	2nd epoch	50	142	70.2	29.7	0	49	147
		70	160	81	38.9	0	52	154
		100	170	84.9	26.7	1	46	137
	3rd epoch	50	153	61.9	26	0	45	135
		70	142	66.5	30.1	0	48	143
		100	158	75.3	23.9	0	38	113
	4th epoch	50	137	61.9	23.4	0	41	123
		70	145	69.4	28.2	0	43	130
		100	158	75.3	23.9	0	37	112
Te	1st	50	96	39.5	28.1	0	50	150

	epoch	70	105	41	27.1	0	50	149
		100	120	56.2	27.4	2	48	142
	2nd epoch	50	110	42.5	30.1	0	53	158
		70	121	63.9	30.4	0	55	166
		100	131	65.9	27.6	2	49	147
	3rd epoch	50	102	47.4	27.2	0	48	145
		70	112	58.9	29	0	51	154
		100	125	63.8	24.9	1	45	134
	4th epoch	50	97	46.5	24.6	0	42	126
		70	106	49.2	25.4	0	47	140
		100	120	56.5	18.6	0	40	120

CONCLUSIONS

Among the factors that led to the superiority of the variant sown at 70 cm between rows in the study period, we must mention the following: the possibility of mechanical tillage until advanced stages of vegetation without affecting the roots and foliar apparatus, creating access to sunlight at the lower stages of the leaves, earlier harvesting of the capsules and their uniform maturation.

Analyzing the influence of the distance between rows on castor bean, it results that at greater distances production deficits are obtained, so when the plant nutrition area is increased, the branching is stronger and the production obtained from the main raceme decreases, increasing instead the production of secondary racemes. The density must be set so as to greatly reduce the production of secondary racemes, which do not always reach maturity.

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