

## RESEARCHES REGARDING THE INFLUENCE OF THE NUTRITION SPACE AT *CASSIA ANGUSTIFOLIA* Vahl. (SENNA) SPECIES CULTIVATED UNDER THE CONDITIONS OF A.R.D.S. SECUIENI

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**Abstract:** The present paper presents the results on the influence of the nutrition space at *Cassia angustifolia* Vahl. (Senna), cultivated under the conditions of A.R.D.S. Secuieni in 2017. The interaction of the studied factors was characterized by very significant negative differences to the production of fresh herb at *Cassia angustifolia* compared to the control variant (30666 kg/ha) at the distance between rows of 50 cm and 70 cm at all three distances between plants per row (continuous row, 15 cm and 25 cm).

**Keywords:** nutrition space, Senna, seeds

### 1. INTRODUCTION

Senna is widely used for its numerous benefits. Scientifically, it is known as *Cassia angustifolia* and belongs to family *Fabaceae* [1, 2]. The plant is mainly valued for its cathartic properties and is mainly useful in habitual constipation. The laxative principles sennoside A and sennoside B, isolated from leaves and pods of senna, constitute important ingredients in purgative medicines [3]. The plant has been investigated for its various chemical constituents and pharmacological properties [3 - 7]

About 26 species of *Cassia* have been reported to contain anthracene derivatives either in their free form or as glycosides. The anthraquinone molecules are widely distributed in the genus *Cassia* and have remarkable biological properties in *C. angustifolia* and *C. acutifolia* [8, 9]. The researches were carried in 2017 at A.R.D.S. Secuieni and aimed establish the optimal nutritional space for the species *Cassia angustifolia* Vahl. in order to develop the technology cultivation.

### 2. MATERIAL AND METHOD

The researches were carried in 2017 at A.R.D.S. Secuieni on a typical cambic soil type. Characterized as being well supplied with mobile phosphorus (39 ppm - P<sub>2</sub>O<sub>5</sub>), moderately supplied in nitrogen with the soil nitrogen index of 2.1, well supplied in mobile potassium (161 ppm - K<sub>2</sub>O), slightly acidic, with the pH (in aqueous suspension) of 6.29 and a humus content of 2.3 %. In order to development of technology cultivation at *Cassia angustifolia* Vahl. species one of the technological links studied was the optimal nutrition space.

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Experienced factors are: A – the distance between rows with graduations: 25 cm, 50 cm and 70 cm and B – the distance between plants per row with graduations: continuous row, 15 cm and 25 cm.

The soil work and the preparation of the germination bed consisted in releasing the soil from the plant debris in the pre-planting, stubble-turning and plowing at a depth of 30 cm. In spring, preparation of the germination bed was made with a harrow disc and the sowing was done manually at a 2 cm depth.

At *Cassia angustifolia* Vahl. species the observations and determinations during the vegetation period were the following: the number of branches/plant, the number of pods/plant, the seeds weight/plant, the production of fresh herb and seeds.

For the production of fresh herbs the plants were harvested manually until full blossom by cutting plants at a height of 5 cm from the ground. Seed harvesting was done by cutting plants with mowing, followed by barking. The seed obtained was conditioned by the small seed selector.

For the entire growing season of the *Cassia angustifolia* Vahl. species the deviation from the multiannual average of temperatures was 0.7 °C (2017). In terms of rainfall recorded during the vegetation period at *Cassia angustifolia* Vahl., the year 2017 was less drought compared to the multiannual average (Table 1, Table 2).

Table 1. Temperatures recorded at A.R.D.S. Secuieni meteorological station.

Average temperature °C	Months									Average vegetation period	Deviation	Vegetation period characterization
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept			
2017	-5.7	-1.8	7.0	9.1	15.4	20.3	20.4	21.2	16.3	17.1	0.7	normal
Multiannual average	-3.8	-2.3	2.6	9.4	15.4	18.8	20.3	19.5	14.8	16.4	-	-

Table 2. Rainfall recorded at A.R.D.S. Secuieni meteorological station.

Rainfall (mm)	Months									Sum for the vegetation period	Deviation	Vegetation period characterization
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept			
2017	7.3	17.0	101.6	54.4	59.4	49.4	72.2	21.0	55.2	313.6	-18.9	less dry
Multiannual average	20.5	19.6	25.4	46.8	64.8	84.3	84.0	61.4	45.4	386.7	-	-

### 3. RESULTS AND DISCUSSION

The average number of branches of the plant was between 2.06 cm and 5.2 cm. The variant sown at the distance of 50 cm between the rows and 25 cm between the plants per row (a2xb3) and the variant sown at 70 cm between the rows and continuous (a3xb1), the difference from the control variant was positive significantly (5.2 and 5.13) compared to the control (a1xb1 - 2.07) (Table 3).

Interactions between a3xb1 (65.80 grams) and a3xb2 (61.53 grams) influenced the average number of pods per plant at *Cassia angustifolia* Vahl. compared to the control a1xb1 (35.47 grams), the differences being significant and distinctly significant (Table 4).

The low rainfall during the vegetation period affected the weight of the seeds/plant and implicitly the production of seeds per hectare. The obtained results on the interaction of the studied factors showed that the average weight of the seeds/plant recorded positive differences, distinctly significant the plants sown at 70 cm between the rows at all three distances between plants per row (continuous row, 15 cm and 25 cm), namely a3xb1 (30.16 grams), a3xb2 (30.18 grams) and a3xb3 (26.59 grams) compared to control variant a1xb1 (sown at 25 cm between rows and plant spacing per row continuously – 15.49 grams) (Table 5).

High temperatures and rainfall during the vegetation period have influenced the yield of fresh herb / hectare. The interaction of the studied factors was characterized by very significant negative differences in the production of fresh herb at *Cassia angustifolia* Vahl. compared to the control variant (30666 kg/ha) at the distance between rows of 50 cm and 70 cm at all three distances between plants per row (continuous row, 15 cm and 25 cm) (Table 6).

Table 3. Influence of the interaction between row spacing and plant spacing in relation to the average number of branches per plant in *Cassia angustifolia* Vahl. (Senna) species at A.R.D.S. Secuieni in 2017.

Distance between rows (A)	Distance between plants per row (B)	Number of branches /plant	% compared to control	Diff.	Significance
a1-25 cm	b1- continuous row	2.07	100	Ct.	
	b2-15 cm	2.06	99.51	-0.01	
	b3-25 cm	3.60	174.19	1.53	
a2-50 cm	b1- continuous row	3.13	151.20	1.06	
	b2-15 cm	2.47	119.32	0.4	
	b3-25 cm	5.20	251.20	3.13	*
a3-70 cm	b1- continuous row	5.13	247.82	3.06	*
	b2-15 cm	4.60	222.22	2.53	
	b3-25 cm	2,87	138.64	0.8	
LSD 5 % = 2.74    LSD 1 % = 4.11    LSD 0.1% = 6.59					

Positive significantly, \*.

Table 4. Influence of the interaction between row spacing and plant spacing in relation to the average number of pods per plant in *Cassia angustifolia* Vahl. (Senna) species at A.R.D.S. Secuieni in 2017.

Distance between rows (A)	Distance between plants per row (B)	Number of pods/plant (g)	% compared to control	Diff.	Significance
a1-25 cm	b1- continuous row	35.47	100	Ct.	
	b2-15 cm	34.73	97.93	-0.73	
	b3-25 cm	32.53	91.72	-2.93	
a2-50 cm	b1- continuous row	41.00	115.59	5.53	
	b2-15 cm	40.40	113.89	4.93	
	b3-25 cm	42.60	120.10	7.13	
a3-70 cm	b1- continuous row	65.80	185.50	30.33	**
	b2-15 cm	61.53	173.47	26.06	*
	b3-25 cm	53.47	150.74	18.00	
LSD 5 % = 19.07    LSD 1 % = 28.06    LSD 0.1 % = 43.53					

Positive significantly, \*; Positive distinct significantly, \*\*

Analyzing the interaction between distance spacing and the distance between plants per row on average seed production, it was found to vary between 1249 kg/ha at a2xb1 (line spacing of 50 cm continuously sown) and 2774 kg/ha at a1xb3 the distance between rows 25 cm and the distance between plants per row of 25 cm (Table 7).

Table 5. Influence of the interaction between row spacing and plant spacing in relation to the average seed weight per plant in *Cassia angustifolia* Vahl. (Senna) species at A.R.D.S. Secuieni in 2017.

Distance between rows (A)	Distance between plants per row (B)	Seed weight/plant (g)	% compared to control	Diff.	Significance
a1-25 cm	b1- continuous row	15.49	100	Ct.	
	b2-15 cm	18.14	117.15	2.66	
	b3-25 cm	14.05	90.70	-1.44	
a2-50 cm	b1- continuous row	17.14	110.65	1.65	
	b2-15 cm	17.88	115.42	2.39	
	b3-25 cm	19.43	125.43	3.94	
a3-70 cm	b1- continuous row	30.16	194.70	14.67	**
	b2-15 cm	30.18	194.83	14.69	**
	b3-25 cm	26.59	171.65	11.1	**
LSD 5% = 7.04 g    LSD 1% = 10,14 g    LSD 0.1% = 15,10 g					

Positive distinct significantly, \*\*.

Table 6. Influence of the interaction between row spacing and plant spacing in relation to the average fresh herbs (kg/ha) in *Cassia angustifolia* Vahl. (Senna) species at A.R.D.S. Secuieni in 2017.

Distance between rows (A)	Distance between plants per row (B)	Production of fresh herb (kg/ha)	% compared to control	Diff.	Significance
a1-25 cm	b1- continuous row	30666	100	Ct.	
	b2-15 cm	23013	75.04	-7653	o
	b3-25 cm	22586	73.65	-8000	o
a2-50 cm	b1- continuous row	15633	50.97	-15033	ooo
	b2-15 cm	15280	49.82	-15386	ooo
	b3-25 cm	13406	43.71	-17260	ooo
a3-70 cm	b1- continuous row	16773	54.69	-13893	ooo
	b2-15 cm	14286	46.58	-16380	ooo
	b3-25 cm	14486	47.23	-16180	ooo
LSD 5 % = 5600 kg/ha    LSD 1 % = 8128 kg/ha    LSD 0.1 % = 12283 kg/ha					

Negative significantly, o; Negative very significant, ooo.

Table 7. Influence of the interaction between row spacing and plant spacing in relation to the average seed production (kg/ha) in *Cassia angustifolia* Vahl. (Senna) species at A.R.D.S. Secuieni in 2017.

Distance between rows (A)	Distance between plants per row (B)	Production (kg/ha)	% compared to control	Diff.	Significance
a1-25 cm	b1- continuous row	2572	100	Ct.	
	b2-15 cm	2314	89.95	-258	
	b3-25 cm	2674	103.93	101	
a2-50 cm	b1- continuous row	1249	48.56	-1323	ooo
	b2-15 cm	1515	58.90	-1057	ooo
	b3-25 cm	1535	59.68	-1037	ooo
a3-70 cm	b1- continuous row	2171	84.40	-401	
	b2-15 cm	2083	80.98	-489	o
	b3-25 cm	1904	74.02	-668	oo
LSD 5 % = 416.9 kg/ha    LSD 1 % = 614.0 kg/ha    LSD 0.1 % = 953.9 kg/ha					

Negative significantly, o; Negative distinct significantly, oo; Negative very significant, ooo.

#### 4. CONCLUSIONS

Under the conditions of A.R.D.S. Secuieni, due to high temperatures and low rainfall during certain months of the vegetation period at the distances of 50 cm and 70 cm between the rows there was a decrease of the herb and seed production as compared to the control of the experience sowing at 25 cm between the rows and continuously row during the 2017.

The interaction of the studied factors was characterized by very significant negative differences at the yield of fresh herb compared to the control variant (30666 kg/ha) at the distance between rows of 50 cm and 70 cm at all three distances between plants per row .

Large deficits yield were obtained at the 50 cm between the rows at all three distances between plants per row. The low rainfall in certain months of vegetation periods has influenced seed production at Senna species.

Being a new species introduced into culture, it requires all the attention the growers of medicinal plants.

#### REFERENCES

- [1] Khan, M.A., Ahmad, M., Zafar, M., Sultana, S., Shaheen S., Leghari, M.K., Jan, G., Ahmad, F., Nazir, A., Medico-botanical and chemical standardization of pharmaceutically important plant of *Tricholepis chaetolepis* (Boiss.), Journal of Medicinal Plants Research, vol. 8, no. 5, 2011, p. 1471-1477.

- [2] Shazia, S., Mushtaq, A., Muhammad, Z., Mir Ajab, K. Muhammad, A., Authentication of herbal drug Senna (*Cassia angustifolia* Vahl.): A village pharmacy for Indo-Pak Subcontinent, *African Journal of Pharmacy and Pharmacology*, vol. 6, no. 30, 2012, p. 2299-2308.
- [3] Tripathi, Y.C., *Cassia angustifolia*, a versatile medicinal crop, *International Tree Crops Journal*, vol. 10, 1999.
- [4] Buburuz, A.A., Popa, L.D., The productivity of some monoecious hemp varieties (for fiber and mixte) under the center of Moldavia ecopedoclimatic conditions, *Journal of Engineering Studies and Research*, vol. 23, no. 2, 2017, p. 7- 11.
- [5] Naie, M., Mirzan, O., Dobrea, D.I., Researches regarding the influence of the nutrition space at *Dracocephalum Moldavica* l. (Dragonhead) species cultivated under the conditions of A.R.D.S. Secuieni, *Journal of Engineering Studies and Research*, vol. 23, no. 2, 2017, p. 16-21.
- [6] Ursache, P.L., Trotus, E., Buburuz, A.A., Observations concerning the harmful Entomofauna from winter rapeseed crops in the conditions of Central of Moldava, between years 2014-2017, *Journal of Engineering Studies and Research*, vol. 23, no. 2, 2017, p. 33-41.
- [7] Irimia, O., Nedeff, V., Panainte Lehadus, M., Tomozei, C., Experimental study concerning the distribution of granular particle shape from a filter layer, *Journal of Engineering Studies and Research*, vol. 22, no. 1, 2016, p. 64-71.
- [8] Ganapaty, S., Thomas, P.S., Ramana, K.V., Vidyadhar, K., Chakradhar, V., A review of phytochemical studies of *Cassia* species, *Journal of Natural Remedies*, vol. 2, 2002, p. 102 - 120.
- [9] Ram, P., Mehrotra, B.N., *Compendium of Indian medicinal Plants*, CDRI Publications: Lucknow, 1999, p. 147-156.