PRELIMINARY RESULTS REGARDING THE BEHAVIOR OF THE CASSIA ANGUSTIFOLIA VAHL. SPECIES ON THE SANDY SOILS OF THE SOUTH OF OLTENIA

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Abstract

The research carried out had as its objective the introduction of some valuable medicinal and aromatic plant species into cultivation on sandy soils and aimed at enriching the collection of medicinal and aromatic plants existing at the Research Development Station Plant Culture Sands Dăbuleni .

The behavior of the Cassia angustifolia Vahl. (senna) species on sandy soils was monitored in 2024 within the framework of Project 1.2.2,, Diversification of the assortment of medicinal, aromatic and Jerusalem artichoke plant species cultivated on sandy soils,, funded by Ministry of Agriculture and Rural Development.

Under irrigation conditions, at Research Development Station Plant Culture Sands Dăbuleni, the senna crop recorded an average production of green herb of 12640 kg/ha and of dry herb of 2429 kg/ha.

Key words: medicinal plants, production, sandy soils.

INTRODUCTION

Cassia angustifolia Vahl., also known as Senna or siminiche, is a species of flowering plant belonging to the family Fabaceae (Khan et al.,2011, Shazia, S. et al.,2012).

Cassia angustifolia Vahl. is a plant native to Asia, Egypt, Saudi Arabia, It was first introduced to Europe as a medicinal plant in the 12th century (Werner and Merz, 2007). It is cultivated on large areas in southern India and can grow as a shrub up to 1.8 m tall. According to some authors, it has about 580 species, some of which are also found in temperate regions (Randell et al., 1998; Savulescu et al.,2018). Many of these species are used for medicinal purposes, others are considered ornamental (Trease & Evans, 1983; Evans, 1992, Kumar et al., 2022,).

The plant is mainly valued for its properties, being generally used in the treatment of constipation. Senna leaves and pods have been used in herbal medicine since ancient times (Bojor and Răducanu, 2001).

From the leaves and pods of senna, the laxative principles are extracted: sennoside A and sennoside B (Tripathi, 1999, Bojor and Răducanu, 2001). The laxative effect of this natural product has been linked to its content of anthraquinone glycosides (Naie, M. et al.,2017). The antifungal activity of senna has been previously demonstrated and linked to a triterpenoid glycoside present in butanol extracts of senna seeds (Ursache, 2017). In addition, a study demonstrated that an aqueous extract of senna can produce DNA (deoxyribonucleic acid) lesions, but cannot induce cytotoxic or mutagenic effects in Escherichia coli cultures. Senna extract also showed an antioxidant/antimutagenic effect in

Escherichia coli cultures (Irimia, O. et al., 2016).
The seeds are used as an anthelmintic, digestive, and to treat skin diseases and abdominal disorders (Srivastava et al., 2006).
Cassia angustifolia is a perennial plant, 60-80 cm tall, glabrous to subglabrous (Photo2).
The leaves are alternate, paripinnately compound, with 5-9 pairs of lanceolate leaflets, with entire margins, acute apex, hairy on both sides, pale green(Photo 3). The flowers are type 5, arranged in clusters at the ends of the branches and are approximately 2 cm in diameter. The sepals are slightly unequal, greenish-yellow in color. The petals are yellow and slightly uneven. The plant blooms in June. The fruit is a dehiscent, slightly hairy, slightly curved pod with approx. 10 seeds (Photo 4). The fruits turn black at maturity. The anatomy of the stem and leaf are similar to the Fabaceae family, being reconfirmed in specialized works (Metcalfe,1979; Toma & Rugina, 1998; Santhan, 2014, Savulescu et al., 2018).
Being a resistant species, it can be cultivated on saline soils and in rainy conditions, it has low requirements regarding fertilization, irrigation and other care works before and after harvesting. This makes the plant an ideal crop for arid regions where water supply, desertification control, sand dune stabilization represent major challenges (Pareek & Gupta, 1984).
The aim of this work was to highlight some aspects of senna plant biology regarding growth and development, adaptability to ecopedological conditions specific to sandy soils(Photo 1).

MATERIAL AND METHOD

The research was carried out during 2024 at RDSPCS Dăbuleni. The culture was established by direct sowing in the field at the end of March.
The sowing distance used was 100 cm between rows and 25 cm between plants per row to allow mechanization of maintenance work (Photo 1). Irrigation was done by drip, to maintain moisture in the upper layers of the soil. Weed control was carried out by using a motor hoe between rows and by manual practices between plants/row.
During the vegetation period, measurements and observations were made on the behavior of the plants in terms of vegetative growth for 3 plants. For each harvested plant, biometric determinations were made represented by plant height, number of floral stems, weight of flowers, number of inflorescences, weight of the underground part, average number of leaves and their weight, weight of a plant, production of fresh and dry herb/plant. In order to determine drought tolerance, physiological measurements were made regarding plant water content and cell sap concentration.

RESULTS AND DISCUSSIONS

From a climatic point of view, it can be said that this species reacted very well to the environmental factors in the area of sandy soils, in all stages of growth and development.
The average air temperatures during the vegetation period were higher, in almost all months, compared to the multiannual average temperature of the respective months (table 1).
At the end of March when the senna crop was sown, the average air temperature was 12.3^0C.
In April there were hot days, with a monthly maximum of 34.1^0C, with 36 mm of precipitation. The summer months of June-July were hot with maximum temperatures of 39.2^0C, respectively 40.9^0C and with low precipitation. During the vegetation period, monthly precipitation was generally below the multiannual monthly values, except for May, when it exceeded the multiannual value, by 50.6 mm (table 1). The water deficit during the growing season was supplemented by irrigation.

Table 1. The climatic elements recorded at the weather station of RDSPCS Dabuleni

Year/Month/Decada/ climatic element	2024						Average/sum
	III	IV	V	VI	VII	VIII	
I	6.8	16.7	16.1	23.8	25.1	24.5	18.9
II	8.4	15.8	15.8	24.6	29.1	27.7	20.2
III	12.3	12.9	18.1	27.1	25.4	25.4	20.2
Monthly average air temperature^{0}C	9.2	15.2	16.7	25.2	26.5	25.8	19.7
Monthly maximum temperature (^{0}C)	29.0	34.1	28.6	39.2	40.9	40.3	40.9
Monthly manimum temperature (^{0}C)	-3.1	2.7	7.4	12.1	10.2	10.5	-3.1
Rainfall (mm)	36.6	36.0	114.0	27.0	22.6	1.4	237.6
Multiannual average air temperature (^{0}C) (1956-2024)	5.9	11.9	16.9	21.6	23.3	22.7	17.0
Multiannual sum rainfall (mm) (1956-2024)	40.6	46.9	63.4	69.3	53.8	36.0	310.0

Regarding the pedological characteristics, the soil type was sandy. poorly supplied in nitrogen (0.07%), medium supplied in phosphorus (44.5 ppm), low to medium content of potassium (61 ppm), with a pH of 6.98 and an organic C content of 0.97 % (table 2).

Table 2. Chemical composition of the soil at Cassia angustifolia species

Depth (cm)	Total nitrogen (%)	Extractable phosphorus (ppm)	Exchangeable potassium (ppm)	Organic carbon (%)	pH
0-20	0.09	44	45	1.54	7.17
20-40	0.05	45	77	0.41	6.8
Average 0-40	0.07	44.5	61.0	0.97	6.98

Biometric measurements performed on plants showed that the Cassia angustifolia species shows a growth in plant height with the stem reaching up to 80-90 cm, with an average of 84 cm.

The number of branches per plant had values of 22-23, with an average of 22.6 branches/plant.

The vegetative mass of a plant recorded values between 154-168 g, with an average of 160.6 g/plant, of which 72.3 g represents the weight of the stem and 76.3 g represents the weight of the leaves (table 3).

Table 3. Biometric measurements during the vegetation period in the Cassia angustifolia species

Plant No.	Plant Height (cm)	Number of branches /Plant	Plant Weight (g)	Stem Weight (g)	Leaves Weight /pl (g)
1	90	22	160	72	76
2	82	23	168	75,6	80
3	80	23	154	69,3	73
Average	84	22.6	160.6	72.3	76.3

Photo 1. Image from the experimental field

The average weight of flowers/plant was 12.06 g/plant, with values ranging between 11.7-12.5 flowers/plant.
The average production of green herb recorded was 12640 kg/ha, and that of dry herb was 2429 kg/ha (table 4).

Table 4. Biometric measurements during the growing season in the Cassia angustifolia species

Plant No.	Flowers weight/ plant (g)	Green herb production (kg)	Dry herb production (kg)
1	12	12800	2460
2	12.5	13120	2520
3	11.7	12000	2307
Average	12.06	12640	2429

Photo 2. Cassia angustifolia plant

Photo 3. Compound paripennate leaves

Photo 4. Dehiscent pods and seeds

During the vegetation period, in order to determine drought tolerance, the forms of water in the plant, the content of dry matter and the concentration of vacuolar juice were recorded.
The leaves of Cassia angustifolia have a large amount of water, both the total water content and the free water content have high values of 73% and 71%, respectively. The dry matter content had a value of 27%. The value of 12% of the vacuolar juice concentration shows us a good drought tolerance of this species(table 5).

Table 5. Determination of some physiological indices in Cassia angustifolia plants

Species	Water forms(%)			Dry matter (%)	Vacuolar juice concentration (%)
Cassia angustifolia	Total water	Bound water	Free water		
	73.0	2.0	71.0	27.0	12.0

CONCLUSIONS

In 2024, the climatic conditions at RDSPCS Dăbuleni, with high temperatures and low rainfall in certain months of the vegetation period, led to good vegetative and productive behavior of the Cassia angustifolia species.

Under irrigation conditions, the senna crop recorded an average production of green herb of 12640 kg/ha and dry herb of 2429 kg/ha.

ACKNOWLEDGEMENTS

This research work was carried out with the support of Ministry of Agriculture and Rural Development, financed from Project 1.2.2.- Diversification of the assortment of medicinal, aromatic and Jerusalem artichoke plant species cultivated on sandy soils.

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