EVALUATION OF AGROPRODUCTIVE CAPACITY IN SEVERAL DIOECIOUS HEMP GENOTYPES, UNDER A.R.D.S. LOVRIN

EVALUAREA CAPACITĂȚII AGROPRODUCTIVE LA CÂTEVA GENOTIPURI DE CÂNEPĂ DIOICĂ, ÎN CONDIȚIILE DE LA S.C.D.A. LOVRIN

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Abstract. *Hemp culture has been unjustly neglected in recent decades, despite the fact that can be used successfully in many areas, returns currently. The present paper aims to evaluate the agro-productive capacity of stems and fiber of some dioic hemp genotypes from the A.R.D.S. Lovrin. The research was carried out on a typical chernozem, weakly gleized and weakly alkalized. During the analyzed period, the production of stems and fiber evolved differently. Compared to the control used, there are distinctly significant and very significant differences in the production of strains, statistically assured for the probability of transgression of 1% and 0.1%. The fiber production did not differ from the control, the recorded values being closely grouped around it.*
Key words: hemp, stems, fiber

Rezumat. *Cultura de cânepă pe nedrept neglijată în ultimele decenii, în ciuda faptului că poate fi utilizată cu succes în multe domenii, revine în actualitate. Prezenta lucrare își propune evaluarea capacității agroproductive de tulpini şi fibră a unor genotipuri de cânepă dioică din colecția A.R.D.S. Lovrin. Cercetările s-au derulat pe un cernoziom tipic , slab gleizat şi slab alcalinizat. În perioada analizată productia de tulpini şi fibră a evoluat diferit. Față de martorul folosit, la producția de tulpini se înregistrează diferențe distins semnificative şi foarte semnificative, asigurate statistic pentru probabilitatea de transgresiune de 1% şi 0,1%. Producția de fibră nu a înregistrat diferențe față de martor, valorile înregistrate fiind grupate strâns în jurul valorii acestuia.*
Cuvinte cheie: cânepă dioică, tulpini, fibră

INTRODUCTION

Hemp is a high-value textile plant for industrial and human use. It is an important source of wood and fiber. The strain represents 60-65% of the total weight of the plant, with a production of dried stems between 6500 and 11000 kg/ha (Ceapoiu, 1965).

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The wood left over from the extraction of the fiber (heard) can be used as a raw material in the manufacture of agglomerated, insulating and phono-insulating plates, which can be used in the furniture industry and in construction. Due to its high cellulose content, the hemp plant can be used as a raw material in the pulp and paper industry. In this area, hemp can replace coniferous wood (Arnoux and Mathieu, 1968; Arnoux *et. al*., 1969).

Depending on the respective organs (root, stem, leaves, seeds), the component parts of a hemp plant are represented in different proportions. In reality, the percentage values representing the parts of the hemp plant vary greatly according to plant, sex, variety, climate, soil, agrotechnical, fertilizer, variety, etc.

The percentage content in fiber is different in the two sexes, the greater fiber richness of male plants is due to the fact that the male strains are thinner and poorer in wood than the female ones. It also depends on the variety, each variety reacts differently to different environmental conditions. The pronounced decrease in the percentage of fiber in the case of hemp cultivation in dry regions is due on the one hand to unfavorable conditions for fiber formation (lack of moisture, too high temperature) and on the other hand to the development of the woody part of the stem (Ceapoiu, 1958).

Of the total weight of the stems, the fibers represent 13-25% and the wood 50-60%. Thus, at a production of 6000 kg/ha, it results in about 3500 kg of wood and 1200 kg of fiber. The quantity of 3500 kg wood is equal to 5.5-6.0 m^3. The annual growth of a fir forest per 1 hectare is equal to about 5.0 m^3 wood. Therefore, the timber production of a hemp crop is equivalent to the annual growth of a fir forest (Ceapoiu, 1958).

The percentage content of the fibers varies along the stem. The highest fiber content is found in the middle of the stem or in the area below it, and the smallest at the tip and base (Bredemann, 1952).

Hemp is grown for its content in natural fibers, hemp stalks contain a percentage of between 26-32% fibers (Şandru *et al.*,1996), fibers that are used in the textile industry for various much-valued fabrics, given the valuable physico-mechanical properties, strength, elasticity, yarn ability are hygroscopic and thermo-conductive (Potlog and Velican, 1972). Hemp fibers can successfully replace plastic and glass fibers from various automotive components (Tabără, 2005). Hemp is a very good forerunner for most crops, reduces the degree of bottling and improves soil attributes (Segărceanu *et al*., 1981).

The particular importance of hemp lies in the fact that the plant can be fully exploited, from its fibers can be manufactured textile products from the coarsest to the finest.

MATERIAL AND METHOD

The field of experience was located on a typical cernoziom, weakly gleized and poorly alkalinized. The experience in the hemp breeding field, of a monofactorial type, was sown in three repetitions, according to the method of randomized blocks. The material used in the study is of Romanian and foreign origin, the varieties Silvana, Lovrin-110 and Armanca are creations of A.R.D.S. Lovrin. The control variety used in the experience was the Silvana dioecious hemp variety, created at A.R.D.S. Lovrin in 2007.

Autumn 2018 was extremely poor in rainfall, registering a deficit of 70.1 mm between September and November.

The year 2019 was characterized by a dry spring with a deficit of 63.3 mm of precipitation and heat with a deviation of 3.8°C in February, 3.7°C in March and 2.7°C in April compared to the multiannual monthly average.

Thus, the agricultural year 2018/2019 is part of the climatic evolution of recent years, characterized by a particularly warm autumn with a deviation of 1.5°C in September, 4.0°C in October and 2.3°C in November, values above the multiannual monthly average.

The lack of rainfall from March to April and the very high temperatures (tab. 1), amid a deficit of rainfall in February, made it difficult to prepare the land for sowing and extended the time of sunrise. In fiber hemp, sown in the optimal period (the first decade of April), due to lack of precipitation the seeds did not germinate 100% in the first phase, some plants remained small, undeveloped sprouted later while those that have reached moisture during sowing have a large waist and are well developed.

Table 1

The main climatic elements during September 1, 2018 - August 31, 2019

Climatic elements		Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Avrg. Sum
Rainfall (mm)	Monthly average	29	10	21	41	58	15	15	34	92	88	55	18	476
	Multiannual average	42.4	40.1	47.6	39.7	32.7	29.6	32.3	42.7	57.3	68.1	55.8	32.3	520.6
	Deviation	-13,4	-30.1	- 26.6	+ 0.3	+25.3	-14.6	-17.3	-8.7	+34.7	+19.9	-0.8	-14.3	-44.6
Temperature (t^0C)	Monthly average	18.3	15.1	7.8	1.0	-0.4	4.6	9.0	13.4	15.1	22.3	21.6	23.9	12.6
	Multiannual average	16.8	11.1	5.5	1.1	-1.1	0.8	5.3	10.7	16.3	19.8	22.2	21.7	10.9
	Deviation	+1.5	+4.0	+2.3	-0.1	+0.7	+3.8	+3.7	+2.7	-1.2	+2.5	-0.6	+2.2	+1.7

During vegetation, work was carried out to maintain the crop, fertilize, remove early male and female plants. The harvest of the fiber crop was carried out at the technical maturity of the plants. The determination of the fiber was made by the modified Bredemann method – from the average sample retained, cut samples 20 cm long from the middle of the whole stem, mix and divide into repetitions of 50 g each. Repeat samples are placed in the tray at 105 °C for 24 hours, then removed into a calcium chloride exicator to cool and weigh. The weight found is the amount of dry matter of the sample. After weighing the samples that are related to both ends with string, boil in a solution of natrium hydroxide (NaOH) 1.5% for 1 1/2 - 2 1/2 hours. After boiling the fibers are carefully removed from the stems, then thoroughly washed with lukewarm water jet. For the removal of impurities from the fibers the samples are boiled again in 1.5% natrium hydroxide solution for 1-2 hours. After boiling the samples are washed with plenty of water and dried in the case at 105 °C until the weight is stabilized. then cool in the excicator, weigh and calculate the percentage content of pure fiber in relation to the weight of the dry substance in the stems.

The experimental results obtained were calculated and interpreted using the variant analysis method (ANOVA).

RESULTS AND DISCUSSIONS

The production of strains, important for use in different industries, was analyzed in the experimental field at A.R.D.S. Lovrin. For this, 10 varieties were used, in the collection of varieties of the Laboratory for the improvement of the dioecious hemp – 4 Romanians and 6 of foreign origin.

The average production of strains, as shown in table 2 and figure 1, fluctuated between 10755 kg/ha and 8250 kg/ha. The variety with the highest production was Felina (10755 kg/ha), followed by Armanca (10388 kg/ha).

Table 2

Production of strains obtained per 10 varieties of dioic hemp of different provenance at A.R.D.S. Lovrin

Nr. crt.	Genotype	Average production (kg/ha)	Relative production (%)	Difference +/- (kg/ha)	Meaning
1	**Silvana**	9935	100	**Mt**	
2	**Lovrin - 110**	9389	94.5	-546	**00**
3	**Armanca**	10388	104.6	454	**
4	**Silistra**	9555	96.2	-380	**0**
5	**Fibramulta 151**	9566	96.3	-368	**0**
6	**Carmagnola**	8250	83.0	-1685	**000**
7	**Hungary 139**	9561	96.2	-373	**0**
8	**Felina**	10755	108.3	821	***
9	**Tiumen 85**	8300	83.5	-1635	**000**
10	**Kuban**	9311	93.7	-624	**000**

LSD 5% = 314.0 kg/ha
LSD 1% = 431.1 kg/ha
LSD 0.1% = 587.8 kg/ha

Analyzing table 1 and figure 1 we can state that, compared to the control variant –Silvana, which recorded an average production of strains of 9935 kg/ha, all other varieties studied presented values of this significant parameter, distinctly significant and very significant, statistically assured. Thus, the Romanian variety Armanca showed a variation in strain production of 4.6% compared to the control and an increase of 454 kg/ha, statistically distinctly significant positive value, for the probability of transgression of 1%. A production increase of 821 kg/ha was obtained in variant 8, represented by the Felina variety, a value statistically assured as very significant for the probability of transgression of 0.1%.

All other varieties studied showed statistically negative insured spores, the lowest values being found in the varieties Carmagnola, Tiumen 85 and Kuban, followed by Silistra and Lovrin 1.

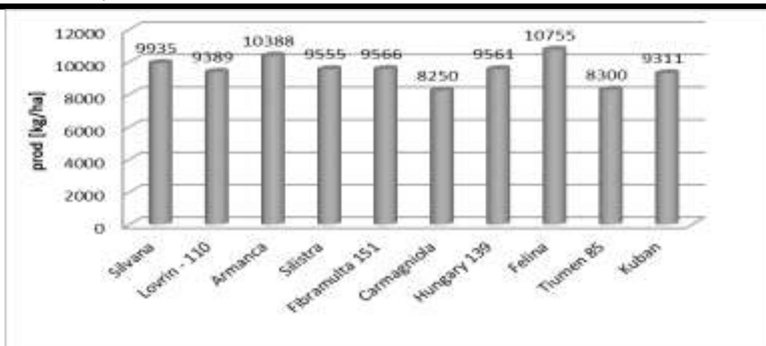

Fig. 1 Variation of stem production to the 10 variants

Another parameter analyzed in this paper is the production of fiber, extracted by a specific process (Bredemann method) and presented in table 3 and figure 2.

Table 3

Fiber production sprawled per 10 varieties of dioecious hemp of different provenance at A.R.D.S. Lovrin

Nr. crt.	Genotype	Average fiber production	Relative production (%)	Difference +/-	Meaning
1	**Silvana**	**26.69**	**100**	**MT**	
2	**Lovrin - 110**	27.24	102.1	0.55	
3	**Armanca**	27.14	101.7	0.46	
4	**Silistra**	28.64	107.3	1.95	
5	**Fibramulta 151**	29.02	108.7	2.33	
6	**Carmagniola**	28.13	105.4	1.44	
7	**Hungary 139**	29.95	112.2	3.26	*
8	**Felina**	27.46	102.9	0.77	
9	**Tiumen 85**	29.61	111.0	2.93	
10	**Kuban**	24.62	92.3	-2.07	

LSD 5% = 3.1 kg/ha
LSD 1% = 4.4 kg/ha
LSD 0.1% = 6.5 kg/ha

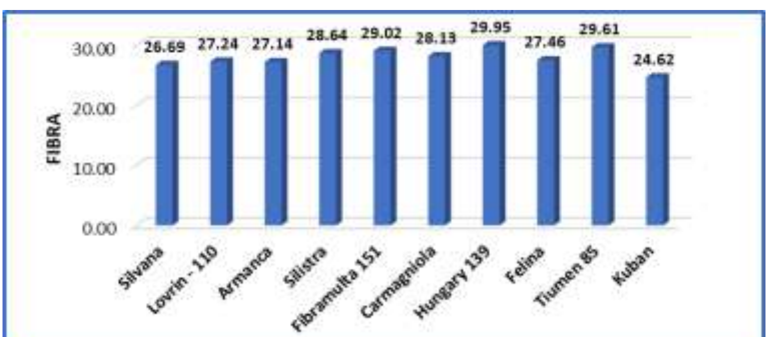

Fig. 2 Variation in fiber production in the 10 varieties studied

CONCLUSIONS

1. The agricultural year 2018/2019 was a dry year, the annual amount of precipitation was only 476 mm, 44 mm less than the multiannual average of 520.6 mm. In terms of temperature, the agricultural year 2018/2019 recorded an annual average of 12.6°C with a deviation of 1.7°C compared to the multiannual monthly average of 10.9°C.

2. The content of the strains in the ten varieties of the dioic hemp analyzed, recorded production increases showing significant, distinctly significant and very significant differences from the control. The Armanca and Felina varieties achieved statistically positive spores. All the others were negative listed from the control used – the Silvana variety.

3. In terms of fiber content, no significant differences were made from the control variety during the period under review, all values being grouped closely around it.

Acknowledgments*: This paper is published under the frame of Sectoral Plan – ADER 2022 of the Ministry of Agriculture and Rural Development, project no. ADER 2.1.5.*

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