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EVALUATION OF THE MAIN PRODUCTION ELEMENTS OF THE VARIETY OF INDUSTRIAL HEMP (*CANNABIS SATIVA* L. VAR. *SATIVA*) *JUBILEU*, UNDER THE CONDITIONS OF THE SUCEVAVA PLATEAU

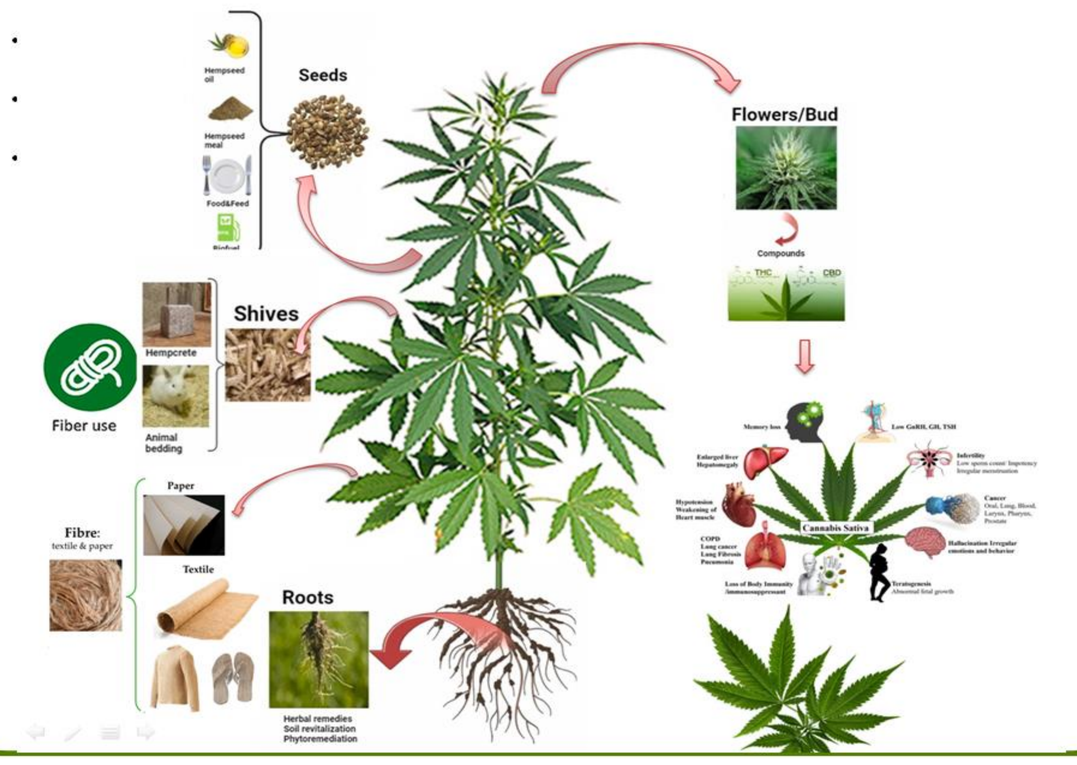
Laurențiu PINTRIJEL[1], Constantin LUNGOCI[2*], Ioan PUIU[2] and Teodor ROBU[2]
[1]Brado Agri S.R.L., Vascauti, 727394, Suceava, Romania
[2] Faculty of Agriculture, Iasi University of Life Sciences "Ion Ionescu de la Brad" (IULS), M. Sadoveanu Alley 3, Iasi, 700490, Romania
[*]Corresponding author, e-mail: constantin.lungoci@iuls.ro

One of the strategies for carbon sequestration aims, in various forms, to encourage agricultural practices that help to sequester carbon from the atmosphere and fix it in the soil or biomass in a sustainable way. Among the alternatives, industrial hemp (*Cannabis sativa* L. var. *sativa*) emerges as a key crop in supporting humanity's journey towards sustainability. A highly versatile plant, industrial hemp has numerous uses in the textile, food, pharmaceutical and energy industries, soil decontamination or erosion control, etc.

The research involved three factors (row spacing, intervention method and foliar fertilization). The experiment was laid out according to the current rules of experimental technique, in the form of randomized blocks. Data were processed by the method of limiting differences (LD). Among the parameters analysed were plant height, number of branches, seed weight per plant, TGM, vegetable oil content and yield, and finally an economic efficiency of the applied methods was performed. During the two years of the observations, the largest height was found to be 253.85 cm, with a maximum number of branches of 57.50±4.95 and a maximum amount of 125.85±59 g seeds per plant. The maximum TGM was 22.5 g, the vegetable oil content was 293.0 *** mL/kg, and the seed yield was 1569.3 *** kg/ha in 2019. The highest gross profit was obtained in 2018 and was 3558.46 lei.

Keywords: *Cannabis sativa* L. *var. sativa*, foliar fertilization, TGM, vegetable oil

Introduction



Material and Methods

Research methodology

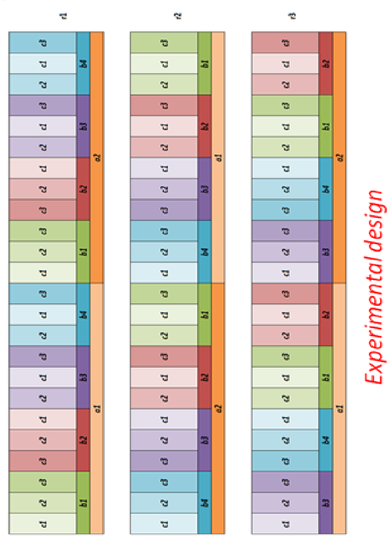
EVALUATION OF THE MAIN PRODUCTION ELEMENTS OF THE VARIETY OF INDUSTRIAL HEMP (*CANNABIS SATIVA* L. VAR. *SATIVA*) *JUBILEU*, UNDER THE CONDITIONS OF THE SUCEVAVA PLATEAU

Location: *Suceava Plateau (47°58'0"N 25°59'48"E)*
Soil: Luvisol
Precipitation: amount 638.5 mm
Temperature: avarage 12.2 °C

A factor– Distance between rows :
a_1 - 45 cm;
a_2 - 70 cm.
B factor– Intervention method:
b_1 – uncut;
b_2 – one cut;
b_3 – two cuts;
b_4 – roller.
C factor- Fertilization variant, with foliar fertilizers
c_1 - unfertilized;
c_2 – Blackjak;
c_3 – Biohumusol.

Statistical analysis

Analysis of variance, statistical difference (LSD), standard deviation, and simple correlation



Results

The influence of the interaction between row spacing (A) x intervention method (B) x foliar treatment (C) on the MMB in the Jubileu variety

Interacțiu-nea (A x B x C)	2018 MMB (g)	2018 Diferență (g)	2018 Sem.	Interacțiu-nea (A x B x C)	2019 MMB (g)	2019 Diferență (g)	2019 Sem.
$a_2 x b_1 x c_2$	20.8	1.0		$a_1 x b_3 x c_2$	22.5	2.4	
$a_1 x b_2 x c_1$	20.6	0.8		$a_1 x b_2 x c_2$	22.1	2.0	
$a_2 x b_2 x c_1$	20.4	0.6		$a_1 x b_1 x c_2$	21.5	1.4	
$a_2 x b_2 x c_2$	20.2	0.4		$a_2 x b_2 x c_3$	21.3	1.2	
$a_1 x b_2 x c_3$	20.2	0.4		$a_2 x b_1 x c_2$	21.3	1.2	
$a_1 x b_2 x c_2$	20.2	0.4		$a_1 x b_3 x c_3$	21.3	1.2	
$a_1 x b_3 x c_2$	20.1	0.3		$a_1 x b_3 x c_1$	21.3	1.2	
$a_2 x b_1 x c_1$	19.8	mt.	-	$a_2 x b_1 x c_3$	21.0	0.9	
$a_2 x b_2 x c_3$	19.7	-0.1		$a_1 x b_1 x c_3$	20.7	0.6	
$a_1 x b_1 x c_3$	19.7	-0.1		$a_2 x b_3 x c_1$	20.4	0.3	
$a_1 x b_3 x c_3$	19.6	-0.2		$a_2 x b_1 x c_1$	20.1	mt.	-
$a_1 x b_1 x c_2$	19.6	-0.2		$a_1 x b_1 x c_1$	20.1	0.0	
$a_2 x b_3 x c_1$	19.3	-0.5		$a_2 x b_3 x c_2$	20.0	-0.1	
$a_1 x b_3 x c_1$	19.1	-0.7		$a_2 x b_2 x c_1$	20.0	-0.1	
$a_2 x b_3 x c_3$	19.0	-0.8		$a_2 x b3 x c_3$	19.8	-0.3	
$a_2 x b_3 x c_2$	18.8	-1.0		$a_2 x b_2 x c_2$	19.7	-0.4	
$a_2 x b_4 x c_1$	18.6	-1.2		$a_1 x b_2 x c_1$	18.5	-1.6	o
$a_1 x b_1 x c_1$	18.6	-1.2		$a_1 x b_4 x c_3$	17.9	-2.2	ooo
$a_2 x b_1 x c_2$	18.2	-1.6	o	$a_1 x b_4 x c_2$	17.9	-2.2	ooo
$a_1 x b_4 x c_1$	18.1	-1.7	o	$a_2 x b_4 x c_3$	17.8	-2.3	ooo
$a_2 x b_4 x c_3$	17.8	-2.0	oo	$a_1 x b_4 x c_1$	17.2	-2.9	ooo
$a_1 x b_4 x c_3$	17.8	-2.0	oo	$a_2 x b_4 x c_1$	17.1	-3.0	ooo
$a_1 x b_4 x c_2$	17.8	-2.0	oo	$a_2 x b_4 x c_2$	16.9	-3.2	ooo
		DL 5%	1.3			DL 5%	1.2
		DL1%	2.0			DL1%	1.6
		DL 0.1%	3.4			DL 0.1%	2.2

The influence of the interaction between row spacing (A) x intervention method (B) x foliar treatment (C) on the oil content of the Jubileu variety

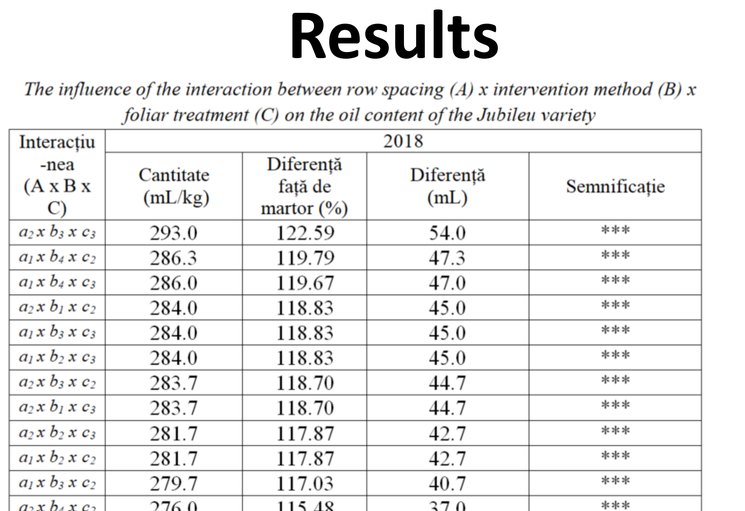
Interacțiu-nea (A x B x C)	2018 Cantitate (mL/kg)	2018 Diferență față de martor (%)	2018 Diferență (mL)	2018 Semnificație
$a_2 x b_3 x c_3$	293.0	122.59	54.0	***
$a_1 x b_4 x c_2$	286.3	119.79	47.3	***
$a_1 x b_4 x c_3$	286.0	119.67	47.0	***
$a_2 x b_1 x c_2$	284.0	118.83	45.0	***
$a_1 x b_3 x c_3$	284.0	118.83	45.0	***
$a_1 x b_2 x c_3$	284.0	118.83	45.0	***
$a_2 x b_3 x c_2$	283.7	118.70	44.7	***
$a_2 x b_1 x c_3$	283.7	118.70	44.7	***
$a_2 x b_2 x c_3$	281.7	117.87	42.7	***
$a_1 x b_2 x c_2$	281.7	117.87	42.7	***
$a_1 x b_3 x c_2$	279.7	117.03	40.7	***
$a_2 x b_4 x c_2$	276.0	115.48	37.0	***
$a_2 x b_2 x c_2$	274.0	114.64	35.0	***
$a_2 x b_4 x c_3$	273.0	114.23	34.0	***
$a_1 x b_1 x c_2$	272.7	114.10	33.7	***
$a_1 x b_1 x c_3$	267.0	111.72	28.0	***
$a_2 x b_3 x c_1$	263.7	110.33	24.7	***
$a_2 x b_4 x c_1$	257.7	107.82	18.7	***
$a_1 x b_3 x c_1$	249.3	104.31	10.3	**
$a_2 x b_1 x c_1$	239.0	100.00	mt.	-
$a_1 x b_2 x c_1$	239.0	100.00	0.0	
$a_1 x b_4 x c_1$	238.7	99.87	-0.3	
$a_2 x b_2 x c_1$	236.7	99.04	-2.3	
$a_1 x b_1 x c_1$	231.7	96.95	-7.3	o
			DL 5%	6.4
			DL1%	8.8
			DL 0.1%	12.0

Influence of the interaction between row spacing (A) x intervention method (B) x foliar treatment (C) on seed production in the Jubilee variety

Interacțiu-nea (A x B x C)	2018 Producție (kg/ha)	2018 Diferență (kg)	2018 Sem.	Interacțiu-nea (A x B x C)	2019 Producție (kg/ha)	2019 Diferență (kg)	2019 Sem.
$a_1 x b_3 x c_2$	1541.7	368.0	***	$a_2 x b_3 x c_2$	1569.3	248.0	***
$a_1 x b_3 x c_3$	1532.7	359.0	***	$a_2 x b_3 x c_1$	1565.7	244.4	***
$a_1 x b_3 x c_1$	1508.7	335.0	***	$a_2 x b_3 x c_3$	1559.3	238.0	***
$a_2 x b_3 x c_3$	1450.0	276.3	***	$a_2 x b_2 x c_2$	1536.7	215.4	***
$a_2 x b_3 x c_2$	1446.7	273.0	***	$a_2 x b_2 x c_3$	1521.0	199.7	***
$a_2 x b_3 x c_1$	1437.0	263.3	***	$a_1 x b_3 x c_2$	1477.3	156.0	***
$a_1 x b_2 x c_2$	1434.0	260.3	***	$a_1 x b_3 x c_3$	1473.7	152.4	***
$a_1 x b_2 x c_3$	1421.7	248.0	***	$a_1 x b_2 x c_2$	1455.0	133.7	***
$a_1 x b_2 x c_1$	1370.7	197.0	***	$a_2 x b_2 x c_1$	1449.7	128.4	***
$a_1 x b_1 x c_2$	1332.7	159.0	***	$a_1 x b_3 x c_1$	1440.7	119.4	***
$a_1 x b_1 x c_3$	1330.3	156.6	***	$a_1 x b_2 x c_1$	1438.7	117.4	***
$a_2 x b_2 x c_2$	1319.3	145.6	***	$a_1 x b_2 x c_3$	1434.7	113.4	***
$a_2 x b_2 x c_3$	1319.0	145.3	***	$a_1 x b_1 x c_2$	1419.3	98.0	***
$a_2 x b_2 x c_1$	1278.0	104.3	***	$a_1 x b_1 x c_3$	1414.0	92.7	***
$a_1 x b_1 x c_1$	1264.0	90.3	***	$a_2 x b_1 x c_3$	1385.3	64.0	***
$a_2 x b_1 x c_2$	1211.0	37.3	***	$a_1 x b_1 x c_1$	1382.3	61.0	***
$a_2 x b_1 x c_3$	1187.7	14.0	**	$a_2 x b_1 x c_2$	1381.0	59.7	***
$a_2 x b_1 x c_1$	1173.7	mt.	-	$a_2 x b_1 x c_1$	1321.3	mt.	-
$a_1 x b_4 x c_3$	793.3	-380.4	ooo	$a_2 x b_4 x c_2$	822.7	-498.6	ooo
$a_1 x b_4 x c_2$	783.0	-390.7	ooo	$a_2 x b_4 x c_3$	816.0	-505.3	ooo
$a_1 x b_4 x c_1$	747.7	-426.0	ooo	$a_1 x b_4 x c_2$	790.0	-531.3	ooo
$a_2 x b_4 x c_2$	705.3	-468.4	ooo	$a_1 x b_4 x c_3$	785.7	-535.6	ooo
$a_2 x b_4 x c_3$	689.0	-484.7	ooo	$a_1 x b_4 x c_1$	785.0	-536.3	ooo
$a_2 x b_4 x c_1$	643.0	-539.7	ooo	$a_2 x b_4 x c_1$	781.0	-540.3	ooo
		DL 5%	11.0			DL 5%	7.8
		DL1%	15.1			DL1%	11.1
		DL 0.1%	20.6			DL 0.1%	17.2

Economic efficiency of the cultivation of Cannabis sativa L., Jubileu, 2018

Interacțiune	Producție (kg/ha)	Valoarea productiei lei/ha	Cheltuieli totale lei/ha	Cost productie lei/kg	Profit brut
$a_1 x b_1 x c_3$	1330.3	5055.14	2300	1.73	2755.14
$a_2 x b_2 x c_3$	1319	5012.2	2600	1.97	2412.2
$a_2 x b_2 x c_2$	1319.3	5013.34	2570	1.95	2443.34
$a_2 x b_3 x c_2$	1446.7	5497.46	2300	1.59	3197.46
$a_1 x b_2 x c_3$	1421.7	5402.46	2600	1.83	2802.46
$a_1 x b_2 x c_1$	1370.7	5208.66	2570	1.87	2638.66
$a_1 x b_3 x c_2$	1541.7	5858.46	2300	1.49	3558.46
$a_1 x b_3 x c_1$	1508.7	5733.06	2600	1.72	3133.06
$a_1 x b_3 x c_3$	1532.7	5824.26	2570	1.68	3254.26
$a_1 x b_4 x c_3$	793.3	3014.54	2300	2.90	714.54
$a_1 x b_4 x c_1$	747.7	2841.26	2600	3.48	241.26
$a_1 x b_4 x c_2$	783	2975.4	2570	3.28	405.4
$a_2 x b_1 x c_2$	1211	4601.8	2300	1.90	2301.8
$a_2 x b_1 x c_3$	1187.7	4513.26	2600	2.19	1913.26
$a_2 x b_1 x c_1$	1173.7	4460.06	2570	2.19	1890.06
$a_1 x b_1 x c_2$	1332.7	5064.26	2300	1.73	2764.26
$a_1 x b_1 x c_1$	1264	4803.2	2600	2.06	2203.2
$a_2 x b_2 x c_1$	1278	4856.4	2570	2.01	2286.4
$a_2 x b_3 x c_3$	1450	5510	2300	1.59	3210
$a_1 x b_2 x c_2$	1434	5449.2	2600	1.81	2849.2
$a_2 x b_3 x c_1$	1437	5460.6	2570	1.79	2890.6
$a_2 x b_4 x c_2$	705.3	2680.14	2300	3.26	380.14
$a_2 x b_4 x c_3$	689	2618.2	2600	3.77	18.2
$a_2 x b_4 x c_1$	643	2443.4	2570	4.00	**-126.6**



Correlation between the factors studied in the Jubileu variety

Economic efficiency of the cultivation of Cannabis sativa L., Jubileu, 2019

Interacțiune	Producție (kg/ha)	Valoarea productiei lei/ha	Cheltuieli totale lei/ha	Cost productie lei/kg	Profit brut
$a_1 x b_2 x c_1$	1438.7	5467.06	2310	1.61	3157.06
$a_1 x b_1 x c_3$	1414	5373.2	2650	1.87	2723.2
$a_2 x b_1 x c_3$	1385.3	5264.14	2620	1.89	2644.14
$a_1 x b_2 x c_2$	1455	5529	2310	1.59	3219
$a_1 x b_2 x c_3$	1434.7	5451.86	2650	1.85	2801.86
$a_1 x b_1 x c_2$	1419.3	5393.34	2620	1.85	2773.34
$a_1 x b_3 x c_2$	1477.3	5613.74	2310	1.56	3303.74
$a_2 x b_2 x c_1$	1449.7	5508.86	2650	1.83	2858.86
$a_1 x b_3 x c_1$	1440.7	5474.66	2620	1.82	2854.66
$a_2 x b_4 x c_3$	816	3100.8	2310	2.83	790.8
$a_2 x b_4 x c_1$	781	2967.8	2650	3.39	317.8
$a_1 x b_4 x c_1$	785	2983	2620	3.34	363
$a_1 x b_1 x c_1$	1382.3	5252.74	2310	1.67	2942.74
$a_2 x b_1 x c_1$	1321.3	5020.94	2650	2.01	2370.94
$a_2 x b_1 x c_2$	1381	5247.8	2620	1.90	2627.8
$a_2 x b_2 x c_2$	1536.7	5839.46	2310	1.50	3529.46
$a_2 x b_2 x c_3$	1521	5779.8	2650	1.74	3129.8
$a_1 x b_3 x c_3$	1473.7	5600.06	2620	1.78	2980.06
$a_2 x b_3 x c_2$	1569.3	5963.34	2310	1.47	**3640,80**
$a_2 x b_3 x c_3$	1559.3	5925.34	2650	1.70	3275.34
$a_2 x b_3 x c_1$	1565.7	5949.66	2620	1.67	3329.66
$a_2 x b_4 x c_2$	822.7	3126.26	2310	2.81	816.26
$a_1 x b_4 x c_3$	785.7	2985.66	2650	3.37	335.66
$a_1 x b_4 x c_2$	790	3002	2620	3.32	382

Conclusions

In terms of climatic conditions, the Suceava Plateau is a favorable area for the cultivation of technical hemp.
a. MMB: the highest weight of the MMB was obtained at the interaction a2 x b1 x c1, which is 20.8 g.
b. Vegetable oil: the largest amount of vegetable oil was obtained in the variant a2 x b3 x c3, which is 293.0 mL/kg;
c. Yield: The highest seed production was obtained at the a2 x b3 x c2 interaction, which was 1569.3 kg/ha.
d. The highest gross profit was recorded for the a2 x b3 x c3 variant, which was 3640.8 lei in 2019.