PRELIMINARY STUDIES ON MAINTAINING THE BIODIVERSITY OF MEDICINAL PLANTS WITHIN NIRDPSB BRASOV

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ABSTRACT

The researches are carried out at NIRDPSB Brasov and are developed in the research project ADER 2.4.1., in the period 2015-2018.

The overall objective of this studies is to introduce in crop some valuable medicinal species from local spontaneous flora.

The researches started by collecting information on existing genetic resources and seed harvesting from spontaneous flora and aimed at enriching and preservation of the genetic resources collection from NIRDPSB Brasov.

It was followed the establishment of multiplication way, the seed norm/ha, the sowing time, optimal nutrition space at Malva sylvestris L. species and also the production of seed material of superior biological categories. These technological links have influence on the production of vegetable raw material and also on the content in active principles.

INTRODUCTION

Humans have developed a broad knowledge of useful plants over time through continuous contact with their environment (Tabaraki,2012). At present, there is an increasing interest both in industry and scientific research in vegetables, fruits, medicinal plants and spices because of their antioxidative phytochemicals and antimicrobial properties.

The use of medicinal plants by a traditional community, both in the simplest forms such as tea and in the sophisticated manufacturing industry, transforming them into tablets, drops or capsules with the isolated active principle, is motivated by properties to generate beneficial reactions to the body (Lorenzi, 2008).

Malva sylvestris L. (*Malvaceae*) is a biennial–perennial herbaceous plant distributed mainly in Europe, North Africa and South-West Asia, and its traditional use has been documented since a long-time ago (Razavi, 2011; Gunjeet Kumar, 2014). *M. sylvestris* is an important medicinal plant which shows a wide range of biological activities; the plant exhibits antioxidant, anti-inflammatory, anticancer, wound healing, hepatoprotective, antinociceptive and antimicrobial activities (Dipak, 2016). Moreover, its use is not only limited to therapeutic purposes; the species is also locally regarded as a food wild herb (Barros, 2010; Arabaci, 2013).

Reference information on this plant are directed towards the study of taxonomy, anatomy-morphological characteristics and functional-curative properties of the plant. Thus, in the present work we intend to reach a less scientific known topic, namely, introducing into crop from the spontaneous flora and cropping technology of the *Malva sylvestris* L. species.

MATERIAL AND METHOD

The researches regarding maintaining biodiversity at medicinal plants are currently in progress at NIRDPSB Brasov and this study presents preliminary results at *Malva sylvestris* L. species (forest mallow). This species was introduced into the crop from the spontaneous flora. The establishment of the crop followed the sketch of experiences

drawn so that we can determine the optimum sowing time and the optimal nutrition space of the plant.

Thus, to determine the optimum sowing time was set up a single factor experience of five variants (three repetitions) (Figure 1), the first two were sown in autumn and variants V3-V5 in the spring, function of climatic conditions.

Single factor experience:

V3 - sowed in the urgency I, late March to early April

V4 - sowed in the urgency II, the second decade of April to the third decade of April

V5 - sowed in the last decade of April - early May.

A - distance between rows with graduations: 50 cm;

B - distance between plants on row: 25 cm; C - repetition length: 500 cm;

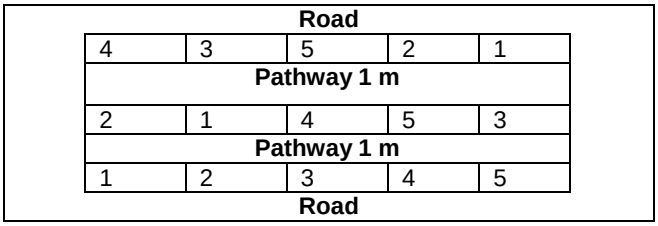

Figure 1. The sketch of experiences to determine the optimum sowing time

In order to determine the optimal nutrition space of the plant was established a bifactorial experience of nine variants in three repetitions (Figure 2) as follows:

Bifactorial experience:

A - distance between rows with graduations: 25 cm, 50 cm; 70 cm;

B - distance between plants on row with the graduations: continuous line; 15 cm; 25 cm;

C - repetition length: 200 cm;

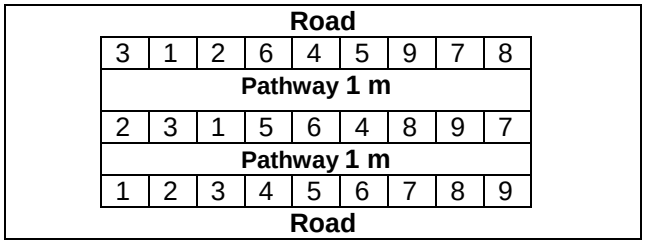

Figure 2. The sketch of experiences to determine the optimal nutrition space of the plant

At each variant/repetition was determined the number of plants/ha, was evaluated plant height, number of ramifications, the total weight of the plant (stems, leaves, flowers), was established production of fresh and dry herb and rate of seed / ha. Results were subjected to statistical analysis.

RESULTS AND DISCUSSIONS

To determine the optimum sowing time was established in autumn 2015 a single factor experience, with 50 cm between rows and 25 cm between plants / row, 2 variants (V1 and V2) of 3 repetitions, with a length of repetition of 500 cm. Variants V3, V4, V5 were sown in the spring of 2016 at different intervals of time (Figure 1).

The crop establishment of *Malva sylvestris* L. by sown in the autumn did not generate favorable results, because in the environmental conditions from NIRDPSB Brasov, the seed has not germinated (V1-V2). Regarding variants V3-V5, they behaved differently, namely, the most uniform emergence was made at V3, which was planted in late March to early April, and the less uniform emergence was realized at the variant V5 sown in the last decade of April - early May. In Photo 1 are exposed several aspects of the species, in different crop phases, from establishment to herb harvest.

Photo 1 a,b,c,d. *Malva sylvestris* L. species from crop establishment to herb harvest

As shown in Table 1, were made measurements on plant height, the results are different on variants/repetitions with values ranging from 94 cm (V5R1) to 145 cm (V3R2) and measurements concerning the number of ramifications of each plant, number between 10 (V5R1) and 25 (V3R3) ramifications/plant.

Plant weight fluctuated between variants, having values between 458 g (V5R1) and 838 g (V3R3). Based on the weight of the plant, the stem represents 51.1 to 57.4% of total plant, leaves from 25.7 to 40.0% of the plant and the flowers are 7.3 to 19.7% of the plant, different depending on the variant/repetition.

The amount of fresh or dried herb assured distinct productions depending on the variant/repetition. The best variant was V3, which conducted a production of fresh herb between 29.200- 32.800 kg/ha and a production of dry herb of 5300-5930 kg/ha.

Biometric measurements for determining the optimal time of sowing

Table 1

Var. No.	Plant height (cm)	Ramifications number	Plant weight (g)	Stem weight (g)		Leaves weight (g)		Flowers weight (g)		Fresh herb production (kg/ha)	Dry herb production (kg/ha)
				% from plant weight		% from plant weight		% from plant weight			
V_3R_1	138	22	792	427	53,9	244	30,8	121	15,3	29200	5300
V_4R_1	113	17	638	336	57,4	195	30,6	107	16,8	24160	4390
V_5R_1	94	10	458	246	53,7	183	40,0	29	6,3	16960	3050
V_3R_2	145	21	832	431	51,8	214	25,7	187	22,5	32080	5810
V_4R_2	117	19	658	341	51,8	188	28,6	129	19,6	25360	4520
V_5R_2	98	13	487	274	56,3	176	36,1	37	7,6	17040	2990
V_3R_3	143	25	838	428	51,1	245	29,2	165	19,7	32800	5930
V_4R_3	115	19	673	345	51,3	197	29,3	131	19,5	26240	4670
V_5R_3	95	11	463	249	53,8	180	38,9	34	7,3	17120	3000

To establish the optimal nutrition space, it was established a bifactorial experience with the distance between rows 25, 50 and 70 cm, between plants/row of 15 cm, 25 cm and a continuous row, in three randomized repetitions with a repetition length of 200 cm (Figure 2). The number of plants/ha was between 57-600 thousand plants/ha, depending on the variant (Table 2).

The number of plants / ha depending on the variation

Table 2

Variant	The number of plants (thousand) / ha
V1 (continuous row -25 between rows)	600
V2 (15 cm between plants/row -25 cm between rows)	280
V3 (25 cm between plants/row -25 cm between rows)	160
V4 (continuous row -50 cm between rows)	300
V5 (15 cm between plants/row -50 cm between rows)	140
V6 (25 cm between plants/row -50 cm between rows)	80
V7 (continuous row-70 cm between rows)	215
V8 (15 cm between plants/row -70 cm between rows)	100
V9 (25 cm between plants/row -70 cm between rows)	57

From the data presented in Table 3 we can see that the plants had a height between 133 cm (V1R3) and 170 cm (V5R1), with a number of ramifications between 12 (V7R3) and 23 (V6R1, V3R3, V8R3) of ramifications. The weight of the plant, it had different values depending on the variant/repetition and reached values between 234 g (V2R3) and 1162 g (V9R3). Percentage share of the stem was 39.8 to 70.5% of total plant, the leaves of the plant were 20.2 to 42.7% and from 2.4 to 18.8% of the plant were flowers.

Biometric measurements for determining optimal nutrition space

Table 3

Var. No.	Plant height (cm)	Ramifications number	Plant weight (g)	Stem weight (g)		Leaves weight (g)		Flowers weight (g)		Fresh herb production (kg/ha)	Dry herb production (kg/ha)
				% from plant weight		% from plant weight		% from plant weight			
V_1R_1	150	18	554	329	59,4	132	23,8	93	16,8	49600	9600
V_2R_1	144	14	237	154	65,0	55	23,2	28	11,8	32760	6720
V_3R_1	148	17	357	240	67,2	85	23,8	32	9,0	36000	8000
V_4R_1	147	20	670	465	69,4	152	22,7	53	7,9	61500	11400
V_5R_1	170	21	719	413	57,4	239	33,2	67	9,3	42140	7980
V_6R_1	158	23	746	445	59,7	223	29,9	78	10,5	24400	5200
V_7R_1	145	16	600	335	55,8	193	32,2	72	12,0	56785	11143
V_8R_1	144	17	789	314	39,8	277	35,1	198	25,1	37500	7700
V_9R_1	146	19	756	368	48,7	246	32,5	142	18,8	22172	4572
V_1R_2	157	18	489	323	66,1	143	29,2	23	4,7	52800	10200
V_2R_2	138	16	253	165	65,2	73	28,9	15	5,9	40040	8680
V_3R_2	150	18	409	266	65,0	133	32,5	10	2,4	26560	6400
V_4R_2	162	22	797	514	64,5	161	20,2	122	15,3	67500	12600
V_5R_2	168	16	725	461	63,6	217	29,9	47	6,5	36960	7560
V_6R_2	161	17	617	392	63,5	134	21,7	91	14,7	24240	5120
V_7R_2	158	20	842	441	52,4	256	30,4	145	17,2	50143	9857
V_8R_2	160	22	981	549	56,0	419	42,7	13	1,3	40100	7900
V_9R_2	153	13	390	275	70,5	83	21,3	32	8,2	24686	4800
V_1R_3	133	13	296	201	67,9	75	25,3	20	6,8	46200	10800
V_2R_3	146	14	234	157	67,1	66	28,2	11	4,7	26600	6440
V_3R_3	134	23	418	210	50,2	157	37,6	51	12,2	33280	7040
V_4R_3	157	15	602	397	65,9	130	21,6	75	12,5	55200	10500
V_5R_3	153	16	603	419	69,5	169	28,0	15	2,5	28700	6440
V_6R_3	156	20	792	511	64,5	256	32,3	25	3,2	22480	4800
V_7R_3	154	12	633	430	67,9	171	27,0	32	5,1	43500	9428
V_8R_3	158	23	795	458	57,6	196	24,7	141	17,7	40400	8200
V_9R_3	169	21	1162	700	60,2	321	27,6	183	15,7	25543	5143

Statistical evaluation within variants on the production of fresh herb (kg / ha)

Table 4

Statistics

		V1	V2	V3	V4	V5	V6	V7	V8	V9
N	Valid	3	3	3	3	3	3	3	3	3
	Missing	6	6	6	6	6	6	6	6	6
Mean		49600,00	33133,33	31946,67	61400,00	35933,33	23706,67	50142,67	39333,33	24133,67
Std. Deviation		3304,542	6727,773	4859,191	6150,610	6778,564	1065,332	6642,500	1594,783	1752,060
Minimum		46200	26600	26560	55200	28700	22480	43500	37500	22172
Maximum		52800	40040	36000	67500	42140	24400	56785	40400	25543

In Table 4 was performed the statistical interpretation of the fresh herb within each variant, as shown the productions from Table 3.

The standard deviation was calculated (the value deviating from calculated average of average population from which has been extracted the batch on which the measurements were made) and the amplitude of each variant (minimum and maximum production in the variant).

At the same time, we evaluated statistically also between variations the production of fresh herb (Table 5).

Statistical evaluation between variants on the production of fresh herb (kg/ha)

Table 5

Statistics

The production of fresh herb (kg/ha)

N	Valid	9
	Missing	0
Mean		38814,4078
Median		35933,3300
Std. Deviation		12681,41189
Minimum		23706,67
Maximum		61400,00

The average between variations is 38814.41 kg/ha, four variants have higher production 35933.33 kg/ha, and four smaller, standard deviation of 12661.41, maximum and minimum production on variants being 61400 kg/ha, respectively 23707 kg/ha.

To interpret which variant was better and determine optimal nutrition space needed to *Malva sylvestris* L. grow efficient, in Figure 3 we determined according to the production of fresh herb (kg/ha), the productions diagram between the established variants. Thus, the chart shows that the variant 4 was the best, namely, continuous row and 50 cm between rows and ensured the variant 9 weakest production (70 cm between rows-25 cm between plants/row). From the above, we can infer that the large distance between rows and between plants on the row has led to lower production herb/ha.

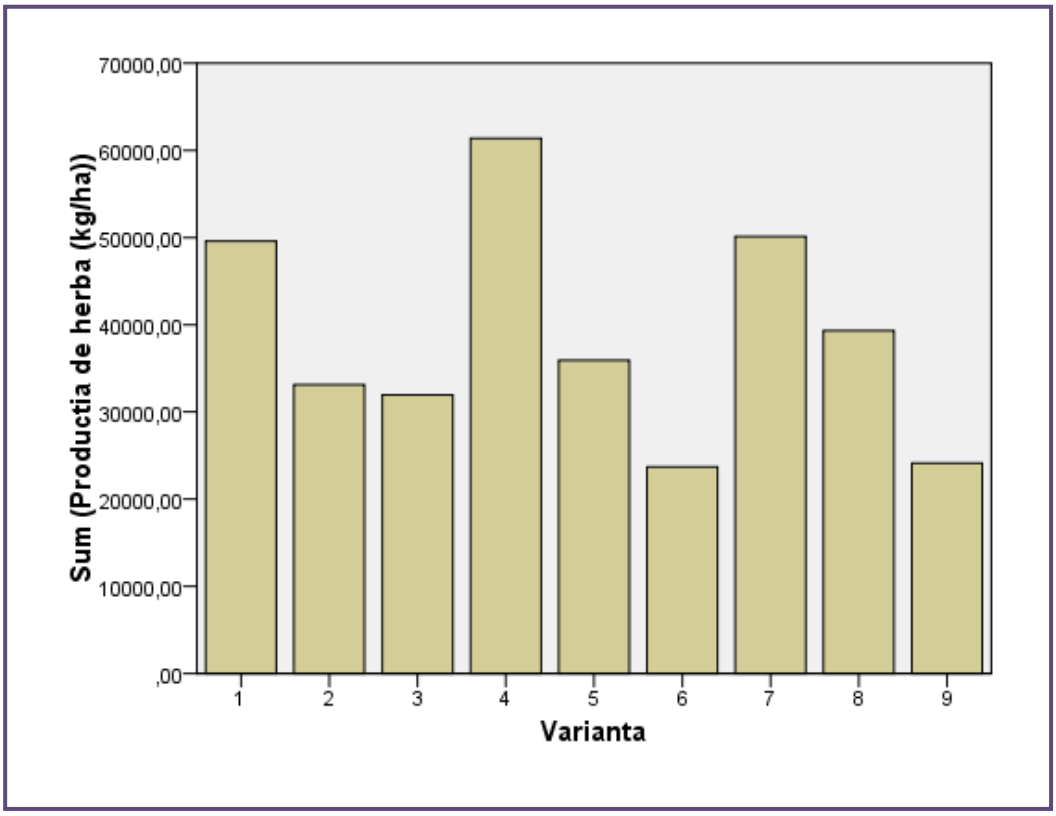

Figure 3. Production of fresh herb between the variants established (kg / ha)

After calculating the MMB (1000 grain weight), depending on experience, respectively, to determine the optimal time of sowing and determination of optimal nutrition space, was established norm of seed/ha. According to calculation, the 1000 grain weight measurements revealed that the value of MMB is 6.8. At the single factor experience (50 cm between rows-25 cm between plants/row) where we watched optimum time sowing the norm seed/ha is 0.544 kg / ha. At the second trial, which was targeted optimal nutrition space, norm seed/ha depending on the variants differ, as shown in Table 6. The biggest norm of seed /ha is required for V1 (4.080 kg) and the lowest seed norm is needed to V9 (0.388 kg).

Setting the norm seed/ha

Table 6

Variant	The norm seed/ha (kg)
V1	4,080
V2	1,904
V3	1,088
V4	2,040
V5	0,952
V6	0,544
V7	1,457
V8	0,680
V9	0,388

In terms of favorability for harvest period, both experiences, in terms of NIRDPSB Brasov recommending the optimal time to harvest the last decade of July.

CONCLUSIONS

1. Species *Malva sylvestris* L., a species of wild flora with special therapeutic properties may be introduced in crop.
2. Generative propagation method gives good results at NIRDPSB Brasov in terms of compliance the period of end of March-beginning of April, as the optimum sowing time.
3. The optimal nutrition space necessary for the harmonious development of the plant is differently depending on the scheme of crop established, also norm seed/ha.
4. As a cropped plant provides higher herb/ha productions in terms of technology applied judiciously.

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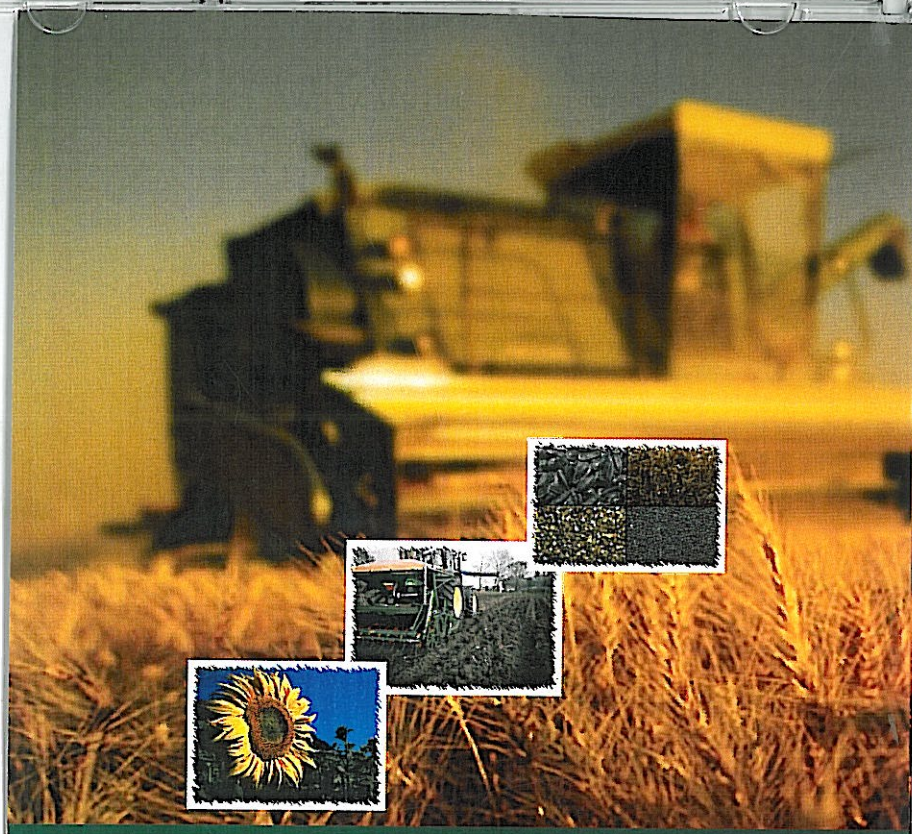

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