INFLUENCE OF SOME TECHNOLOGY ELEMENTS ON THE EVOLUTION OF THE MAIN BIOMETRIC INDICATORS ON THE MINT CULTURE UNDER THE CONDITIONS OF CLUJ AREA

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Abstract: The paper presents a part of the research results regarding the influence of some technological factors on the evolution of mint culture in the specific conditions of Transylvania. The experiments underlying the research were located in the vicinity of Cluj-Napoca, in the Hodai-Someseni experimental field. Experimental technological factors were: the irrigation regime, the fertilization degree and the biological material, being tested three strains of mint grown in culture in Transylvania, *M. x piperita* var. *piperita* "Swiss Mint", *M. spicata* L. var. *crispa* "Morroccan" and *M. suaveolens* var. "Apple mint". The paper presents the influence of the three factors and their graduations on two characters - the average height of the plants and the average number of leaves per plant, which influence the vegetal mass production.

Keywords: mint, experiments, irrigation regime, fertilization, biological material

INTRODUCTION

Among cultivated medicinal and aromatic plants, the mint occupies a special place. It is known, used and appreciated for its qualities since antiquity. The largest mint cultivation countries are currently Morocco, Spain, Japan and Bulgaria (FAOSTAT 2016) and the world's largest essential oil producers are India, Italy, Argentina and Australia (LAWRENCE, 2007).

In Romania, it was introduced and spread in culture at the beginning of the 20th century, being cultivated mainly in the Barsei area, the Banat Plain, the Olt and Mureş valleys and in the Romanian Plain (MUNTEAN et al., 1998).

MATERIAL AND METHOD

The biological material used in the experiments in Cluj - Someşeni was represented by species and varieties established in culture in Transylvania, *Mentha x piperita* var. *piperita* "Swiss Mint", *Mentha spicata* L. var. *crispa* "Morroccan" şi *Mentha suaveolens* var. "Apple mint".

Mentha x piperita "Swiss Mint" is associated with a famous brand of Swiss candy, which gives it a specific flavor. According to the Richters producer (source: richters.com), the cultivar has a lighter flavor compared to other *M. x piperita* varieties. The dimensions of the bushes are 60 x 60 cm, gray-greenish leaves and lavender-colored flowers.

Mentha spicata L. var. *crispa* "Morroccan", according to the Royal Horticultural Society (source: rhs.org.uk), is characterized by the thickest aspect of the bushes, the presence of creeping rhizomes, intensely crinkled green leaves and white flowers that appear in summer in inflorescences in the form of terminal spikes. The height and maximum diameter of the bush is 0.5-1 m. It is susceptible to powdery mildew and is relatively less

resistant to cold than other varieties (although it can withstand temperatures below -20°C). It can be grown in any type of soil provided, with the condition to be moist, with exposure to full sunlight or partial shade.

Mentha suaveolens "Applemint", according to the Royal Horticultural Society (source: rhs.org.uk), is characterized by sub-earth rhizomes, slightly hairy leaves with rounded shape, pale pink flowers in dense inflorescences in the form of spike, that appear at the end of summer / early autumn. It is less resistant to cold (up to -15°C). It is recommended to cultivate it in poor and humid soil, with full sun exposure. Rustiness and powdery mildew sensitivity in drought conditions. Leaves have a green apple flavor.

Settling experiences. Experiences were based on the subdivision parcel method in three rehearsals. Parcels were grouped and separated by protective plots of 0.5 m between blocks and 1 m between rehearsals and at the margins of the experimental fields.

The experimental factors studied were: the irrigation regime - with two graduations (irrigated/ non-irrigated), fertilization with two graduations (basic fertilization/ basic fertilization + Lignohumate growth stimulator) and biological material with three graduations (*M. x piperita* var. *piperita* "Swiss Mint", *M. spicata* L. var. *crispa* "Morroccan" şi *M. suaveolens* var. "Apple mint"). The culture technology applied was the one recommended by the team of medicinal and aromatic herbs at the University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca.

The land was prepared since autumn on both experimental fields by plowing at 25-30 cm and incorporating manure 40 t/ ha (4 kg/ m^2) (basic fertilization). Just prior to the planting of the seedlings, the soil was well shredded.

The planting was carried out in mid-March 2016, the planting density being 9 plants / m^2, the planting distance of 30 cm between the plants and 15 cm from the edges of the plot. The plants were manually weeded whenever needed, and protective plots were threshed three times during each season. The irrigation was done after the surface drainage method, the irrigation on the strips.

RESULTS AND DISCUSSIONS

In each of the two experimental years, 2016 and 2017, quantitative and qualitative determinations of production were made in order to assess the degree of influence of each of the three experimental factors and their graduations. The present paper presents the determinations' results on the influence of the interaction of the three factors on two biometric plant indicators, the average height of the plants and the average number of leaves per plant, which contribute to both the quantitative accumulations and the quality of the production.

The effect of experimental factors on plant mean height, Hodai, 2016.

As can be seen from the data presented in Tables 1, 2 and 3, irrigation had a distinctly significant effect on the plant height, which resulted in a quantitative increase in production, but in the context of reducing the number of leaves/ plant, from which rises the problem of the quality of production (the amount of essential oil, mainly present in the leaves).

Biological material (cultivar) influenced the plant height in the expected direction, *Mentha x piperita* having the highest height, while the significant result obtained for *Mentha suaveolens* in the context of lower production can be explained by the fact that this light loving plant rose higher but less vigorous.

Table 1.

Influence of factor A (irrigation) on the average height of plants, Hodai, 2016

Graduations	Mean height (cm)	%	Difference	Significance
A1- non-irrigated	54.17	100.0	0.00	Mt.
A2 - irrigated	55.83	103.1	1.67	**

DL (p 5%) 0.41; DL (p 1%) 0.96; DL (p 0.1%) 3.04

Table 2.

Influence of factor B (fertilization) on the average height of plants, Hodai, 2016

Graduations	Mean height (cm)	%	Difference	Significance
B1 – basic fertilization	54.83	100.0	0.00	Mt.
B2 – basic fertilization + Lignohumate growth stimulator	55.17	100.6	0.33	-

DL (p 5%) 3.97; DL (p 1%) 6.57; DL (p 0.1%) 2.29

Table 3.

Influence of factor C (mint) on the average height of plants, Hodai, 2017

Graduations	Mean height (cm)	%	Difference	Significance
C1- *Mentha spicata* L. var. *crispa* "Morroccan"	48.50	100.0	0.00	Mt.
C2 - *Mentha x piperita* var. *piperita* "Swiss Mint"	65.83	135.7	17.33	***
C3 - *Mentha suaveolens* var. "Apple mint"	50.67	104.5	2.17	*

DL (p 5%) 1.94 ; DL (p 1%) 2.67 ; DL (p 0.1%) 3.67

The effect of experimental factors on mean plant height, Hodai, 2017 (Tables 4, 5 and 6). It is noted that factor A, the irrigation regime, does not significantly influence the average plant height, instead, in the conditions of more frequent watering, fertilization had a significant positive impact on the plant height. It is also found that the effect of the mint variety is close to that obtained in 2016.

Table 4.

Influence of factor A (irrigation) on the average height of plants, Hodai, 2017

Graduations	Mean height (cm)	%	Difference	Significance
A1- non-irrigated	50.43	100.0	0.00	Mt.
A2 - irrigated	54.00	107.1	3.57	-

DL (p 5%) 13.34; DL (p 1%) 30.82; DL (p 0.1%) 98.07

Table 5.

Influence of factor B (fertilization) on the average height of plants, Hodai, 2017

Graduations	Mean height (cm)	%	Difference	Significance
B1 - basic fertilization	49.24	100.0	0.00	Mt.
B2 - basic fertilization + Lignohumate growth stimulator	55.19	112.1	5.95	*

DL (p 5%) 5.47; DL (p 1%) 9.05; DL (p 0.1%) 16.93

Table 6.

Influence of factor C (mint) on the average height of plants, Hodai, 2017

Graduations	Mean height (cm)	%	Difference	Significance
C1- *Mentha spicata* L. var. *crispa* "Morroccan"	46.57	100.0	0.00	Mt.
C2 - *Mentha x piperita* var. *piperita* "Swiss Mint"	59.73	128.3	13.17	***
C3 - *Mentha suaveolens* var. "Apple mint"	50.34	108.1	3.77	*

DL (p 5%) 2.77; DL (p 1%) 3.81; DL (p 0.1%) 5.25

The effect of experimental factors on average leaf/ plant number, Hodai (average 2016-2017). From the data presented in Tables 7, 8 and 9, it can be observed that

only the mint variety caused statistically significant differences in the number of leaves / plant - in the case of *Mentha x piperita*. It is an expected result, considering that it is the most vigorous variety, while *M. suaveolens* had the lowest number of leaves per plant, although the result does not have statistical significance. Irrigation also had a positive effect on the number of leaves/ plant in combination with the mint variety, whereas the combination with the fertilizer resulted in a reduction in the number of leaves/ plant, possibly due to the fact that the plants had instead developed more thick strains at the expense of leaf growth (plant height is roughly the same in fertilized and non-fertilized variants).

Table 7.

Influence of factor A (irrigation) on the average number of leaves/ plant, Hodai 2016-2017

Graduations	Mean nr. leaves/plant	%	Difference	Significance
A1- non-irrigated	853.89	100.0	0.00	Mt.
A2 - irrigated	813.89	95.3	-40.00	-

DL (p 5%) 54.77; DL (p 1%) 126.48; DL (p 0.1%) 402.49

Table 8.

Influence of factor B (fertilization) on the average number of leaves/ plant, Hodai 2016-2017

Graduations	Mean nr. leaves/plant	%	Difference	Significance
B1 – basic fertilization	837.39	100.0	0.00	Mt.
B2 – basic fertilization + Lignohumate growth stimulator	830.39	99.2	-7.00	-

DL (p 5%) 43.87; DL (p 1%) 72.59; DL (p 0.1%) 135.86

Table 9.

Influence of factor C (mint) on the average number of leaves/ plant, Hodai 2016-2017

Graduations	Mean nr. leaves/plant	%	Difference	Significance
C1- *Mentha spicata* L. var. *crispa* ”Morroccan”	763.17	100.0	0.00	Mt.
C2 - *Mentha x piperita* var. *piperita* ”Swiss Mint”	1098.75	144.0	335.58	***
C3 - *Mentha suaveolens* var. ”Apple mint”	639.75	83.8	-123.42	-

DL (p 5%) 93.09; DL (p 1%) 128.21; DL (p 0.1%) 176.51

CONCLUSIONS

Following the analysis of the results of the experiments from Hodai - Someseni, the three tested factors, the irrigation regime, the degree of fertilization and the biological material, have been differently influenced by the main biometric indicators of the plants.

Thus irrigation had a distinctly significant effect on the plant height in 2016, but it had a lesser influence on this character in 2017. The basic *fertilization graduation + Lignohumate growth stimulator* caused significant increases in plant height only in 2017 while in the case of biological material the variant *Mentha x piperita* var. *piperita* "Swiss Mint" significantly outperformed the control variant in each of the two experimental years.

Regarding the average leaf/ plant number indicator, it was found that only in case of *Mentha x piperita* var. *piperita* "Swiss Mint" recorded a very significant increase compared to the control variant.

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