

THE INFLUENCE OF TECHNOLOGY ELEMENTS ON SODIUM, CALCIUM AND MAGNESIUM CONTENT, AT THE MINT CULTURE, IN CONDITIONS OF SOMEȘENI - CLUJ AREA

Laura Budiu, Emil Luca, Viorel Budiu, Laura Cristina Luca*, Păunița Boancă, Dorina Simedru, Alina Mornea Petrache

University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Faculty of Horticulture, 3-5 Calea Mănăștur Street, 400372 Cluj-Napoca, Romania

*Corresponding author: laura_c_luca@yahoo.com

Abstract. The present paper presents part of the results of the researches carried out within the "Exploitation of systems for land improvement and crop irrigation" specialization at the University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca. The research underlying this paper was to determine the influence of some technological factors - irrigation, fertilization and biological material on the content of three important mineral elements - sodium, calcium and magnesium, at the mint culture, under the specific conditions of Someșeni area - Cluj. The technological factors studied were: the irrigation regime, the degree of fertilization and the biological material, being tested three varieties 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".

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

INTRODUCTION

Being known, used and appreciated for its qualities since antiquity, the mint was introduced and spread in culture in Romania at the beginning of the 20th century and it is cultivated mainly in the Barsei area, the Banat Plain, the Olt and Mureș valleys and in the Romanian Plain (Muntean et al., 1998, Lawrence, 2007).

MATERIAL AND METHOD OF RESEARCH

The biological material used in the experiments conducted in Hodai – Someșeni, Cluj county, was represented by species and varieties established in culture in Transylvania, *Mentha x piperita* var. *piperita* "Swiss Mint", *Mentha spicata* L. var. *crispa* "Morroccan" și *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.

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. 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", as 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. 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" și *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.

RESULTS AND DISCUSSIONS

During the years 2016-2018, the quantitative determinations of the mineral content (Na, Ca, Mg) of the plants were made in order to assess the degree of influence to 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 mineral composition (Na, Ca, Mg) of the plant that contributes to both the quantitative accumulations and the quality of the production.

The effect of experimental factors on the sodium concentration of the plant, Hodai - Someseni, mean of the years 2016-2018. It can be seen from the data presented in table 1, irrigation (factor A2) had a significant effect on the high concentration of sodium in the mint plants. The influence of the B2 factor (fertilization) basic fertilization + Lignohumate growth stimulator has a slight increased concentration of sodium, because high concentration of Lignohumate may cause soil salinity and a high level of sodium (table 2). A significant increase in sodium concentration was recorded for *Mentha suaveolens* (table 3).

Table 1

Influence of factor A (irrigation) on the level of sodium concentration in the plants,
Hodai - Someseni, mean of the years 2016-2018

Graduations	Na, mg/kg	%	Difference	Significance
A1- non-irrigated	18.96	100.0	0.00	Mt.
A2- irrigated	25.14	132.6	6.18	-

DL (p 5%) 20.18

DL (p 1%) 46.6

DL (p 0.1%) 148.30

Table 2

Influence of factor B (fertilization) on the level of sodium concentration in the plants,
Hodai - Someseni, mean of the years 2016-2018

Graduations	Na, mg/kg	%	Difference	Significance
B1- basic fertilization	21.08	100.0	0.00	Mt.
B2-basic fertilization + Lignohumate growth stimulator	23.03	109.3	1.95	-

DL (p 5%) 2.00

DL (p 1%) 3.31

DL (p 0.1%) 6.19

The effect of experimental factors on the calcium concentration of the plant, Hodai - Someseni, mean of the years 2016-2018. Factor A2 (irrigation) has negatively influenced the concentration of the calcium in the mint plants as can be seen from the data presented in table 4. Influence of factor B2 (fertilization) basic fertilization + Lignohumate growth on calcium concentration has a significant effect on the low concentration of calcium

in the mint plants (table 5). *Mentha x piperita* has a low concentration of calcium, while a significant result was obtained for the *Mentha suaveolens*, which was recorded with the highest calcium concentration (table 6).

Table 3
Influence of factor C (variety of mint) on the level of sodium concentration in the plants,
Hodai - Someseni, mean of the years 2016-2018

Graduations	Na, mg/kg	%	Difference	Significance
C1- <i>Mentha spicata</i> L. var. <i>crispa</i> "Morroccan"	19.98	100.0	0.00	Mt.
C2 - <i>Mentha x piperita</i> var. <i>piperita</i> "Swiss Mint"	20.21	101.1	0.23	-
C3 - <i>Mentha suaveolens</i> var. "Apple mint"	25.97	130.0	5.99	-

DL (p 5%) 5.09 DL (p 1%) 7.02 DL (p 0.1%) 9.66

Table 4
Influence of factor A (irrigation) on the level of calcium concentration in the plants,
Hodai - Someseni, mean of the years 2016-2018

Graduations	Ca, mg/kg	%	Difference	Significance
A1- non-irrigated	5600.11	100.0	0.00	Mt.
A2 - irrigated	5352.72	95.6	-247.39	-

DL (p 5%) 577.6 DL (p 1%) 1333.87 DL (p 0.1%) 4244.74

Table 5
Influence of factor B (fertilization) on the level of calcium concentration in the plants,
Hodai - Someseni, mean of the years 2016-2018

Graduations	Ca, mg/kg	%	Difference	Significance
B1 – basic fertilization	5598.61	100.0	0.00	Mt.
B2 – basic fertilization + Lignohumate growth stimulator	5354.22	95.6	-244.39	-

DL (p 5%) 977.42 DL (p 1%) 1617.32 DL (p 0.1%) 3027.19

Table 6
Influence of factor C (variety of mint) on the level of calcium concentration in the plants,
Hodai - Someseni, mean of the years 2016-2018

Graduations	Ca, mg/kg	%	Difference	Significance
C1- <i>Mentha spicata</i> L. var. <i>crispa</i> "Morroccan"	5398.16	100.0	0.00	Mt.
C2 - <i>Mentha x piperita</i> var. <i>piperita</i> "Swiss Mint"	5301.54	98.2	-96.63	-
C3 - <i>Mentha suaveolens</i> var. "Apple mint"	5729.55	106.1	331.39	-

DL (p 5%) 823.14 DL (p 1%) 1133.76 DL (p 0.1%) 1560.86

The effect of experimental factors on the magnesium content of the plant, Hodai - Someseni, mean of the years 2016-2018. It can be seen from the data presented in table 7, that irrigation (factor A2) had a negative effect on the magnesium concentration in the plants. Also, it can be seen from the data presented in the table 8 that the influence of basic fertilization + Lignohumate growth stimulator (factor B2) has the lowest level of magnesium. *Mentha suaveolens* has a low concentration of magnesium, while a significant result was obtained for the *Mentha x piperita* which was recorded with the highest magnesium concentration (table 9).

Table 7

Influence of factor A (irrigation) on the level of magnesium concentration in the plants,
Hodai- Someseni, mean of the years 2016-2018

Graduations	Mg, mg/kg	%	Difference	Significance
A1 - non-irrigated	1507.36	100.0	0.00	Mt.
A2- irrigated	1433.11	95.1	-74.25	-

DL (p 5%) 280.57

DL (p 1%) 647.93

DL (p 0.1%) 2061.88

Table 8

Influence of factor B (fertilization) on the level of magnesium concentration in the plants,
Hodai - Someseni, mean of the years 2016-2018

Graduations	Mg, mg/kg	%	Difference	Significance
B1- basic fertilization	1523.80	100.0	0.00	Mt.
B2 - basic fertilization + Lignohumate growth stimulator	1416.67	93.0	-107.14	-

DL (p 5%) 177.43

DL (p 1%) 293.58

DL (p 0.1%) 549.51

Table 9

Influence of factor C (variety of mint) on the level of magnesium concentration in the plants, Hodai
- Someseni, mean of the years 2016-2018

Graduations	Mg, mg/kg	%	Difference	Significance
C1- <i>Mentha spicata</i> L. var. <i>crispa</i> "Morroccan"	1458.32	100.0	0.00	Mt.
C2 - <i>Mentha x piperita</i> var. <i>piperita</i> "Swiss Mint"	1544.00	105.9	85.68	-
C3 - <i>Mentha suaveolens</i> var. "Apple mint"	1408.39	96.6	-49.93	-

DL (p 5%) 275.83

DL (p 1%) 379.91

DL (p 0.1%) 523.03

CONCLUSIONS

The analysis of the results of the experiments from Hodai - Someseni, show that the three tested factors, the irrigation regime, the degree of fertilization and the biological material, had a significant influence for the mineral composition of mint plants. The influence of factor irrigation had a distinctly significant effect on the plant mineral composition, with the highest level of sodium, lowest level of calcium and low level for magnesium. The basic *fertilization graduation + Lignohumate growth stimulator* caused significant decreases of magnesium and calcium, but not a significant decrease of sodium.

Mentha x piperita var. *piperita* "Swiss Mint" recorded a very significant increase of magnesium concentration and a low level of calcium. *Mentha suaveolens* recorded a very significant increase of sodium, the highest level of calcium and a low level of magnesium.

REFERENCES

1. Budiu Laura, E. Luca, V. Budiu, Laura Cristina Luca, 2017, Influence of some technology elements on the evolution of the main biometric indicators on the mint culture under the conditions of Cluj area, Agricultura, Year XXVI, No. 3-4 (103-104)/2017.
2. Lawrence, B.M. (ed.), 2007, Mint. The genus *Mentha*, Taylor & Francis Group, Boca Raton.
3. ***, *Mentha suaveolens*. Apple mint, <https://www.rhs.org.uk/Plants/98755/i-Mentha-suaveolens-i/Details>