CONTRIBUTIONS REGARDING THE MORPHOLOGICAL CHARACTERS OF *MONARDA CITRIODORA* CERV. EX LAG. IN FIELD CONDITIONS

CONTRIBUȚII PRIVIND INFLUENȚA CONDIȚIILOR PEDO-CLIMATICE ASUPRA UNOR CARACTERE MORFOLOGICE LA SPECIA *MONARDA CITRIODORA* CERV. EX LAG.

CIURUŞNIUC Ana-Maria[1], ROBU T.[1], SAGHIN GH.[2], ANDRIEŞ Iuliana[1], COTEANU A.Gh[1].
e-mail: ciurusniucanamaria@yahoo.com

Abstract. *This paper brings new contributions to the knowledge of morphological characters belonging to the species Monarda citriodora Cerv. ex Lag. (family Lamiaceae) cultivated in the climatic conditions in three areas of Moldova: Iasi, Vaslui and Pojorâta (Suceava). Research focused on species growing Monarda citriodora Cerv. ex Lag. in different climatic conditions, followed by observations and measurements of plants, as established by seed crops as well as those established by seedling. It should be noted that the differences were found between plants grown in three locations and the establishment of methods of culture.*
Key words*: Monarda citriodora* Cerv. *ex* Lag*,* morphological characters

Rezumat: *Lucrarea aduce noi contribuții la cunoașterea unor caractere morfologice care aparțin speciei MonardacitriodoraCerv. ex Lag. (familia Lamiaceae) cultivată în condițiile pedo-climatice din trei zone ale Moldovei: Iași, Vaslui și Pojorâta (Suceava). Cercetările au vizat cultivarea speciei Monarda citriodora Cerv. ex Lag. în condiții pedo-climatice diferite, urmate de observații și măsurători ale plantelor, atât la culturile înființate prin semințe cât și la cele înființate prin răsad. De remarcat este faptul că s-au constatat diferențieri atât între plantele cultivate în cele trei locații, cât și între metodele de înființare ale culturii.*
Cuvinte cheie*: Monarda citriodora* Cerv. *ex* Lag*.,* caractere morfologice

INTRODUCTION

Monarda L., also known popular as bergamot, decorative mint, Indian mint, bee balm, OswegoTea, is part of the family *Lamiaceae*, botanical family known for many species of medicinal plants, aromatic and decorative, that it contains. Genus species, originating in North America, have been successfully used in medicinally purposes since the seventeenth century by numerous Indian tribes to treat digestive affections, having many effects like febrifuge, diaphoretic,

[1] University of Agricultural Sciences and Veterinary Medicine of Iași, Romania
[2] Development Research Station of Agricultural Suceava, Romania

antirheumatic, carminative, sedative, tonic.

In specialty literature the number of genus *Monarda* L. varies from 12 (Guşuleac, 1961) to 30 species (Selaru, 2007), being herbaceous plants, mostly perennial, but also annual.

Bentham (1876), Briquet (1897), Wunderlich (1967) Harley et al. (2004) placed the genus *Monarda* L in the family *Lamiaceae*., *Nepetoidae* subfamily, tribe *Mentheae*, subtribe *Menthinae* (Ryding, 2009, 2010, Moon et al., 2009).

Monarda citriodora Cerv. ex Lag. is an annual species, with heights of 25-90 cm well-develop droot system, swivel type, branched. Stems are branched, erect, square pubescent. The leaves are opposite, petiolate, lanceolate or oblong-lanceolate, pubescent, with serrate edges (fig. 1).

Flowers pink-purple, are grouped in whorls 2-7 capitulum formed terminals, accompanied by colorful bracts, tubular calyx, 5 lobes, two lipped corolla, long tube, glabrous narrow interior, straight or slightly curved upper lip, lower short, the three lobes (P. Grisvard, Chaudun V., 1964). Previous stamens are ascending hind rudimentary or absent, anthers linear. The ovary is deep, with four lodges. The style is bifida peak (Guşuleac M., 1961) (fig. 1), the fruits are glossy ovoid nukas.

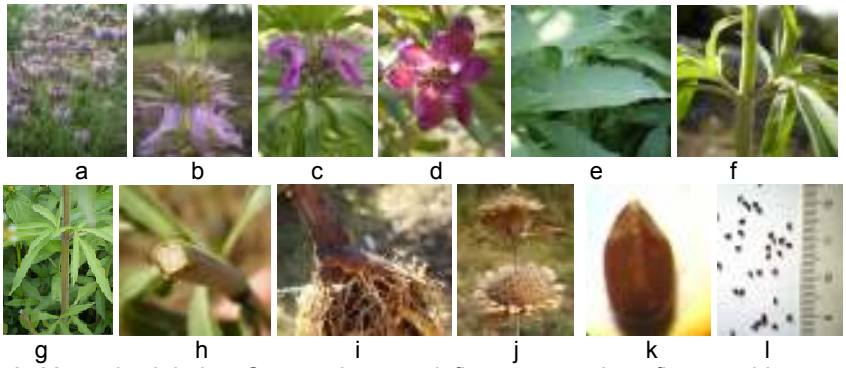

Fig. 1- *Monarda citriodora* Cerv. ex Lag. : a- inflorescences; b, c- flowers; d-bracts; e, f- leaves; g, h- strain squared; i- root; j, k, l- seeds

MATERIALS AND METHODS

The experiments were conducted in three areas of the climatic Moldova: Plant growing on experimental field of discipline Phytotechnique of the University of Agricultural Sciences and Veterinary Medicine of Iasi, the experimental field of Văleni Station Vaslui and Suceava-Agricultural Research and Development center Pojorâta. The experiments were established in spring 2011, located in plots subdivided in three repetitions, being differentiated by the establishment of culture: sown directly in the field and greenhouse seedling obtained Veterinary Medicine Teaching Science Station.

Observations and biometric measurements were performed on a total of 30 plants, from May 2011 until August 2011, aiming at growing plants in all stages (fig. 2).

Bilogical material used in the establishment of culture is the *Monarda citriodora* Cerv. ex Lag.

RESULTS AND DISCUSSION

In tables 1 and 2 are presented data on sowing date, sunrise, planting date, flowering date, plant height and flowering so early to full flowering of the three locations. Note that in cultures established plants by seeds, Vaslui area, slope heights presented in full flowering phenophase lower than those in cultures established by seedling. In contrast, plants in full flowering phenophase of culture established by seeds of Pojorâta had an average height of 75.3 cm, compared to the culture created by the seedling, which measured on average 68.2 cm.

Table 1

Characters of plants *Monarda citriodora* Cerv. ex Lag in cultures established by seed.

Location	Sowing date	Date sunrise	Appearance I pairs of leaves	Date of flowering	Height at full flowering - cm
Iaşi	6.05	16.05	30.05	20.08	61,71
Vaslui	14.05	23.05	2.06	15.08	41,8
Pojorâta	27.05	14.06	23.06	15.09	75,3

Table 2

Characters of plants *Monarda citriodora* Cerv. ex Lag in cultures established by seedling

Location	Planting date	Height before blooming - cm	Date of flowering	Height at full flowering - cm
Iaşi	13.05	40,7	6.06	67,87
Vaslui	20.05	38,7	10.06	61,71
Pojorâta	27.05	46,75	18.06	68,2

a b c d e

Fig. 2 - Aspects of the experimental field, a- the seed culture, b, c, d-seedling crop established by, e-seedling of *M. citriodora* Cerv. ex Lag

Table 3 presents the characterization climate of 2011 in areas where they were created experiences: Iaşi, Vaslui and Pojorâta. Multi-annual average temperatures in 2011 in Vaslui. County was 10.55ºC, 10.34º C in Iaşi and 5.36º C in the Pojorâta.

Table 3

The characterization of the climate of 2011

Specification	Iaşi		Vaslui		Pojorâta	
	Temperatures ºC	Precipitationmm	Temperaturesº C	Precipitation mm	Temperaturesº C	Precipitation mm
Jan	-2	18.8	-2.5	23.4	-7	52.6
Feb	-2.4	8.8	-2.4	8.2	-3.3	37.0
Mar	3.7	21.0	3.7	22.2	-1.1	41.3
Apr	10.3	81.4	10.3	47.0	5.2	45.6
May	16.5	41.0	17	45.6	10.8	145.6
Jun	20.2	113.8	21.1	108.4	14.9	143
Jul	22.6	66.0	23.2	86.4	16.1	242.2
Aug	21.5	28.2	24.7	77.2	16.5	169.3
Sept	18.8	22.8	15.7	71.2	9.9	85.8
Oct	9.2	42.6	11.5	29.7	2.9	29.8
Nov	3.0	1.4	6.4	10.2	4.0	53.7
Dec	2.7	9.8	-2.1	58.4	-4.5	58.2
Average annual/ Monthly amount	10.34	455.6	10.55	587.9	5.36	1104

In table 4 the values of biometric measurements made on plants species *Monarda citriodora* Cerv. ex Lag., cultivated in the climatic three areas of Moldova, established by seedling.

Table 4

***Monarda citriodora* Cerv. ex Lag. species biometric measurements the full flowering phenophase in the three areas of culture, established by seedling**

Nr. crt	Specification (avarage)	Vaslui	Iaşi	Pojorâta
1	**Height (cm)**	61,71	67,87	68,2
2	**No. of branches**	14,2	15,42	16
3	**Leaf lenght (cm)**	5,21	5,58	6
4	**Leaf width (cm)**	1,16	1,16	1,28
5	**No. of whorls of inflorescences**	4,5	4,5	4,5
6	**Inflorescences diameter (cm)**	2,96	3,5	3,7

Following comments made in the three areas of crop plants species *M. citriodora* Cerv. ex Lag., on the character height, the lowest average of 61.71 inches was reported in the culture of Vaslui, and highest, 68.2 cm, the plants cultivated in Pojorâta.

The average number of branches of the stem varies little, from 14.2 ramifications of plants grown in Vaslui, from 15.42 to plants cultivated in Iasi branch to 16 branches from plants Pojorâta. *M. citriodora* Cerv. ex Lag. leaf length presented values of 5.21 cm for plants in Vaslui, up to 6 cm from the plants grown at Pojorâta. On leaf width, plants grown in Vaslui and Iaşi have registered the same value of 1.16 cm, whereas leaves of plants in culture Pojorâta had widths of 1.28 cm. Number of whorls of inflorescences was monarda average of 4.5 in all

three are as of culture, while inflorescence diameter ranged from an average value of 2.96 cm from the plants grown in Vaslui, from 3.7 cm to those grown in Pojorâta.

Table 5

***Monarda citriodora* Cerv. ex Lag. species biometric measurements the full flowering phenophase in the three areas of culture, founded by seeds**

Nr. crt	Specification (avarage)	Vaslui	Iaşi	Pojorâta
1	**Height (cm)**	41,8	61,71	75,3
2	**No. of branches**	7,42	7,42	14,85
3	**Leaf lenght (cm)**	4,68	4,86	5,96
4	**Leaf width (cm)**	1,12	1,21	1,33
5	**No. of whorls of inflorescences**	2,25	2,66	3,88
6	**Inflorescence diameter (cm)**	2,78	2,86	3,94

In table 5, biometric measurements made on plants of *Monarda citriodora* Cerv. ex Lag. grown in three, established by direct sowing in the field (tab. 1) had values different from those established by the seedlings, culture and between locations. Thus, the average height of plants at full flowering phenophase, measured in Vaslui only 41.8 cm, whereas those of Pojorâta recorded an average height of 75.3 cm.

The average number of stem branches ranged from 7.42 branch to plants grown in Vaslui and Iaşi, until 14.85 on the ramifications of the strain grown in Pojorâta. On leaf length, plants grown in Vaslui and Iaşi have measured an average of 4.68 cm and 4.86 cm, while those grown in the mountains, Pojorâta, have an average length of 5.96 cm.

Average width of leaves showed values between 1.12 cm from the plants grown in Vaslui, 1.21 cm in those grown in Iasi and 1.33 cm from the plants grown in the Pojorâta.

The culture plants established in Vaslui, inflorescences showed the average diameter of 2.78 cm, 2.86 cm cultivated in Iasi and in those of Pojorâta 3.94 cm. On the average number of whorls/flowering plants of culture established in Vaslui area included an average of 2.25 whorls/inflorescence, those of culture in Iasi, 2.66 whorls/inflorescence and plants grown in Pojorâta an average of 3, 88 whorls/inflorescence.

CONCLUSIONS

1. *Monarda citriodora* Cerv.ex Lag. species grown in the three areas of Moldova (Iaşi, Vaslui and Pojorâta) have different values of biometric measurements made during the growing season, indicating that both the climatic conditions of the three areas of culture, and how to establish the culture influence the morphology of plants.

2. The lowest average height (41.8 cm) reported the culture of Vaslui, and

the greatest height (75.3 cm) that measured a Pojorâta area plants were recorded in the culture established by seed.

3. The average number of stem branches ranged from 14.2 (Vaslui) to 16 branches/strain (Pojorâta) to set the seedling crop plants, and from 7.42 (Vaslui and Iaşi) to 14.85 branch/stem (Pojorâta) to set the seed crop plants.

4. The average length of the leaf of the highest values measured in cultures established by seedling plants (6 cm-Pojorâta) and the lowest average value (4.68 cm-Vaslui) to set the seed crop plants.

5. Lowest average number of whorls/inflorescence was reported at plants established by seed culture Vaslui area (2.66 whorls/inflorescence), and the highest number of whorls/blossom from the culture established by seedling plants in all three locations (4.5 vertical/inflorescence).

6. Biometric measurements made at plants in cultures established by seeds (number of branch/stem, leaf length, leaf width, number of whorls/inflorescence, diameter of inflorescences) had lower values than biometric measurements of plants in the seedling crop established.

REFERENCES

1. **Grisvard P., Chaudun V., 1964** - *Le bon jardinière*, vol. 2, Encyclopedie Horticole, Edit. La maison rustique.
2. **Guşuleac M.**, **1961** - *Gen Monarda L. în Săvulescu Tr., (Edit.), Flora R.P.R.*, vol. VIII, p 273-274.
3. **McClintock Elizabeth, Epling C., 1942** - *A rewiew of the genus Monarda (Labiatae)*, Univ. of California Press Berkeley and Los Angeles, p. 147-194.
4. **Moon Hye-Kyoung, Suk-Pyo Hong, Smets Erik, Huysmans Suzy, 2009** - *Phylogenetic significance of leaf micromorphology and anatomy in tribe Mentheae (Nepetoideae: Lamiaceae)*, Botanical Journal of the Linnean Society, 160, p. 211-231.
5. **Ryding O., 2009** - *Pericarp structure of Monarda (Lamiaceae)*, Botanische Jahrbucher, vol. 127, nr. 4, p. 453-458.
6. **Ryding O., 2010** - *Pericarp structure and phylogeny of tribe Mentheae (Lamiaceae)*, Plant Syst Evol, 285, p. 165-175.
7. **Şelaru Elena, 2007** - *Cultura florilor de grădină*, Edit. Ceres, Bucureşti.