

STUDY REGARDING THE INFLUENCE OF CULTURE ESTABLISHING MANNER ON SOME MORPHOLOGICAL CHARACTERS FOR SEVERAL SPECIES OF THE GENUS *MONARDA* L. CULTIVATED IN MOLDOVA

STUDII PRIVIND INFLUENȚA MODULUI DE ÎNFIINȚARE A CULTURII ASUPRA UNOR CARACTERE MORFOLOGICE LA UNELE SPECII ALE GENULUI *MONARDA* L. CULTIVATE ÎN MOLDOVA

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Abstract. The study follows the influence of the culture establishing manner on some morphological characters (plant height, number of branches/strain and number of whorls/ inflorescence) from three species of the genus *Monarda* L.: *Monarda didyma* L., *Monarda fistulosa* L. și *Monarda citriodora* Cerv. ex Lag. The experience was conducted in 2012, in three locations of Moldova, in subdivided plots, in three repetitions, including variants established by seedling and variants established by seed. After biometric measurements, it was found that the highest average values for the pursued characters were reached for the plants from the variants established by seedling.

Key words: *Monarda*, morphological charcaters, seedling.

Rezumat. Studiul urmărește influența modului de înființare a culturii asupra unor caractere morfologice (talie plantelor, numărul de ramificații/tulpină și numărul de verticile/inflorescență) la 3 specii ale genului *Monarda* L.: *Monarda didyma* L., *Monarda fistulosa* L. și *Monarda citriodora* Cerv. ex Lag. Experiența a fost înființată în anul 2012, în 3 zone ale Moldovei, în parcele subdivizate, în 3 repetiții, având variante înființate prin răsad și variante înființate prin semințe. În urma măsurărilor biometrice efectuate, s-a constatat că valorile medii cele mai mari ale caracterelor urmărite au fost obținute de plantele din variantele înființate prin răsad.

Cuvinte cheie: *Monarda*, caractere morfologice, răsad.

INTRODUCTION

Monarda L. genus is named in honor and memory of Spanish botanist, physician and explorer of the sixteenth century, Nicolas Bautista Monardes (1493-1588), who made known American medicinal plants across Europe (Sanchez, 2008).

Monarda L. genus, which has its origins in North America is part of the botanical family *Lamiaceae* and contains plants commonly known as bergamot, decorative mint, Indian mint.

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In the literature *Monarda* L. genus species number varies from 12 species (Guşuleac, 1961), 12-20 species (Preda, 1989), 15 species (Brickell, 2004), up to 30 species (Şelaru Elena, 2007).

Monarda L. genus include annual and perennial herbaceous plant species, with simple or branched, four-edged, pubescent or hairless stems. The leaves are opposite, ovate, oblong, sessile or petioled (McClintock and Epling, 1942). The flowers are grouped in terminals capituliforme whorls with colored bracts, tubular calyx by 5 lobes, bilipped corolla with long tube, slim, with straight or slightly curved upper lip and short lower lip, consisting of three lobes (Grisvard and Chaudun, 1964).

Plants of the genus are heliophile, requiring high light intensity, long day conditions determining flower development, but they can be cultivated also in semidarkness (Teuscher et al., 2005).

MATERIAL AND METHOD

The experiments were conducted in three areas of Moldova pedo-climatic conditions: the experimental field of the Department of Crop Production, within USAMV Iaşi, the experimental field of Văleni, Vaslui county and the experimental field of Agricultural Research and Development Station Suceava- Pojorâta center.

The experiments were established in the spring of 2011 and 2012 located in subdivided plots in three repetitions, with variants established by seeds and variants established by seedling obtained in the greenhouse of the USAMV Iaşi Didactic Station.

Experimental factors investigated were:

Factor A – Area; a1- Pojorata area, a2-Iasi area and a3- Vaslui area

Factor B – Species; b1- *M. citriodora* Cerv. ex Lag., b2- *M. didyma* L. şi b3- *M. fistulosa* L.

Factor C - The culture establishment manner of, c1-by seeds and c2-by seedling.

Sowing was done in all three location in May and plant emergence occurred in about 3 weeks. Seedling was planted in the same month, with a height of 14 cm, at a distance of 40 cm between plants in the row and 50 cm between rows.

RESULTS AND DISCUSSIONS

The culture stablishing manner affected positively and negatively the height at the plants full flowering, resulting in significant differences for seedling established variants and negative very significant for those established by seeds (Table 1). Plants cultivated in variants established by seedling counted on average 5.39 branches/strain, with a very significant difference related to the experience average. Instead, plants from variants established by seed recorded a number of branches / strain lower by 0.71 to control taken into consideration in the study, the difference being negative very significant. Analyzing the influence of the culture establishing manner on the number of whorls / inflorescence, in experimental year 2012, significant differences from the control were obtained at the plants from variants established by seedling (Table 1).

Table 1

The influence of culture establishing manner on height, number of branches / strain and on number of whorls / inflorescence for the three species of the genus *Monarda* L. studied

Establishing manner	Height (cm)	% to the control	Difference	Significance
By seeds	57,77	94,38	-3,44	000
By seedling	64,65	105,62	3,44	***
Average	61,21	100,00	control	-
DL 5% 0,7 cm DL 1% 1,0 cm DL 0,1% 1,4 cm				
Establishing manner	Number of branches / strain	% to the control	Difference	Significance
By seeds	3,98	84,86	-0,71	000
By seedling	5,39	114,93	0,70	***
Average	4,69	100	control	-
DL 5% 0,2 DL 1% 0,3 DL 0,1% 0,4				
Establishing manner	Number of whorls / inflorescence	% to the control	Difference	Significance
By seeds	1,77	85,92	-0,29	000
By seedling	2,35	114,08	0,29	***
Average	2,06	100	control	-
DL 5% 0,03 DL 1% 0,10 DL 0,1% 0,14				

In the interaction between cultivated species and culture establishing manner on the plant height at the plants full flowering, *Monarda fistulosa* L. plants obtained very significant differences were from the experience average (61.21 cm) in both the variants established by seeds and those established by seedlings (Table 2). *Monarda didyma* L. plants and *Monarda citriodora* Cerv. ex Lag. recorded average values of height at full flowering phenophase lower than experience average, the differences being less distinct and very significant in minus.

Table 2

The influence of the interaction between species x culture establishing manner on height at full flowering of the three species in 2012

Species	Establishing manner	Height (cm)	% to the control	Difference (cm)	Significance
<i>M. fistulosa</i>	by seeds	70,41	115,03	9,20	***
<i>M. fistulosa</i>	by seedling	77,05	125,88	15,84	***
<i>M. didyma</i>	by seeds	49,68	81,16	-11,53	000
<i>M. didyma</i>	by seedling	56,79	92,78	-4,42	000
<i>M. citriodora</i>	by seeds	53,22	86,95	-7,99	000
<i>M. citriodora</i>	by seedling	60,12	98,22	-1,09	-
Average		61,21	100	control	-
DL 5% 1,5 cm DL 1% 2,0 cm DL 0,1% 2,8 cm					

In Table 3 it is observed that the interaction between area and culture establishing manner leads to a distinct and very significant difference related to the average experience (61.21 cm), at the variants cultivated by field direct sowing and at the variants established by seedling, in the Pojorâta area. Negative differences related to the control were recorded by plants from the variants established by seeds in Iași and Vaslui counties, measuring at the full flowering phenophase in average 56.71 cm and respectively 50.21 cm.

Table 3

The influence of the interaction between area x culture establishing manner on height at full flowering of the three species in 2012

Area	Establishing manner	Height (cm)	% to the control	Difference (cm)	Significance
Iași	by seeds	56,71	92,65	-4,50	00
Iași	by seedling	62,77	102,55	1,56	-
Vaslui	by seeds	50,21	82,03	-11,00	000
Vaslui	by seedling	58,55	95,65	-2,66	-
Pojorâta	by seeds	66,39	108,46	5,18	**
Pojorâta	by seedling	72,64	118,67	11,43	***
Average		61,21	100	control	-

DL 5% 2,7 cm

DL 1% 4,4 cm

DL 0,1% 7,7 cm

Table 4

The influence of the interaction between species x culture establishing manner on number of branches / strain for the three species in 2012

Species	Establishing manner	Number of branches / strain	% to the control	Difference (no.)	Significance
<i>M. fistulosa</i>	by seeds	4,46	95,10	-0,23	-
<i>M. fistulosa</i>	by seedling	5,44	115,99	0,75	***
<i>M. didyma</i>	by seeds	2,78	59,28	-1,91	000
<i>M. didyma</i>	by seedling	3,2	68,23	-1,49	000
<i>M. citriodora</i>	by seeds	4,70	100,21	0,01	-
<i>M. citriodora</i>	by seedling	7,54	160,77	2,85	***
Average		4,69	100	control	-

DL 5% 0,4

DL 1% 0,5

DL 0,1% 0,7

The largest number of branches of the strain, of 7.54 was determined experimentally in 2012, at the species *Monarda citriodora* Cerv. ex Lag. from the variations established by seedling, with a difference to the average experience (2.85 branches / strain) very significant. Still a very significant difference to the control (0.75 branches / strain) was obtained also by *Monarda fistulosa* L. plants from the variants established by seedling (Table 4).

Analyzing interaction between area and culture establishing manner on the number of strain branches, a very significant difference to the experience average was recorded by the culture established by seeds and seedlings in the Pojorâta area

(Table 5). Negative differences very significant were obtained at the plants from the same species cultivated in variants established by seed, in Iași and Vaslui.

Table 5

The influence of the interaction between area x culture establishing manner on number of branches / strain for the three species in 2012

Area	Establishing manner	Number of branches / strain	% to the control	Difference (no.)	Significance
Iași	by seeds	3,36	71,64	-1,33	000
Iași	by seedling	4,32	92,11	-0,37	-
Vaslui	by seeds	3,05	65,03	-1,64	000
Vaslui	by seedling	4,98	106,18	0,29	-
Pojorâta	by seeds	5,53	117,91	0,84	***
Pojorâta	by seedling	6,87	146,48	2,18	***
Average		4,69	100	control	-

DL 5% 0,4

DL 1% 0,5

DL 0,1% 0,8

Table 6

The influence of the interaction between species x culture establishing manner on number of whorls / inflorescence for the three species in 2012

Species	Establishing manner	Number of whorls / inflorescence	% to the control	Difference (no.)	Significance
<i>M. fistulosa</i>	by seeds	1,13	54,85	-0,93	000
<i>M. fistulosa</i>	by seedling	1,32	64,08	-0,74	000
<i>M. didyma</i>	by seeds	1,20	58,25	-0,86	000
<i>M. didyma</i>	by seedling	1,52	73,79	-0,54	000
<i>M. citriodora</i>	by seeds	2,99	145,15	0,93	***
<i>M. citriodora</i>	by seedling	4,22	204,85	2,16	***
Average		2,06	100	control	-

DL 5% 0,10 buc.

DL 1% 0,15

DL 0,1% 0,20

Monarda citriodora Cerv. ex Lag. plants from the variants established by seedling and seeds determined the highest number of whorls / inflorescence (4.22 and respectively 2.99 whorls / inflorescence), obtaining significant differences related to the experience average (2.06 whorls / inflorescence) (Table 6).

Table 7

The influence of the interaction between area x culture establishing manner on number of whorls / inflorescence for the three species in 2012

Zona	Establishing manner	Number of whorls / inflorescence	% to the control	Difference (no.)	Significance
Iași	by seeds	1,58	76,70	-0,48	000
Iași	by seedling	2,11	102,43	0,05	-
Vaslui	by seeds	1,62	78,64	-0,44	000
Vaslui	by seedling	2,34	113,59	0,28	***
Pojorâta	by seeds	2,12	102,91	0,06	-
Pojorâta	by seedling	2,60	126,21	0,54	***
Average		2,06	100	control	-

DL 5% 0,10

DL 1% 0,20

DL 0,1% 0,22

The influence of the interaction between the factors area and culture establishing manner on the number of whorls / inflorescence, produced significant differences compared to the experience average (2.06 whorls / inflorescence) for the plants from variants established by seedling in Vaslui and Pojorâta, and very significant in minus for the plants established by seeds in Iași and Vaslui (Table 7).

CONCLUSIONS

1. Plants from variants established by seedling determined the highest average values of height at the plants full flowering, of the number of branch / strain and of the number of whorls / inflorescence in all three species studied in the three areas of culture.

2. *Monarda fistulosa* L. measured highest average height (77.05 cm), and *Monarda citriodora* Cerv. ex Lag. counted the highest number of whorls / inflorescence (4.22 whorls / inflorescence).

3. Variants established by seedling cultivated in the Pojorâta obtained the highest values of height (72.64 cm), number of branches / strain (6.87 branches / strain) and number of whorls / inflorescence (2.60 whorls / inflorescence).

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