

## RESEARCHES REGARDING THE INFLUENCE OF THE SOWING EPOCH AND CLIMATIC CONDITIONS ON THE BIOLOGY OF THE SPECIES, HERB AND SEED YIELDS AT *DRACOCEPHALUM MOLDAVICA* L. (MOLDAVIAN DRAGONHEAD) IN A.R.D.S. SECUIENI

Oana MÎRZAN<sup>1</sup>, Margareta NAIE<sup>1</sup>, SIMONA-FLORINA ISTICIOAIA<sup>1</sup>, Bogdan MÎRZAN<sup>2</sup>

e-mail: spanuoana@yahoo.com

### Abstract

The paper aims to highlight the influence of climatic conditions and the optimal sowing epoch on species biology and herb and seed yields at *Dracocephalum moldavica* L. (moldavian dragonhead). The research was carried out in 2017, in the experimental field of A.R.D.S. Secuieni. Due to the higher temperatures in the epoch II, the sown plants had a faster evolution. From sowing to seed harvesting it was necessary 131 days, the sum of the thermal degrees was 2293.3 °C and 242.2 mm precipitations. Under the conditions of S.C.D.A. at epoch II and III, there was a decrease decrease at herb and seed yields compared to the control of the experience sowing at the end of March - early April. Compared with the control variant (epoch I), where the seeds production was 635.33 kg/ ha, at epoch III of sowing there was a loss of production of 21% representing 131.66 kg/ ha.

**Key words:** herb, moldavian dragonhead, seeds

The importance and necessity of cultivating medicinal and aromatic herbs derives from some aspects, such as their use in human nutrition, perfumery, cosmetics, pharmaceutical industry, etc.

Dragonhead with scientific name (*Dracocephalum moldavica* L.) is an annual herbaceous, some times biennial, which is aromatic belonging to Lamiaceae, has antioxidative properties and can be used as food and cosmetic related preservatives (Dastmalchi K. *et al*, 2007). The origin of this plant is reported from southern Siberia and the Himalaya (Omidbaigi R., 2005;) and naturally grows in temperate zones of Europe and Asia (Abdossi V. *et al*, 2015).

It is also known as medicinal plants which is used for treatment of liver disorders and stomach. Dragonhead shoot contains secondary metabolites such as phenolic compounds (flavonoids), essential oils and etc. which are responsible for medicinal characteristics of this plant (Dastmalchi K. *et al*, 2007). Dragonhead flowers mainly in July and sets fruit in August, and contains terpenes, flavones, proteins, polypeptides and 16 amino acids, of which 8 are essential (Dziki D. *et al*, 2012; Sultan A. *et al*, 2008.).

The seasonal changes in plant height, fresh and dry weight of plant as well as fresh and dry

yield of herb are significant. It is demonstrated that essential oil content increase with increasing plant age to reach the maximum values at post flowering stage (Aziz E.E. *et al*, 2012, Roghiyeh A. O. *et al*, 2012).

### MATERIAL AND METHOD

A factorial experiment was organized in 2016-2017 in the experimental field of Agricultural Research - Development Station Secuieni, Neamt County, using a randomized blocks in three replications.

The trial was conducted on a typical cambic chernozem soil type, middle texture, acid: pH H<sub>2</sub>O–6.29, characterized as: well-supplied in phosphorus (39 ppm PAL), Ca (13.6 mEq/100 g soil Ca) and Mg (1.8 mEq/100 g soil Mg), middle supplied in active humus (1.88 %) and nitrogen (16.2 ppm N-NO<sub>3</sub>) and poorly supplied in potassium (124.6 ppm K<sub>2</sub>O).

In the conditions of A.R.D.S. Secuieni we experimented three sowing epochs:

V1(control) - Epoch I, sowing in the first emergency (the third decade of March);

V2 - Epoch II, sowing in the second emergency (the second decade of April);

V3 - Epoch III, sowing late (the last decade of April - the first decade of May).

<sup>1</sup> A.R.D.S. Secuieni, Secuieni

<sup>2</sup> Societatea Agricolă Moldoveni, Moldoveni

The soil work and the preparation of the germination bed consisted in releasing the soil from the plant debris in the pre-planting, stubble-turning and plowing at a depth of 30 cm. In spring, preparation of the germination bed was made with a harrow disc and the sowing was done manually at a depth of 2 cm.

The research was aimed to establish the optimal epoch of sowing for the species *Dracocephalum moldavica* L. in order to develop the technology cultivation.

During the vegetation period of plants, phenological observations were made to establish the sum of the thermal degrees and sum of the precipitations needed to grow and develop the plants.

The agricultural year 2016/2017 is characterized in terms of temperatures as a normal year, the average temperature was 9.4°C with a deviation from the multiannual average of 0.6°C.

The negative deviations from the monthly average were between -0.3°C and -1.9°C, registered in October, November (2016), January and April (2017), in the rest of the month, monthly deviations were positive over the multiannual monthly average, between 0.1°C (July) and 4.4°C (March). In terms of precipitation, the agricultural year 2016/2017 is characterized as a rainy year, the sum of precipitations was 681.1 mm, 140.2 mm more than the 541 mm multiannual average.

For the entire growing season of the dragonhead, the precipitations recorded negative deviations in May (-5.4 mm), June (-34.9 mm), July (-11.8 mm) and August (-38.4 mm) versus multiannual average, this deficit influencing at the end of the production of herb and seeds (*table 1*).

Table 1

**Temperatures and rainfall recorded at A.R.D.S. Secuieni meteorological station**

Specification		2016			2017									
		X	XI	XII	I	II	III	IV	V	VI	VII	VIII	IX	X
Temperatures °C	Decade I	10.7	4.7	0.9	-6.5	-4.4	6.8	9.5	14.2	19.4	20.0	23.6	18.3	
	Decade II	5.0	2.5	-1.0	-7.3	-4.0	4.6	8.3	14.9	19.2	19.7	22.2	18.9	
	Decade III	6.7	1.9	-1.7	-3.5	4.2	9.4	9.7	16.8	22.5	21.3	18.0	11.8	
	Monthly average	7.4	3.0	-0.4	-5.7	-1.8	7.0	9.1	15.4	20.3	20.4	21.2	16.3	9.4
	Multiannual average	9.2	3.5	-1.8	-3.8	-2.3	2.6	9.4	15.4	18.8	20.3	19.5	14.8	8.8
	Deviation	-1.8	-0.5	1.4	-1.9	0.5	4.4	-0.3	0.0	1.5	0.1	1.7	1.5	0.6
Precipitations mm	Decade I	5.0	20.2	1.4	5.8	8.2	33.8	14.0	6.6	12.4	27.6	13.6	28.8	
	Decade II	152.0	32.6	2.2	1.5	4.8	55.2	26.0	24.0	10.0	36.0	7.2	22.8	
	Decade III	23.6	4.6	0.0	0.0	4.0	12.6	14.4	28.8	27.0	8.6	2.2	3.6	
	Monthly average	180.6	57.4	3.6	7.3	17.0	101.6	54.4	59.4	49.4	72.2	23.0	55.2	681.1
	Multiannual average	34.7	27.8	26.2	20.5	19.6	25.4	46.8	64.8	84.3	84.0	61.4	45.5	541.0
	Deviation	145.9	29.6	-22.6	-13.2	-2.6	76.2	7.6	-5.4	-34.9	-11.8	-38.4	9.8	140.2

## RESULTS AND DISCUSSION

The *Dracocephalum moldavica* L. species sowing in the epoch I plants have sprung after 29 days from the sowing, accumulating a sum of the degrees of 280.8 °C and 56.4 mm precipitations. From the emergence to the appearance of flowering rods, the sum of accumulated degrees was 689.9 °C and 69.8 mm precipitations.

In the case of *Dracocephalum moldavica* L. in 2017, from the appearance of the flowering rods until the beginning of blooming passed 34 days, the sum of the thermal degrees recorded for this period was 687.3 °C and 77 mm precipitation. The herba harvest was done after 15 days from the beginning of the blooming, with a total of 288.9° C

and 38.6 mm precipitations, beneficial for a rich herba production.

Harvesting the seed was carried out 16 days after the beginning of fructification, accumulating 368.4° C and 20.8 mm of precipitation. Due to higher temperatures from the second epoch of sowing the plants had a faster evolution. From sowing to seed harvesting 131 days were required, the sum of the accumulated temperatures was 2293.3 °C and the rainfall amounted to 242.2 mm.

Due to the high summer temperatures, the plants harvested for herba and seeds from the epoch III of sowing had a vegetation period with 12 days less than the epoch II of sowing. The sum of thermal degrees was 2230.4° C and 155.8 mm precipitation (*table 2*).

Table2

**Phenological observations at *Dracocephalum moldavica* L. in 2017**

Phenological observations	The date from which the phenophase began	Duration in days		Σ of thermal degrees (°C)	Σ of precipitations (mm)
		Herba	Seeds		
Epoch I					
Sowing	24.03.2017	-	-	-	-
Emergence	21.04.2017	29	29	280.8	56.4
The appearance of flowering rods	06.06.2017	46	46	689.9	69.8
The beginning of blooming	10.07.2017	34	34	687.3	77.0
Harvesting for herba	25.07.2017	15	15	288.9	38.6
Total herba	-	124	124	1946.9	241.8
The beginning of fructification	31.07.2017	-	6	99.8	8.6
Harvesting for seeds	16.08.2017	-	16	368.4	20.8
Total seeds	-	-	22	468.2	29.4
TOTAL	-	124	146	2415.1	271.2
Epoch II					
Sowing	10.04.2017	-	-	-	-
Emergence	01.05.2017	22	22	218.6	40.4
The appearance of flowering rods	09.06.2017	39	39	638.6	71.8
The beginning of blooming	14.07.2017	35	35	717.4	96.8
Harvesting for herba	27.07.2017	13	13	245.8	7.0
Total herba	-	109	109	1820.4	216.0
The beginning of fructification	03.08.2017	-	7	134.6	5.4
Harvesting for seeds	18.08.2017	-	15	338.3	20.8
Total seeds	-	-	22	472.9	26.2
TOTAL	-	109	131	2293.3	242.2
Epoch III					
Sowing	25.04.2017	-	-	-	-
Emergence	10.05.2017	16	16	221.2	13.4
The appearance of flowering rods	19.06.2017	40	40	696.5	22.4
The beginning of blooming	18.07.2017	29	29	578.9	90.6
Harvesting for herba	30.07.2017	12	12	256.9	8.6
Total herba	-	97	97	1753.5	135.0
The beginning of fructification	07.08.2017	-	8	176.1	13.6
Harvesting for seeds	21.08.2017	-	14	300.8	7.2
Total seeds	-	-	22	476.9	20.8
TOTAL	-	97	119	2230.4	155.8

Table 3.

**The influence of the sowing epoch on the production of fresh and dry herba at *Dracocephalum moldavica* L. in 2017**

Variant	Average production of fresh herb (kg/ha)				Average production of dry herb (kg/ha)				Ratio (fresh/ dry)
	Kg/ha	%	Diff. (Kg/ha)	Significance	Kg/ha	%	Diff. (Kg/ha)	Significance	
Epoch I	30740	100	Ct.	Ct.	8786	100	Mt	Ct.	3.5:1
Epoch II	32883	107	2143		10710	122	1923	*	3.1:1
Epoch III	28593	93	-2146		8503	97	-283		3.4:1
	LSD 5%= 2306 (kg/ha) LSD 1%= 3815(kg/ha) LSD 0.1%=7142 (kg/ha)				LSD 5%= 1164 (kg/ha) LSD 1%= 1927(kg/ha) LSD 0.1%=3606 (kg/ha)				

Table 4

**The influence of the sowing epoch on the production of seeds at *Dracocephalum moldavica* L. in 2017**

Variant	Average production of seeds (kg/ha)			
	Kg/ha	%	Diff. (Kg/ha)	Significance
Epoch I	635.33	100	Ct.	Ct.
Epoch II	545.0	86	-90.33	
Epoch III	503.67	79	-131.66	o
			LSD%= 113.1 (kg/ha) LSD1%= 187.1 (kg/ha) LSD 0,1%= 350.2 (kg/ha)	

The average production of fresh herb was between 30740 kg / ha at the first epoch of sowing and 28593 kg/ha at the epoch III of sowing. The average of dry herb yield at epoch II of sowing was 10710 kg/ha, the difference being positive, significant compared to the control (8786 kg/ha) (*table 3*).

The ratio of fresh herb production and dry herb production was recorded values between 3.5 at epoch I of sowing (control), 3.1 at epoch II and 3.4 at epoch III of sowing (*table 3*).

Compared to the control variant at which the seed production was 635.33 kg/ha, at the epoch III of sowing was a production loss of 21% representing 131.66 kg/ha (*table 4*).

### CONCLUSION

The climatic conditions of 2017 influenced the growth and development of the *Dracocephalum moldavica* L. species, influencing the production of herb and seeds.

The highest production of fresh herb was recorded in the epoch II of sowing (32883 kg/ha).

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