

RESULTS REGARDING BIOLOGICAL CHARACTERISTICS OF THE SPECIES *LALLEMANTIA IBERICA* IN THE SPECIFIC CONDITIONS FROM SOUTH ROMANIA

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Keywords: *Lallemantia*, biology

Abstract

Lallemantia iberica is a plant cultivated since antiquity, but which has not extended as cultivated crop during the time because of the small yielding capacity. Taken into account the specificity of the oil content in fatty acids, especially the high content in linolenic acid, it could become of interest for different purposes the *lallemantia* oil can be used. In the present paper, there are presented the main biological characteristics of the *Lallemantia iberica* species under the specific conditions from South Romania, respectively: setting up of pair leaves (fully developed leaves) on the main stem and the main processes during this period (branching, development of inflorescences); leafstalk length and leaf sizes; morphological characteristics of leaves, bracts, inflorescence, flowers, and seeds; plant high and plant biomass, as dry matter.

INTRODUCTION

Lallemantia iberica (Bieb.) Fischer & C.A. Meyer (sin. *Dracocephalum ibericum* M. Bieb.) also named „Dragon's head” is a crop cultivated from the prehistoric times in southwestern Asia and southeastern Europe. *Lallemantia iberica* is an annual plant belonging to the *Lamiaceae* family, this been cultivated for its seeds containing about 30% (even 35-38%) drying oil (siccative oil), with the iodine index between 163 and 203, and which is used in foods, but especially in dye and varnish industry.

Lallemantia iberica seeds have traditional uses as reconstitute, stimulant, diuretic and expectorant [3]. Also, it is considered as a linseed substitute in a number of applications including: wood preservative, ingredient of oil-based paints, furniture polishes, printing inks, soap making, and manufacture of linoleum [2].

Lallemantia oil content in fatty acid is the following: 6.5% palmitic acid, 1.8% stearic acid, 10.3% oleic acid, 10.8% linoleic acid, and 68.0% linolenic acid [3]. The high content in linolenic acid makes the *lallemantia* to be of high interest for different purposes. In fact, the high content in linolenic acid balances the little interest in *Lallemantia* due to low yields (usually up to 10 q/ha).

Lallemantia plants grow well in dry areas, which make the crop a potential alternative to the traditional crops in the arid zones, paying however attention to the fact that this species tends to become a weed outside its native territory. It requires a light well-drained soil, heavy clay soils been not well tolerated.

Lallemantia is a non traditional crop with low nitrogen, phosphorus and potassium consumption for 100 kg seeds [1], having a short growing period.

In a perspective of the development of lallemantia crop in different areas including South Romania, a well knowing of the biological characteristics of the plant represents a premise to be successfully.

MATERIAL AND METHODS

The biological characteristics of the species *Lallemantia iberica* (Bieb.) Fischer & C.A. Meyer were studied in a field experiment located on a reddish preluvosoil, 15 km faraway North-East from Bucharest, within Moara Domneasca Research Farm belonging to the University of Agronomic Sciences and Veterinary Medicine of Bucharest. In this area, the multiannual average temperature is 10.5°C and the multiannual average rainfall is 614 mm.

The study were performed in 2009, when the sowing was carried out on 30th of March on a surface of 1.5 hectare, at a rate of 20 kg/ha, seed depth 2-3 cm and 12.5 cm between rows. The emergence took place on 12 of April.

The observations and determinations performed in the field were aimed to identify and quantify the main biological characteristics of the *Lallemantia iberica* species under specific local conditions, respectively: setting up of pair leaves (fully developed leaves) on the main stem and the main processes during this period (branching and inflorescences setting up); leafstalk length and leaf sizes (leaf length and leaf width); morphological characteristics of leaves, bracts, inflorescence, flowers, and seeds; plant high and plant biomass as dry matter.

For biometric determinations, a number of twelve plants were analysed in different periods of time according to the plant biology. Also, in view to determine the plant biomass as dry matter/plant at maturity stage, twelve plants were dried in air oven.

RESULTS AND DISCUSSION

The leaves develop in pairs at each stem node (opposite leaves), under a polynomial curve during the time (Figure 1). The total number of pair leaves on the main stem was in average 16 (with limits of variation between 14 and 17), this been reached at about 45 days after emergence. A pair of leaves where took into consideration when the leaves were completely unfolded. Above each pair of completely unfolded leaves there are a pair of leaves developing during the first part of vegetation and two pairs of leaves developing later in the vegetative phase.

The edge leaf is dentate (toothed) for the first four pairs of leaves, denticulate (finely toothed) for the next four pairs of leaves, and denticulate only for the upper pairs of leaves on the main stem.

The branches appear at the first six nodes on the main stem. Also, branches appear at the cotyledonal node, these been in fact the first branches developing. First branches appear quite early from the cotyledonal node, after the formation of the first pair of leaves (Figure 1). The branches are forming, as the leaves, in pairs (opposite branches), these been developing from the leaves axils.

At the seventh node, the inflorescence starts to develop in verticillus once the seventh pair of leaves is completely unfolded (Figure 1). Starting from the seventh node, the inflorescences are developing in verticillus at each node upwards. Once the 13th pair of leaves is completely unfolded, the first flowers are visible, the flowering process starting.

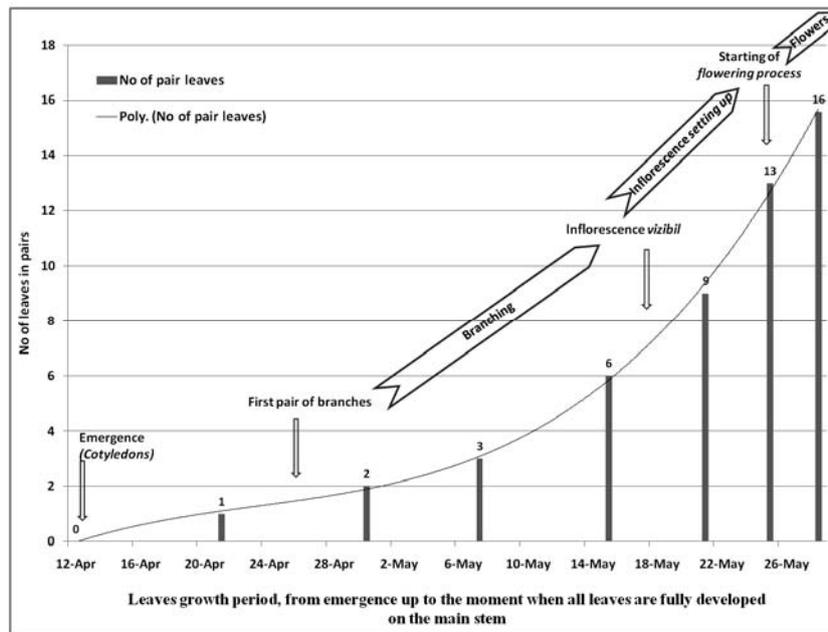


Fig. 1. Setting up of pair leaves (fully developed) on the main stem and the main processes during this period at *Lallemantia iberica* species

The first nine leaves have stalk with different length, this been decreasing upwards the stem. The longest stalk is present at the first leaf on the main stem (2.7 cm in average). The stalk is missing starting with the leaf 10 on the main stem, the leaves above been sessile. The ninth leaf on the main stem is stalkleaf on some plants while on others is sessile (Table 1, Figure 2).

The leaf length (table 1; figure 2) increases from bottom up to the leaf four on the main stem, which is the longest leaf on the plant (6.3 cm in average, with the highest recorded value of 7.3 cm). Starting from the leaf four on the main stem, the leaves length decreases upwards the stem, the leaves from the top of the stem having the length of 0.5 cm, in average (the smallest recorded value been 0.3 cm).

The leaf width (Table 1, Figure 2) increases from the first leaf to the second one, and then is decreasing upwards the stem. Thus, the second leaf on the main stem has the largest width (2.1 cm in average, with the highest recorded value of 2.4 cm), while the smallest width is recorded on the leaves from the top of the stem (0.2 cm in average, with the smallest recorded value of 0.1 cm).

Table 1

Leafstalk length and leaf sizes on the main stem at *Lallemantia iberica* species

Leaf on the main stem	Leafstalk length		Leaf length		Leaf width	
	Average values (cm)	Limits of variation (cm)	Average values (cm)	Limits of variation (cm)	Average values (cm)	Limits of variation (cm)
Leaf 1	2.7	2.3-3.1	3.7	3.1-4.2	2.0	1.7-2.3
Leaf 2	2.2	1.4-3.0	4.2	3.4-4.8	2.1	1.6-2.4
Leaf 3	1.6	1.2-2.1	5.7	4.6-6.3	2.0	1.7-2.3
Leaf 4	1.0	0.7-1.3	6.3	5.1-7.3	1.9	1.6-2.2
Leaf 5	0.7	0.5-0.9	5.7	4.3-6.7	1.5	1.2-1.9
Leaf 6	0.5	0.4-0.7	4.9	4.1-5.5	1.2	1.0-1.5
Leaf 7	0.4	0.3-0.6	4.3	3.5-4.9	1.1	0.9-1.2
Leaf 8	0.3	0.2-0.4	3.5	3.0-4.2	0.9	0.7-1.1
Leaf 9	0.3/sessile	0.2-0.4 sessile	3.1	2.3-3.7	0.8	0.6-1.0
Leaf 10	Sessile leaves		2.4	1.8-2.9	0.7	0.5-.09
Leaf 11			2.0	1.5-2.6	0.6	0.5-0.8
Leaf 12			1.7	1.4-2.2	0.5	0.4-0.7
Leaf 13			1.4	0.8-1.8	0.4	0.3-0.5
Leaf 14			1.0	0.6-1.3	0.3	0.2-0.4
Leaf 15			0.7	0.3-1.0	0.3	0.2-0.3
Leaf 16			0.5	0.3-0.8	0.2	0.1-0.3

Each leaf has at its base tow bracts, one on each side of the leaf (Figure 3). That means that at each node there are four bracts (two bracts for each of the two opposite leaves). The bracts from the bottom of the main stem have a stalk of 2 mm length and they have the length of 9 mm and width of 5 mm, in average; these bracts are ending in their superior part with a number of ten awns, the exterior ones

having 5 mm of length while the middle ones having 1-2 mm of length. The bracts from the top of the main stem have a stalk of 2 mm length and they have the length of 4 mm and width of 2 mm, in average; these bracts are ending in their superior part with a number of six awns, the exterior ones having 3 mm of length while the middle ones having 1 mm of length.

The flowers are bisexual and form verticillus inflorescences placed in the leaf axils (Figure 3). The calyx has a tube of 9 mm of length and presents five triangular teethe with 3 mm of length and 2 mm of width at its base, among which two of them are inferiors, two of them are lateral and one of them are superior and more wide, with 3 mm of length and 3 mm of width at its base (Figure 4).

The corolla has white colour and has a structure specific for the *Lamiaceae* family (Figure 4). Thus, it presents a tube of 10-12 mm of length and two lips (labia). The upper lip has two lobes, and the lower lip consists of three lobes, out of which two of them are lateral and one of them are central and presents two small lobes at its turn. There are four stamens, two of them longer and two of them shorter. The pollination is accomplished by insects (entomophylus allogam pollination).

At maturity stage, the plant high was in average of 40.8 cm, with limits of variation between 36.0 and 46.7 cm, and the plant biomass was of 3.7 g dry matter/plant, with limits of variation between 3.35 and 4.05 g dry matter/plant. The seeds are small, with one thousand seeds weigh of 4.7 g, in average.

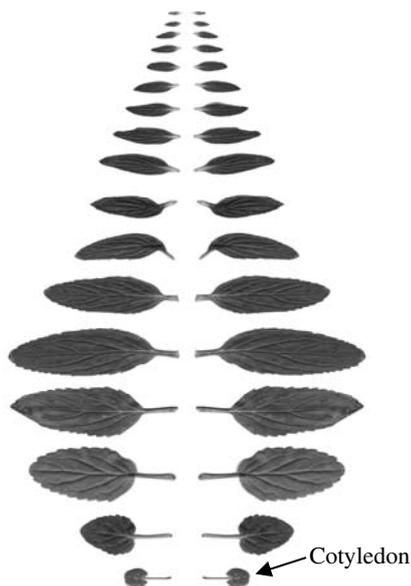


Fig. 2. The pair of leaves on the main stem at *Lallemantia iberica*

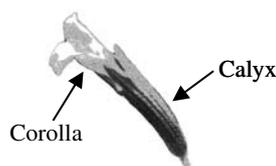


Fig. 4. The flower at *Lallemantia iberica*

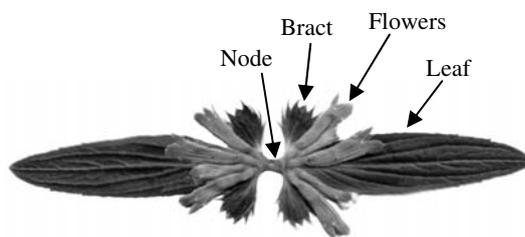


Fig. 3. The inflorescence at *Lallemantia iberica*

CONCLUSIONS

1. The leaves are disposed in pairs on each stem node (opposite leaves), the average number of pair leaves on the main stem been 16.
2. The leaves on the main stem are fully developed at about 45 days after emergence.
3. The first nine leaves have stalk with different length, which decreases upwards the main stem, the stalk been missing starting with the 10th leaf upwards (sessile leaves).
4. The leaf length on the main stem increases from bottom up to the leaf four, then decreases upwards.
5. The leaf width on the main stem increases from the first leaf to the second one then is decreasing upwards.
6. Each leaf has tow bracts, one on each side of the leaf, each bract having a stalk of 2 mm length and the edge with awns.
7. The branching process takes place at the first six nodes on the main stem, the branches developing from each leaf axils (opposite branches).
8. The inflorescence starts to develop in verticillus from the seventh node upwards the stem, once the seventh pair of leaves is fully unfolded.
9. The flowering process starts once the 13th pair of leaves is fully unfolded.
10. The flowers are disposed in verticillus placed in the leaf axils.
11. The main characteristics of the flowers are the following: calyx presents five triangular teethe, among which two are inferiors, two lateral, and one superior; corolla has white colour and presents two lips, the upper lip with two lobes, and the lower lip with three lobes; there are four stamens, two of them longer and two of them shorter.
12. At maturity stage, the plant high was of 40.8 cm, the plant biomass was of 3.7 g dry matter/plant, and one thousand seeds weigh of 4.7 g, in average.

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