

Research on the Use of Seed Preparation Methods for the Generative Production of Seedlings in the Species *Evodia danielii* (Benn.) Hemsl.

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Abstract *Evodia danielii* (Benn.) Hemsl. is a tree 10 m high, with pubescent, red-brown shoots with large lenticels. The leaves have 7-11 folioles 5-10 cm ovate to oblong ovate, acuminate, rounded at the basis, light green on the underside, with 3-4 mm white flowers grouped into corymbs of 10-16 cm. The fruits are bivalve pods with brown-blackish, bright seeds.

The Genus *Evodia* covers about 50 species native from East-South Asia, Australia and Polynesia, two of which are cultivated in Romania. Ornamental species, they are appreciated for their delicate foliage and are recommended for large parks where the goal is to make the landscape sober. Their culture is successful on light soils, in harboured places. Multiplication can be done through seeds or grafting seedlings of *Phellodendron* [1].

Biometric measurements on seedlings concerned plant size. The experiment was monofactorial and aimed at producing seedlings generatively using different methods of seed preparation.

In Korea, they carried out studies on the isolation of four crystal compounds in the bark, pods, and seed oil. Three of these were shown to be methyl sinapate, bergapten and evodiamine [2]. Wang Zhen-yi et al., in 2005, carried out a study on the growth of the species *Evodia danielii* [3]. Duan Da-juan et al., in 2007, studied the re-planting of seedlings from the seeds of *Evodia danielii* [4].

From the leaves of *Evodia danielii*, they isolated four flavonoid glycosides, flavaprin, evodioside B, vitexin and hesperidin, as well as the coumarins bergapten, xanthotoxin, and isopimpinellin, the lignan simplex-oxide, the steroids β -sitosterol and daucosterol, the limonoids isolimonexic acid and limonin and uracil and myo-inositol, and structures of these compounds were established from spectral data [5].

From the bark of *Evodia danielii* (Rutaceae), limonin and four isoquinoline alkaloids were isolated, and the latter four alkaloids were identified as 6,7-dimethoxyhydrastine, gandrhamine, isocorydine and palmatine p-hydroxybenzoate [6].

Evodia danielii can be trimmed and it is planted rather around parking sites or along the streets because it tolerates urban environments well. During summer, it produces abundant flowers and attracts many honeybees with its nectar-rich flowers. This species is resistant to the attack by diseases and pests [7]. In the species *Evodia hupehensis* Dode., a study evaluated the influence of presowing treatments (seeds kept at room temperature, seeds kept at room temperature and treated with magnetic water, and seeds stratified at 1-

Key words

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5°C in moist sand prior to sowing in early spring) on the biochemical parameters and seedling production [8].

Biological Material and Method

To produce seedlings in a short period, we need to prepare seeds before sowing to speed up their germination.

The experiment was monofactorial with three experimental variants with 5 replicates, as follows:

a₀ – no preparation seeds (control);

a₁ – seeds stratified in the sand on February 24, 2014;

a₂ – seeds moistened in warm water at 25°C, for 24 hours.

Sowing was done on March 24, 2014, in a nutritive mixture of 50% manure and 50% sand in a nursery green house. The number of seeds used in each experimental variant was 200.

The observations have been made using the current observation techniques, experimental data processing has been performed using statistical and mathematical methods and those data regarding the production were calculated and interpreted based on variance analysis.

Results and Discussions

In the first experimental stage, we prepared the seeds using two current methods: stratification and warm water moistening. A synthesis of the experimental

results regarding the dynamics of germination in the

seeds of *Evodia danielii* is shown in Table 1.

Table 1

Dynamics of seed germination in *Evodia danielii* (Benn.) Hemsl. (Didactic Base Timișoara – 2014)

Preparation method	sowing date	sowed seeds	Dynamics of germination in 2014								
			April 18	April 23	April 28	May 3	May 8	May 13	May 18	May 23	May 28
a ₀ – no preparation seeds (control)	March 24, 2014	200	0	0	0	20	27	26	32	30	25
a ₁ – sand stratified seeds		200	0	0	27	34	38	38	43	0	0
a ₂ – warm water moistened seeds		200	28	36	43	58	29	0	0	0	0

Seed preparation before sowing with different methods is an alternative to the improvement of its cultural value. Literature presents experimental results of research and use of certain methods separately of the series of quantitative evaluations presented in Table 1.

Germination control was done on April 18, 2014, at an interval of five days (i.e., 25 days after sowing) until May 28, 2014.

The first plantlets sprouted on April 18, 2014, i.e. 25 days after sowing, in the variant a₂.

In the variant a₁ (seeds stratified in sand), the first plantlets sprouted 35 days after sowing.

Experimental results regarding the percentage of seed germination of the seeds of *Evodia danielii* and the significance of the differences between the experimental variants adopted are shown in Table 2.

Table 2

Mean values of seed germination in the species *Evodia danielii* (Benn.) Hemsl. (Didactic Base Timișoara – 2014)

Experimental value	Comparison to Control 1				Comparison to Control 2			
	Mean value	Relative value	Difference	Significance	Mean value	Relative value	Difference	Significance
a ₀ – no preparation seeds (control 1)	79.75	100.00	0.00	-	79.75	89.71	- 9.13	o
a ₁ – sand stratified seeds	89.75	112.53	10.00	*	89.75	100.96	0.86	-
a ₂ – warm water moistened seeds	97.16	121.83	17.41	***	97.16	109.31	8.27	*
Average (control 2)	-	-	-	-	88.88	100.00	0.00	-

LSD_{5%} = 7.61

LSD_{1%} = 10.82

LSD_{0.1%} = 15.67

After comparing the mean values of the seed germination percentage in the three variants of preparation of the biological material, we see a very significantly positive difference in the variant a₂ (17.41%).

When comparing the experimental variants with the mean of the experiment, we see a positive

difference again in the seed preparation by moistening with warm water, but this is only significant (8.27%).

Comparing the seed preparation methods with the two control variants for the number of plantlets, we obtained the differences and significances presented in Table 3.

Table 3

Mean values of the number of seedlings in the species *Evodia danielii* (Benn.) Hemsl. (Didactic Base Timișoara – 2014)

Experimental value	Comparison to Control 1				Comparison to Control 2			
	Mean value	Relative value	Difference	Significance	Mean value	Relative value	Difference	Significance
a ₀ – no preparation seeds (control 1)	159.50	100.00	0.00	-	159.50	89.72	- 18.30	o
a ₁ – sand stratified seeds	179.50	111.13	19.97	*	179.50	101.00	1.72	-
a ₂ – warm water moistened seeds	194.33	120.31	34.83	***	194.33	109.30	16.60	*
Average (control 2)	-	-	-	-	177.77	100.00	0.00	-

LSD_{5%} = 15.23

LSD_{1%} = 21.65

LSD_{0.1%} = 31.35

Multiple analysis of the significance of differences in the two comparison methods shows a similitude with the situations in the seed germination process.

Experimental results regarding the influence of seed preparation methods on *Evodia danielii* plant size are presented in Table 4.

Table 4

Mean values of plant height in the seedlings of the species *Evodia danielii* (Benn.) Hemsl. (Didactic Base Timișoara – 2014)

Experimental value	Comparison to Control 1				Comparison to Control 2			
	Mean value	Relative value	Difference	Significance	Mean value	Relative value	Difference	Significance
a ₀ – no preparation seeds (control 1)	3.57	100.00	0.00	-	3.57	71.67	- 1.41	○○○
a ₁ – sand stratified seeds	5.14	143.97	1.57	***	5.14	103.10	0.15	-
a ₂ – warm water moistened seeds	6.23	174.50	2.66	***	6.23	125.20	1.25	***
Average (control 2)	-	-	-	-	4.98	100.00	0.00	-
		LSD _{5%} = 0.53 cm		LSD _{1%} = 0.75 cm		LSD _{0.1%} = 1.09 cm		

The use of the two seed preparation methods (stratification in the sand and warm water moistening) determines more vigorous plants, with very significant differences compared to the no preparation seeds (between 1.57-2.66 cm).

Seed preparation by warm water moistening influences very significantly plant size (1.25 cm), compared to the mean of the experiment (4.98 cm).

Conclusions

Based on the experimental results in the generative production of biological material in the species *Evodia danielii* (Benn.) Hemsl., we can draw the following conclusions:

- 1.–seed germination in an interval of 25 days is done when moistening them with warm water;
 - 2.–the percentage of germinated seeds and the number of plants is very significant when moistening the biological material with warm water;
- using the two seed preparation methods (stratification in sand and warm water moistening) determines more vigorous plants.

References

1.Burda, Ș. G.; Iliescu, A. F., 2008, Research on the growing and the quality of *Euodia hupehensis* Dode (*Rutaceae*) seedlings, 2008, *Lucrări Științifice - Universitatea de Științe Agronomice și Medicină*

Veterinară București. Seria B, Horticultură 2008 No. 51 pp. 178-183, ISSN1222-5312.
 2.Chung, B. S., 1970, 1, 4, Studies on the components of *Evodia danielii* Hemsley in Korea. Korean Journal of Pharmacognosy, pp 119-124, 14 ref.
 3.Duan Da-juan, Zhang Tao, Zhou Xin, Cui Rui-jing, 2007, Study on Seedling Raised from Seed of *Evodia danielii*. Northern Horticulture, Issue 3 , Page 143-144
 4.Dumitriu-Tătăranu, I. and col.,1960, *Arbori și arbusti forestieri și ornamentali cultivați în R.P.R.*, Editura Agro-Silvică, pp. 352.
 5.Edward F. Gilman and Dennis G. Watson, 1993, Fact Sheet ST-242, a series of the Environmental Horticulture Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Publication date: November.
 6.KATsuyoshi MrrsuNAGA, KAzuo KoIKE and TAIcHI OHMoTO, 1991, Constituents of the Bark of *Evodia danielii*, School of Pharmaceuticat Seienees, 7bho Uuniversiyy, 2-2-1 Miyama. Fletnabashi, Chtha 274, Japan, Shoyakugaku Zasshi 45(3), 263-265.
 7.Sang Woo Yoo, Ju Sun Kim,Sam Sik Kang, Kun Ho Son, Hyeun Wook Chang, Hyun Pyo Kim, KiHwan Bae, Chong -Ock Lee, 2002, Constituents of the fruits and leaves of *Evodia danielii*, Archives of Pharmacal Research, Volume 25, Issue 6, pp. 824-830.
 8.Wang Zhen-yi, Duan Da-juan, Yin Hong-yan, Wang Jian-zhao, 2005, Study on breeding of *Evodia danielii*. Hebel Journal of Forestry and Orchard Research, Issue 2 , pp. 117-119.