

**MORPHOLOGICAL AND ORNAMENTAL STUDIES OF
EREMURUS SPECIES**

**STUDII PRIVIND CARACTERELE MORFOLOGICE ȘI
ORNAMENTALE ALE UNOR SPECII DE EREMURUS**

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Abstract. *The species of Eremurus genus (Liliaceae family), by its distinctive ornamental characters and its ability to adapt to the most diverse ecological conditions, can represent valuable variants in the enrichment of floral assortment, for landscaping design or cut flowers. In this paper are presented the results of observations and determinations carried out for three species of Eremurus (E. himalaicus Baker, E. robustus Regel, E. stenophyllus (Boiss. & Buhse) Bak.) cultivated in Iasi (N-E Romania) during 2015-2016. The main objective of the paper is to highlight the morphological and decorative characters of these plants, so that their cultivation can be valid in unprotected conditions and the efficient way of uses. The results obtained support the promotion of these plants in culture, both in floral art and in landscaping design.*

Key words: *Eremurus*, morphological characters, ornamental value

Rezumat. *Speciile genului Eremurus (familia Liliaceae), prin caracterele ornamentale deosebite și prin capacitatea bună de adaptare la cele mai diverse condiții ecologice, pot reprezenta variante foarte valoroase în îmbogățirea sortimentului de plante floricole pentru amenajarea grădinilor sau pentru flori tăiate. În lucrarea de față sunt prezentate rezultatele observațiilor și determinărilor efectuate în perioada 2015-2016 la trei specii de Eremurus (E. himalaicus Baker, E. robustus Regel, E. stenophyllus (Boiss. & Buhse) Bak.) cultivate la Iași (partea de N-E României). Obiectivul principal al lucrării este de a evidenția caracterele morfo-decorative ale acestor plante, astfel încât să poată fi argumentată cultivarea lor în condiții neprotejate și modul eficient de valorificare. Rezultatele obținute susțin promovarea în cultură a acestor plante, atât în arta florală, cât și în amenajările peisagistice.*

Cuvinte cheie: *Eremurus*, caractere morfologice, valoare decorativă

INTRODUCTION

The species of the *Eremurus* genus (*Liliaceae* family) are spread over large areas in Central Asia, Afghanistan, Iran, Pakistan, Iraq, Turkey, Lebanon, India and China (Wendelbo and Furse, 1963, cited by Naderi Safar et al., 2009) and have been studied by many researchers concerned with taxonomy, cytology, morphology, ecology, decorative traits, etc. of these plants (Naderi Safar et al., 2009, 2014; Kumari et al., 2016; Schiappacasse et al., 2013; Mushtaq et al., 2016). From an ornamental point of view, most

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of the *Eremurus* species are particularly appreciated for high, elegant, inflorescences with differently colored flowers (Șelaru, 2007).

The purpose of the paper is to evaluate series of morphological and decorative characters of some *Eremurus* species cultivated in the N-E of Romania, so that on the basis of the results obtained recommendations can be made for cultivation of these plants in unprotected conditions and their efficient utilization for ornamental purposes.

MATERIAL AND METHOD

The research has been carried out in 2015-2016, in the floriculture fields of the University of Agricultural Sciences and Veterinary Medicine Iasi, Romania. Establishing experimental crops was done in the autumn of 2014 by planting underground *Eremurus* organs (rhizomes with 1-2 large buds from which, as in a giant star, are detach 5-8 tuberous roots), purchased from specialized firms in the production of the seedlings (fig. 1d).

In this paper are presented the results of the researches conducted on three species of *Eremurus* - *E. himalaicus* Baker, *E. robustus* Regel, *E. stenophyllus* (Boiss. & Buhse) Bak. - differentiated by both flower color and other characters. *E. himalaicus* (fig. 1a) shows white flowers with elongated tepals, inclined and with a brown line on the outside, and the leaves are erect and have lengths of approx. 30-50. *E. robustus* (fig. 1b) has green-bluish leaves and grows up to 50-70 cm long and numerous flowers with pink pale color. *E. stenophyllus* (fig. 1c) has stellate yellow flowers and leaves of 30-40 cm.

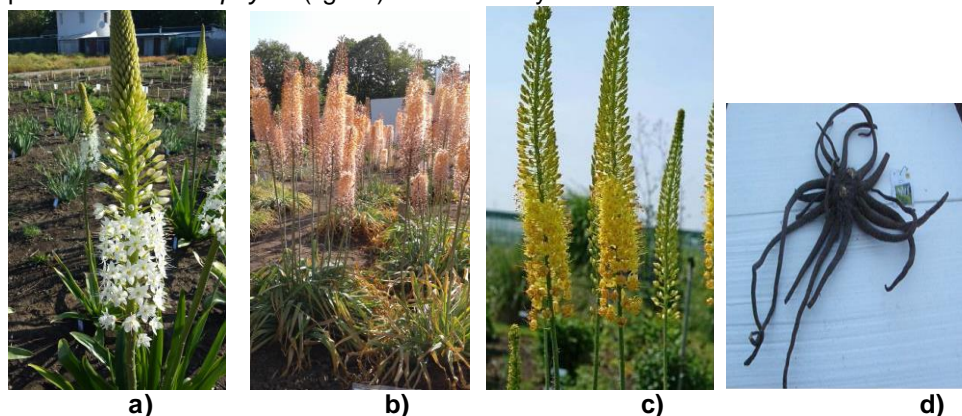


Fig. 1. Aspects with the biological material in the experimental field (original):
a) *E. himalaicus*; **b)** *E. robustus*; **c)** *E. stenophyllus*; **d)** underground organ

Each species analyzed was an experimental variant, the experience being organized in randomized blocks with three repetitions (5 plants/repetition, respectively 15 plants of each species/variant).

In order to determine the adaptation of *Eremurus* plants in ecological conditions in Iasi, determinations and observations were made during the vegetation periods of 2015 and 2016, in different phenophases (those aimed at starter, growth and development the leaves began in April, and those on the growth and development of inflorescences have started since May). The data was processed using analysis of variance, by testing the difference between variants with LSD test (Săulescu and Săulescu, 1967). As a control was considered the average of variants.

RESULTS AND DISCUSSIONS

It is known that the ornamental value of a plant is given not only by flowers or inflorescences, but also by other parts of the plant, including the appearance of the foliage. Although the *Eremurus* leaves begin to wilt before the end of flowering, they can ensure the decoration, even for a short period, in early spring, after starting vegetation and until flowering. Therefore, biometric determinations were carried out: average leaf / plant size, length and leaf width, diameter of the plant.

The number of leaves / plant varies between 24.6 and 29.3, compared to the average control (26.3), the differences being negative for *E. himalaicus* and *E. robustus*, but very significant positive for *E. stenophyllus* (tab.1).

Table 1

Number of leaves / plant at *Eremurus*

Var.	Species	Number of leaves		d (±)	Significance of differences
		Absolute value	Relative value (%)		
V ₁	<i>E. himalaicus</i>	24.60	93,54	-1.7	000
V ₂	<i>E. robustus</i>	25.10	95.44	-1.2	00
V ₃	<i>E. stenophyllus</i>	29.30	111.41	+3.0	xxx
Average (control)		26.30	100.00	-	-

LSD 5% = 0.4; LSD 1% = 0.7; LSD 0,1% = 1.3

Table 2

Length of leaves at *Eremurus*

Var.	Species	Length of leaves		d (±)	Significance of differences
		Absolute value (cm)	Relative value (%)		
V ₁	<i>E. himalaicus</i>	51.90	111.37	+5.3	xx
V ₂	<i>E. robustus</i>	54.20	116.31	+7.6	xxx
V ₃	<i>E. stenophyllus</i>	33.60	72.10	-13.0	000
Average (control)		46.57	100.00	-	-

LSD 5% = 1.9; LSD 1% = 3.2; LSD 0,1% = 6.0

Table 3

Width of leaves at *Eremurus*

Var.	Species	Width of leaves		d (±)	Significance of differences
		Absolute value (cm)	Relative value (%)		
V ₁	<i>E. himalaicus</i>	4.70	180.77	+2.1	xx
V ₂	<i>E. robustus</i>	2.10	80.77	-0.5	00
V ₃	<i>E. stenophyllus</i>	1.10	42.31	-1.5	000
Average (control)		2.63	100.00	-	-

LSD 5% = 0.2; LSD 1% = 0.3; LSD 0,1% = 0.5

The length and width of the leaves also varied according to the species. It can be seen from the data presented in Tables 2 and 3 that longer leaves, more than 50 cm, form *E. himalaicus* and *E. robustus*, with significant differences, respectively distinct significant differences, compared to average control. At *E. stenophyllus* the leaf length is approx. 72% below the control value, the differences being very significantly negative. The data on the leaf width reveals, first of all, the species *E. himalaicus* with the wider leaves (4.7 cm) and the *E. stenophyllus* species with the narrowest leaves (1.1 cm).

To establish the assortment of plants in the landscaping design is also accomplish according to the diameter of the plant, the number of plants at unit surface, being given also by the diameter of the plants, therefore, during the researches, measurements were made regarding this character to the *Eremurus* species. Analyzing the obtained results we can see values of the diameter of the plants ranging from 69 cm to *E. robustus* to 58.10 cm in *E. stenophyllus*, the character being correlated with the length of the rosette leaves (tab. 4).

Table 4

Diameter of plants at *Eremurus*

Var.	Species	Diameter of plants		d (±)	Significance of differences
		Absolute value (cm)	Relative value (%)		
V ₁	<i>E. himalaicus</i>	63.20	99.68	-0.2	-
V ₂	<i>E. robustus</i>	69.00	108.83	+5.6	xxx
V ₃	<i>E. stenophyllus</i>	58.10	91.64	-5.3	000
Average (control)		63.43	100.00	-	-

LSD_{5%} = 1.1; LSD_{1%} = 1.8; LSD_{0,1%} = 3.4

An important indicator for the ornamental value of a plant is the number of floral stems formed. By comparing the results obtained with the analyzed species it was found that the values varied from 2.5 floral stems / plant to *E. himalaicus*, at 1.25 floral stems / plant at *E. robustus*, the differences from the average of the experience (1.9) being distinct significantly positive, respectively significantly negative In *E. stenophyllus*, although the values are slightly above average, the differences are not statistically assured (tab. 5).

Table 5

Number of floral stems/plant at *Eremurus*

Var.	Species	Number of floral stems		d (±)	Significance of differences
		Absolute value	Relative value (%)		
V ₁	<i>E. himalaicus</i>	2.50	131.58	+0.6	xx
V ₂	<i>E. robustus</i>	1.25	68.42	-0.6	00
V ₃	<i>E. stenophyllus</i>	2.00	105.26	+0.1	-
Average (control)		1.90	100.00	-	-

LSD_{5%} = 0.3; LSD_{1%} = 0.5; LSD_{0,1%} = 1.0

In the studied *Eremurus* species, determinations were made regarding the height of the floral stems, the length and the diameter of the inflorescences. Therefore, large differences were recorded at the inflorescence length, respectively the height of the plants (tab. 6). *E. himalaicus* formed the highest rods (135.5 cm), exceeding the average of the experiment by 37 cm (very significant positive differences) and being at double values against *E. stenophyllus* with the shortest flower stems. At *E. robustus* the differences from the average of the experience were insignificant (tab. 6).

Table 6

Length of floral stems at *Eremurus*

Var.	Species	Length of floral stems		d (±)	Significance of differences
		Absolute value (cm)	Relative value (%)		
V ₁	<i>E. himalaicus</i>	135.50	137.98	+37.3	xxx
V ₂	<i>E. robustus</i>	97.90	99.69	-0.3	-
V ₃	<i>E. stenophyllus</i>	61.20	62.32	-37.0	000
Average (control)		98.2	100.00	-	-

LSD 5% = 1.7; LSD 1% = 2.9; LSD 0,1% = 5.4

In the study was determined, in all species, a long inflorescence (raceme), more than 50 cm. The values obtained ranged from 69.30 cm (*E. himalaicus*) to 52.60 cm (*E. stenophyllus*), with very significant differences from the average. The values for this character were closer to the average at *E. robustus* experience, so the differences were insignificant (tab. 7).

Table 7

Length of inflorescences at *Eremurus*

Var.	Species	Length of inflorescences		d (±)	Significance of differences
		Absolute value (cm)	Relative value (%)		
V ₁	<i>E. himalaicus</i>	69.30	113.98	+8.5	xxx
V ₂	<i>E. robustus</i>	60.40	99.34	-0.4	-
V ₃	<i>E. stenophyllus</i>	52.60	86.51	-8.2	000
Average (control)		60.8	100.00	-	-

LSD 5% = 0.7; LSD 1% = 1.2; LSD 0,1% = 2.2

Table 8

Diameter of inflorescences at *Eremurus*

Var.	Species	Diameter of inflorescences		d (±)	Significance of differences
		Absolute value (cm)	Relative value (%)		
V ₁	<i>E. himalaicus</i>	8.10	110.96	+0.8	xx
V ₂	<i>E. robustus</i>	8.20	112.33	+0.9	xx
V ₃	<i>E. stenophyllus</i>	5.60	76.71	-1.7	000
Average (control)		7.30	100.00	-	-

LSD 5% = 0.5; LSD 1% = 0.8; LSD 0,1% = 1.5

Relating to the inflorescence diameter, the values were larger and very close (8.2-8.1 cm) to *E. himalaicus* and *E. robustus*, with distinct positive differences compared to the control (tab. 8). In *E. stenophyllus*, inflorescences are thinner with approx. 2.5 cm from the other two species, determined very significant negative differences from the control.

CONCLUSIONS

1. Under the conditions of Iași, the three *Eremurus* species developed normally and displayed specific ornamental characters.

2. *E. himalaicus* and *E. robustus* form a smaller number of leaves / plant, but their dimensions (length, width) are higher compared to those of *E. stenophyllus*.

3. The highest production of floral stems (2-2.5) was recorded in the plants of *E. himalaicus* and *E. stenophyllus*.

4. *E. himalaicus* and *E. robustus* are distinguished by the most vigorous inflorescences.

5. *Eremurus* species which have been studied can be successfully utilized in landscaping design or cut flowers.

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