

NEWS

OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN

SERIES OF BIOLOGICAL AND MEDICAL

ISSN 2224-5308

Volume 4, Number 340 (2020), 62 – 67

<https://doi.org/10.32014/2020.2519-1629.33>

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INTRODUCTION OF *EUPHORBIA* L. SPECIES AT THE INSTITUTE OF BOTANY AND PHYTOINTRODUCTION IN ALMATY

Abstract. The article “Introduction of *Euphorbia* L. species at the Institute of Botany and Phytointroduction in Almaty” presents the results of many years of introduction experiment with the genus *Euphorbia* L. in the closed ground of the Institute of Botany and Phytointroduction. The collection of the genus *Euphorbia* L. continues, which today has 14 species. We carried out a taxonomic analysis based on the literature data of 14 species that are presented in our collection. *Euphorbia abyssinica* J.F.Gmel., *Eu. leuconeuira* Boiss, *Eu. lophogona* Lam., *Eu. milii* var. *splendens* (Bojer ex Hook.) Ursch & Leandri, *Eu. monteiroi* Hook., *Eu. obesa* Hook.f., *Eu. polygona* Haw., *Eu. pseudocactus* A.Berger., *Eu. ramipressa* Croizat, *Eu. trigona* Mill., *Eu. tirucalli* L., *Eu. tithymaloides* ‘*Variegata*’ L., *Eu. pulcherrima* Willd.exKlotzsch, *Eu. phosphorea* Mart.

Distribution area of plants: Madagascar, Northeast, Central and South Africa, tropical and subtropical North and Central America. As a result of the study, the features of the individual development of certain species were identified. For example, we found out that for some species of *Euphorbia* L. it is necessary to shade plants for several months so that they bloom better or in winter increase the temperature so that the plant forms better than children. Under the conditions of our microclimate, not all plants bloom and bear fruit, i.e. all ontogenetic periods and stages of development do not pass, resistant to pests and diseases.

Features such as high decorativeness of leaves, stems, inflorescences, as well as a high percentage of vegetative propagation, resistance to pests and diseases, and ecological plasticity make these plants promising for growing indoors.

Key words: *Euphorbia*, succulent, introduction, closed ground, phytodesign.

The role of flora in creating the contemporary look of our planet is invaluable. However, today many plant species disappear from the face of the Earth due to human activities. Their introduction into botanical gardens might be the most reliable way to preserve them. *Euphorbia* L. is a good example since it is in extinction at its habitat [5].

Spurge, or *Euphorbia* L., is a large genus of the Spurge family (Euphorbiaceae), which includes about 2000 species of monoecious and dioecious, perennial and annual plants growing in different climatic conditions. These are herbage plants, subshrubs, shrubs, and trees, succulents very similar to cacti. *Euphorbia* ranks third among succulents in number, amounting to about 290 species, and is one of the TOP 10 species of flowering plants. It is characterized by large morphological diversity; some species are highly ornamental, ecologically flexible, and are widely used in phytodesign. Their properties make these plants valuable for herbal medicine.

Euphorbia was named after Mr. Euphorb, the Surgeon in Ordinary to the King, who was the first to determine the medicinal properties of *Euphorbia resinifera* O.Berg. Its milk sap was long used in medicines. Most of the succulent *Euphorbias* originate from South Africa, Ethiopia, Congo, and Madagascar, where they are used as plant hedge. Thorn bushes with thin branches or ribbed, upright sprouts grow up to 10 m and serve to both protect and decorate the house. All *euphorbia* plants discharge milk sap at the slightest damage to the plant. *Euphorbia* flowers are unisexual. They are unattractive but have bright leaves or nectar glands to attract insects. The fruit is a three-cell box with seeds [1].

Our purpose was to introduce *Euphorbia* L. species.

Tasks to achieve this: introduction of this genus in greenhouses, the development of differentiated cultivation methods, a preliminary biological assessment.

Studies on the introduction of *Euphorbia* L. at the Institute of Botany and Phytointroduction started in 1932, as evidenced by the mention of *Euphorbia songorica* Boiss. in the list of plants for that year. The collection was replenished with *Delectus semenum* seeds and living plants obtained from various botanical gardens during business trips and provided by amateur gardeners. Today, the Almaty Botanical Garden possesses a whole exposition section called “Plants of arid regions,” where *Euphorbia* L. occupies a large area. In previous years, plants of this genus passed the first stages of introduction, with a successful introduction of 10 species. Certain species have grown large. E.g., *Eu. tirucalli* L. has reached 12 m high, with a trunk of 40 cm in dia. *Eu. leuconeura* Boiss., *Eu. lophogona* Lam., and *Eu. Trigona* Mill also grew large. The plants aged 35 to 60 years. However, our collection of succulents, including the *Euphorbia* genus, has been destroyed during the cold winter of 2018, and we are currently restoring the succulent section. Many years of introduction tests gave us a wide experience in obtaining a collection of plants of this genus [2].

At the Institute of Botany and Phytointroduction, these plants grow indoor under the illumination of 10,000 lux. The air temperature is about 11-15°C in winter and reaches 40-45°C in summer. Therefore, the watering and spraying shall be abundant in summer and moderate in winter. The plants are watered three times a week in the spring-summer period and twice a week – in the autumn-winter season. The soil mixture includes clay-turf, leafy earth, peat, and sand, with the addition of pieces of charcoal (2:1:1:2:0.5). Young plants need annual replanting into fresh soil. Adult plants are replanted less often – every 2-3 years, while the plants planted in the ground (exposition “Plants of arid regions”) are not replanted. In summer, we add the fertilizer for cacti 1-2 times a month. We have identified the specific features of the individual development of some species. E.g., the plants need shading for several months to bloom better, or they need higher temperatures in winter to form better pups. Not all plants can bloom and yield crop, i.e., pass through all ontogenetic periods and stages of development, in our climate. The plants are resistant to pests and diseases.

In our greenhouse, all types of euphorbia are propagated mainly by cuttings harvested in June-July. After cutting, the cut is submerged into warm water to let the milk sap out, then sprinkled with crushed coal. After 2-3 days, the dried cutting is planted in well-washed river sand for rooting. Rooting occurs in 20-25 days at the optimum temperature of 20°C.

Table shows the taxonomic analysis of the 14 species from our collection based on literature data [3-4]. According to the table, these plants are common in the isle of Madagascar, in Northeast, Central, and South Africa, tropical and subtropical parts of North and Central America. We can only bloom three species: *Eu. milii* var. *splendens* (Bojer ex Hook.) Ursch & Leandri, *Eu. pulcherrima* Willd. ex Klotzsch, and *Eu. leuconeura* Boiss. Only *Eu. leuconeura* Boiss sets seeds. All plants from the table (except *Eu. Obesa* Hook. f.) spread by vegetative propagation.

Tropical and subtropical euphorbias include many popular and beautiful species used for winter gardens or pot planting. We have some of these species from the introduced genus *Euphorbia* L. in our collection:

Euphorbia leuconeura Boiss. – one of the most popular species. Habitat: Madagascar. A slightly branched succulent-stem shrub with 3-4 rib stems and normally developed leaves. The leaves gradually fall off from the trunk remaining only on the top. In our conditions, it blooms with white flowers from May to August. It sets seeds that scatter around and germinate. Propagates by self-seeding or cuttings (figure 1).

Eu. milii var. *splendens* (Bojer ex Hook.) Ursch & Leandri. Habitat: Madagascar. A wide-spreading, highly branched shrub with bizarrely curving branches up to 1 m long. It is also called ‘indoor blackthorn.’ The stems are round, brownish-gray, covered with numerous strong and very sharp spikes up to 2 cm long. Between the spikes, there are green oblong leaves slightly pointed at the top. In our conditions, the blooming is constant, though more active in the warm season. The inflorescence is umbellate, with 2-4 flowers located on a long, sticky peduncle. The flowers are small and nondescript but surrounded by bright two-lobed bracts, painted in bright red, orange, or yellow. Propagates easily by cuttings or division of the bush (figure 2).

Euphorbia L. species introduced at the Institute of Botany and Phytointroduction in Almaty

No.	Species	Habitat	Flowering indoors	Fruits in protected ground	Propagated in protected ground
1	2	3	4	5	6
1	<i>Euphorbia abyssinica</i> J.F.Gmel.	Africa	No	No	Vegetatively
2	<i>Eu. leuconeura</i> Boiss	Madagascar	Yes (May-August)	Yes	By seeds, vegetatively
3	<i>Eu. lophogona</i> Lam.	Southeast Madagascar	No	No	Vegetatively
4	<i>Eu. milii</i> var. <i>splendens</i> (Bojer ex Hook.) Ursch & Leandri	Endemic species of Madagascar	Yes (April-November)	No	Vegetatively
5	<i>Eu. monteiroi</i> Hook.	South Africa	No	No	Vegetatively
6	<i>Eu. obesa</i> Hook.f.	RSA (Cape Province)	No	No	No
7	<i>Eu. polygona</i> Haw.	South Africa	No	No	Vegetatively
8	<i>Eu. pseudocactus</i> A.Berger.	RSA	No	No	Vegetatively
9	<i>Eu. ramipressa</i> Croizat	Madagascar	No	No	Vegetatively
10	<i>Eu. trigona</i> Mill.	South West Africa	No	No	Vegetatively
11	<i>Eu. tirucalli</i> L.	Africa, Asia, India, Madagascar, Arabian Peninsula	No	No	Vegetatively
12	<i>Eu. tithymaloides</i> 'Variegata' L.	Central and South America	No	No	Vegetatively
13	<i>Eu. pulcherrima</i> Willd.exKlotzsch	Tropical Mexico and Central America	Yes (January, February)	No	Vegetatively
14	<i>Eu. phosphorea</i> Mart.	Madagascar	No	No	Vegetatively



Figure 1 – *Euphorbia leuconeura* Boiss



Figure 2 – *Eu. milii* var. *splendens* (Bojer ex Hook.) Ursch & Leandri

Euphorbia pulcherrima Willd. ex Klotzsch. Habitat: Tropical Mexico and Central America. In the wild, it is a shrub up to 2.5-3 m high. The leaves are 10 to 15 cm long, ovoid-elliptical with a pointed top, on long reddish cuttings. At the ends of the annual sprouts, there appear complex umbellate inflorescences with small, inconspicuous flowers surrounded by bright bracts of red, white, or yellow color. In our conditions, it blooms without seeding. It spreads easily, by vegetative propagation only (figure 3).

Euphorbia tirucalli L. Habitat: Tropical and subtropical areas of Africa, Asia, Arabian Peninsula, Madagascar, and India. Succulent-stem shrub up to 4 m or a tree up to 12 m tall, with smooth cylindrical bunched branches with falling leaves. It grows along the banks of small rivers, forming groves in bright forests at high altitudes. Propagates by cuttings (figure 4).



Figure 3 – *Euphorbia pulcherrima* Willd.ex Klotzsch



Figure 4 – *Euphorbia tirucalli* L.

Euphorbia obesa Hook. f. Habitat: RSA (Cape Province). It looks similar to *Astrophytum asterias* (Zucc.) Lem. However, its body is slightly elongated, and it grows slower. A dioecious succulent-stem perennial with spherical or hemispherical non-branching leaves. The plant is gray-green, with transverse stripes, has 8-10 very flat ribs. With age, lateral sprouts are formed at the base. It does not bloom in our conditions but sometimes produces pups (figure 5).

Euphorbia (Pedilanthus) tithymaloides 'Variegata' L. Habitat: Central and South America. A shrub with many branches, cylindrical stems, ovate sessile green or mottled leaves, and small flowers. It does not bloom in our conditions but spreads easily by vegetative propagation (figure 6).



Figure 5 – *Euphorbia obesa* Hook



Figure 6 – *Euphorbia (Pedilanthus) tithymaloides* 'Variegata' L.

Thus, the Institute of Botany and Phytointroduction continues forming the collection of *Euphorbia* L. plants, which today accounts for 14 species. The plants were taxonomized based on the literature data. The conducted introduction tests allowed selecting the proper soil substrate, illumination, humidity, and temperature conditions. The article also describes the five most popular species of this genus. We can recommend these plants for indoor cultivation thanks to the good decorative properties of leaves, stems, inflorescences, as well as extensive vegetative propagation, the resistance to pests and diseases, and ecological flexibility.

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АЛМАТЫ ҚАЛАСЫДАҒЫ БОТАНИКА ЖӘНЕ ФИТОИНТРОДУКЦИЯ ИНСТИТУТЫНДА *EUPHORBIA* L. ТҰҚЫМ ТҮРІН ЖЕРСІНДІРУ

Аннотация. «Алматы қаласындағы БЖФИ-да *Euphorbia* L. тұқымдарының түрлерін енгізу» атты мақалада Ботаника және фитоинтродукция институтының жабық алаңында *Euphorbia* L. Тұқымы негізінде көпжылдық тәжірибе нәтижелерін ұсынады. *Euphorbia* L. тұқымдарының коллекциясы жалғасуда, бүгінде 14 түрі бар. *Euphorbia abyssinica* J.F.Gmel., *Eu. leuconeura* Boiss, *Eu. lophogona* Lam., *Eu. milii* var. *splendens* (Bojer ex Hook.) Ursch & Leandri, *Eu. monteiroi* Hook., *Eu. obesa* Hook.f., *Eu. polygona* Haw., *Eu.pseudocactus* A.Berger., *Eu. ramipressa* Croizat, *Eu. trigona* Mill., *Eu. tirucalli* L., *Eu. tithymaloides* `Variegata` L., *Eu. pulcherrima* Willd.exKlotzsch, *Eu. phosphorea* Mart әдебиеттер негізінде 14 түрге таксономиялық талдау жүргіздік.

Бұл өсімдіктердің таралу аймағы – Мадагаскар, Солтүстік-Шығыс, Орталық және Оңтүстік Африка, тропикалық және субтропикалық Солтүстік және Орталық Америка. Зерттеу нәтижесінде белгілі бір түрлердің жеке даму ерекшеліктері анықталды. Мысалы, *Euphorbia* L. өсімдіктерінің кейбір түрі бойынша өсімдіктер жақсы гүлденуі үшін немесе қыс мезгілінде өсімдік өскіні (отросток) жақсы қалыптасуы үшін температураны жоғарылатып, бірнеше ай бойы көлеңкелеу қажетін анықтадық.

Сонымен қатар, біздің микроклимат жағдайында барлық өсімдіктер гүлдеп, жеміс бермейді, яғни барлық онтогенетикалық және даму кезеңдерінен өтпейтіндігі белгілі болды. Бұған қоса, зиянкестер мен ауруға төзімді.

Жапырақ, сабақ, гүлшоғырдың аса сәнділігі, вегетативті көбеюдің жоғары деңгейі, зиянкестер мен ауруларға төзімділік, экологиялық пластикалық сынды қасиеттер өсімдіктерді жабық жерде өсіру үшін перспективті болып саналады.

Түйін сөздер: эуфорбия, суккулент, интродукция (жерсіндіру), жабық грунт, фитодизайн.

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ИНТРОДУКЦИЯ ВИДОВ РОДА *EUPHORBIA* L. В ИБИФ Г. АЛМАТЫ

Аннотация. В статье «Интродукция видов рода *Euphorbia* L. в ИБиФ г. Алматы» приводятся результаты многолетнего интродукционного опыта с родом *Euphorbia* L. в закрытом грунте Института ботаники и фитоинтродукции.

Продолжается сбор коллекции рода *Euphorbia* L., которая на сегодняшний день насчитывает 14 видов. Нами был проведен таксономический анализ на основе литературных данных 14 видов, которые представлены в нашей коллекции. *Euphorbia abyssinica* J.F.Gmel., *Eu. leuconeura* Boiss, *Eu. lophogona* Lam., *Eu. milii* var. *splendens* (Bojer ex Hook.) Ursch & Leandri, *Eu. monteiroi* Hook., *Eu. obesa* Hook.f., *Eu. polygona* Haw., *Eu.pseudocactus* A.Berger., *Eu. ramipressa* Croizat, *Eu. trigona* Mill., *Eu. tirucalli* L., *Eu. tithymaloides* `Variegata` L., *Eu. pulcherrima* Willd.exKlotzsch, *Eu. phosphorea* Mart.

Ареал распространения растения Мадагаскар, Северо-Восточной, Центральной и Южной Африке, тропической и субтропической Северной и Центральной Америке. В результате исследования были выявлены особенности индивидуального развития некоторых видов. Например, мы выяснили, что для

некоторых видов *Euphorbia* L. растения необходимо притенять на несколько месяцев для того, чтобы они лучше цвели или в зимнее время повышать температуру содержания для того, чтобы растение образовывало лучше деток.

В условиях нашего микроклимата не все растения цветут и плодоносят, т.е. не проходят все онтогенетические периоды и этапы развития. Устойчивы к вредителям и болезням.

Такие особенности, как высокая декоративность листьев, стебля, соцветий, а также высокий процент вегетативного размножения, устойчивость к вредителям и болезням, экологическая пластичность делают эти растения перспективными для выращивания в закрытом грунте.

Ключевые слова: эуфорбия, суккулент, интродукция, закрытый грунт, фитодизайн.

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