

FAR EASTERN ADAPTOGENIC SPECIES IN THE “ALEXANDRU CIUBOTARU” NATIONAL BOTANICAL GARDEN (INSTITUTE)

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Abstract: This paper refers to Far Eastern adaptogenic plants (*Aralia mandshurica*, *Eleutherococcus senticosus*, *Schizandra chinensis* and *Securinega suffruticosa*) grown in the Collection of Medicinal Plants from “Al. Ciubotaru” National Botanical Garden (Institute). Phenological observations, biometric measurements and biological peculiarities of investigated species under *ex situ* conditions have been undertaken. Under the conditions of the Republic of Moldova introduced adaptogenic species are well naturalized, as manifested the entire ontogenetic cycle.

Key words: adaptogenic plants, *Aralia*, *Eleutherococcus*, *Schizandra*, *Securinega*, *ex situ* conservation.

SPECII ADAPTOGENE CERCETATE ÎN GRĂDINA BOTANICĂ NAȚIONALĂ (INSTITUT) „ALEXANDRU CIUBOTARU”

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Rezumat: Prezenta lucrare se referă la plantele adaptogene native din Orientul Îndepărtat (*Aralia mandshurica*, *Eleutherococcus senticosus*, *Schizandra chinensis* și *Securinega suffruticosa*) cultivate în Colecția de Plante Medicinale din Grădina Botanică Națională (Institut) „Al. Ciubotaru”. Au fost efectuate observații fenologice, măsurări biometrice și evidențiate particularitățile biologice ale speciilor investigate în condiții *ex situ*. În condițiile Republicii Moldova, speciile adaptogene introduse sunt bine acclimatizate, fapt demonstrat prin realizarea întregului ciclu ontogenetic.

Cuvinte cheie: plante adaptogene, *Aralia*, *Eleutherococcus*, *Schizandra*, *Securinega*, conservare *ex situ*.

INTRODUCTION

Herbal adaptogens bring great benefits to the human body. These plant species are sources of biologically active substances that can enhance the body's resistance to harmful effects of a different nature [16]. They stimulate and strengthen the immune system, increase physical and mental endurance, reduce the discomfort caused by poor health, improve mood, influences the maintenance of normal weight.

The term adaptogen was introduced into scientific literature in 1947 to denote substances that help the body resist any adverse effects of a physical, chemical or biological stressor, causing nonspecific resistance. By the 1960s, adaptogenic plants had become so popular, that they were isolated in a separate area of biomedical research. Just two decades later, Russian scientists published more than 1500 clinical and pharmacological studies of adaptogenic plants. In light of more recent researches adaptogens are redefined as “metabolic regulators which increase the ability of an organism to adapt to environmental stressors and prevent damage to the organism by such stressors” [8, 9].

Thanks to the properties of adaptogens to enhance physical performance and immunity, they have found wide application in modern medicine and sports. They can

be used as a treatment or as part of the treatment in case of chronic diseases, weak immunity and loss of strength, recovering from a serious illness, after chemotherapy, radiation and radiotherapy. The herbal adaptogens can be administrated in the form of tablets, capsules, tinctures and infusions, like seasonings to food.

This paper refers to far eastern medicinal plants (*Aralia mandshurica* Rupr. et Maxim., *Eleutherococcus senticosus* Maxim., *Schizandra chinensis* (Turcz.) Baill., *Securinega suffruticosa* (Pall.) Rehd.) with adaptogenic, immunogenic and tonic effects successfully introduced in the collection of medicinal plants from “Alexandru Ciubotaru” National Botanical Garden (Institute) .

MATERIALS AND METHODS

The adaptogenic species (*A. mandshurica*, *E. senticosus*, *S. chinensis*, *S. suffruticosa*) involved in this research were brought from the Russian Far East more than 35-40 years ago [1, 17]. A literature survey of studied species was made according to their therapeutic importance and utilization in popular and modern medicine.

The *ex situ* experiment focused on highlighting biological characteristics of plants in the conditions of the Republic of Moldova was conducted at Experimental Field of the National Botanical Garden (Institute), geographically located at N 46°58'25.43", E 28°52'47.16". The phenological observations, biometric measurements and biological peculiarities were registered using standard methods [10, 11, 14].

RESULTS AND DISCUSSIONS

The Far Eastern medicinal plants (*A. mandshurica*, *E. senticosus*, *S. chinensis*, *S. suffruticosa*) with adaptogenic, immunogenic and tonic effects are successfully growing at the experimental fields in National Botanical Garden (Institute).

Aralia mandshurica Rupr. et Maxim. (Manchurian Thorn Tree) belonging to Araliaceae family is a small tree, reaching 12-15 m height, with large long-petiolate leaves growing directly from the top of the stem. The leaves are up to 1 m long, complex, bi-pinnate, composed of 2-4 first-order segments, each of which consisting of 5-9 pairs of oval leaves. The flowers are small, yellowish-white, arranged in umbels occurring in terminal panicles, the length of which reaches up to 45 cm. Fruits – blue-black drupes with diameter of 3-5 mm.

The young rhizomes and the bark of the old rhizomes have anodyne, carminative and tonic effects. They stimulate the central



Figure 1. *Aralia mandshurica*

nervous system and can be used in physical and neural asthenia, schizophrenia, as hypotonic, accelerates the convalescence after viruses and surgical interventions. The plant restores the appetite, memory, energy and vigor [3, 13, 15].

In our conditions the growth rhythm of the plants is being observed at normal rate, reaching a height of 3-3,5 m (Figure 1). The flowering period is noted in July-August. The fruits ripen in September. *A. mandshurica* can be propagated in vegetative way by portions of the rhizomes, and by seeds. The seeds germinate on the 2-3rd year, even after a long stratification. Therefore, freshly harvested seeds are best sown in the autumn. More effective is the vegetative reproducing. The fragments of the rhizomes can be planted out direct into their permanent positions. The scheme of planting is 70x60cm. The plants prefer a position in semi-shade and well-drained soil.

Eleutherococcus senticosus Maxim., also named Siberian Ginseng, is a medicinal shrub from Araliaceae family native from the Far East. The spreading area includes East Asia, China, Japan, and Siberia. It is cultivated as a medicinal plant in Russia and China.

Eleuterococcus senticosus is a deciduous shrub, up to 1,5-3 m high. The numerous stems are erect, grey-barked covered with thin thorns directed to the base. The palmate long-petiolate leaves are alternate; leaflets 5, obovate to oblong, apex acuminate, base cuneate, densely haired along veins, margins serrate, dark green above and light green below. The feminine yellow and masculine pale-violet small flowers are arranged in spherical, terminal umbels, solitary or 2-4 polygamy sparsely panicle. Fruit – purple-black berry-shaped subglobose drupe.

Siberian Ginseng possesses adaptogenic, anti-stress, anti-inflammatory, chemoprotective, tonic, and immuno-modulatory properties [12]. The extracts from the plants increases the body's ability to adapt to various stress conditions, acts positively in cases of nervous fatigue, favors intellectual concentration [2, 4, 5, 7]. The plant also increases body resistance to viral infections and many other pathogens. Siberian ginseng is indicated in male sexual dysfunction disorders. Root and root bark are administered internally during periods of convalescence and for treatment of depression, debility, physical and mental asthenia [12]. The plant neutralizes radiation and toxic substances

in the body. *E. senticosus* may have adverse interactions with alcohol. High doses may cause irritability, confusion, insomnia or anxiety.

Within the Republic of Moldova Siberian Ginseng have quite favorable climatic conditions. Plants rich up to 3 m height (Figure 2) and develop a much branched root system. They begin the spring vegetation in the first or second decade of April. The shoot growth period is relatively short lasting until the third



Figure 2. *Eleutherococcus senticosus*
(general aspect)

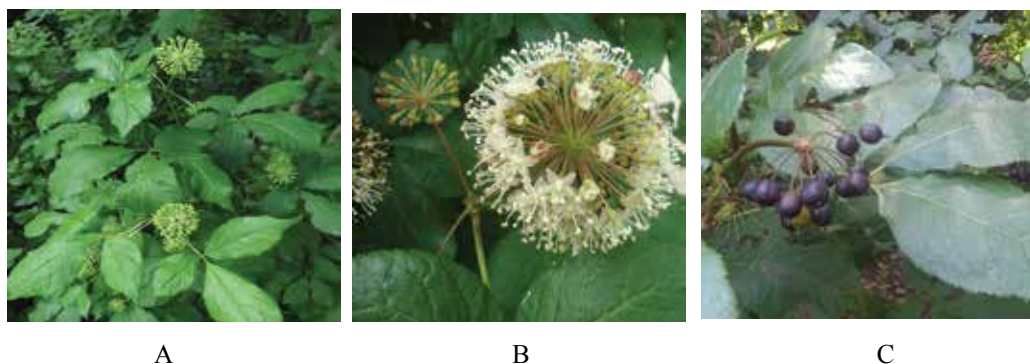


Figure 3. *Eleutherococcus senticosus*
(A – budding stage, B – flowering stage, C – fruit maturation)

decade of May. The maximum annual growth of vegetative shoots is 60-80 cm, and generative – 25-40 cm. The budding phase occurs in the first or second decade of May (Figure 3A). The flowering period is lasting 30-35 days and starts from the middle of June (Figure 3B). From the central flower bud of each generative shoot develop 4-5 spherical umbels. The central umbrella has vertical position and is much larger than others. The number of flowers in central umbel varies between 80 and 130. The lateral umbels are perpendicular and have 30-40 flowers each. Within spherical umbel flowers bloom acropetally and by the time of the opening of the last flowers, the lower ones have already flowered and formed green fruits. The fruits ripen in September (Figure 3C). In our conditions the plants are characterized by a low percentage of fruiting and seed reproduction is not promising. In this way we reproduce the plants in the vegetative way, by the fragments of the rhizomes at the second year. The plant prefers humus-rich soil and can grow in semi-shade. It is not affected by pests and diseases.

Schizandra chinensis (Turcz.) Baill. (Chinese herb), belonging to the Schizandraceae family is native to forests of Northern China and the Russian Far East.

Schizandra chinensis is a deciduous, dioecious woody climbing plant (Figure 4). Young branches red-brown, old branches gray-brown, slightly angular. Leaves alternate, petiolate, obovate or ovate-elliptic, 5-10 cm long and 3-5 cm wide, apex acute, base cuneate, margins glandular-serrulate. Flowers are white or pink, solitary or clustered in leaf axils. Fruit – spherical berries, red at maturity. Seeds – 1-2 kidney-shaped, light brown.

The plant has a long history of its medicinal use. Today, this species is the most widely used in Russian Far East as adaptogenic, anti-oxidant, stimulating and antidepressant plants [6, 12]. The fruit



Figure 4. *Schizandra chinensis*

is antitussive, aphrodisiac, hepatic, astringent, cardiotonic, cholagogue, expectorant, hypotensive, lenitive, nervine, pectoral, sedative, stimulant and tonic. The fruits also regulate the cardiovascular system. It is taken internally in the treatment of dry coughs, asthma, night sweats, urinary disorders, involuntary ejaculation, chronic diarrhea, palpitations, insomnia, poor memory, hyperacidity, hepatitis and diabetes [18]. Low doses of the fruit stimulate the central nervous system, regulates the cardiovascular system.

Schizandra chinensis can be reproduced in vegetative way by portions of the layering shoots in the autumn. In the next spring the apical buds open in the first decade of April, and towards the end of the month the voluble sprouts start to develop. At the base of the young sprouts there are 5-6 small leaves and short internodes. In May-June, the growth of the voluble sprouts continues reaching 50-60 cm height. The number of leaves on each sprout varies between 15 and 17. As the leaves grow, the length of the internodes increases. In the first decade of July the lignification of the basal part of the climbing sprouts is observed and the basal leaves dying out. In the following vegetation periods beginning of the vegetation is noted at the end of March-early April. Plants climb by twining around supports. The first fruiting was observed at the 4th year after planting. At the beginning, male flowers begin to form and only after 1-3 years – the female flowers. The flowering period lasts for 20-25 days, from the second decade of May to the first decade of June. The fruits ripen in the second part of August. By this time most of the leaves dry up. Beginning with the second year of vegetation, individuals develop underground shoots that reach the surface of the soil at various distances from the mother plant. Next year they give rise to new plants. Taking into account the low seed productivity of plants in the conditions of R. Moldova a reliable method of reproduction is separation of layering sprouts from the mother plants and planting them in the autumn. The plant prefers a rich well-drained moisture soil. It

can grow in full shade or semi-shade. In the climatic and edaphic conditions of Moldova plants reach 1,5-2 m high at the age of 9-10 years.

Securinega suffruticosa (Pall.) Rehd. (Euphorbiaceae family) is native to the Far East, Mongolia, China, Japan, Korea, and Taiwan. In Russia – in the Primorsky, Khabarovsk and the Amur Regions [16].

Securinega suffruticosa is a spreading dioecious bush with numerous straight, thin branches, up to 1,5-3 m height. (Figure 5) The bark on the old branches is gray; the young shoots are light yellow. Leaves are small, alternate, glabrous, petiolate, elliptical or oval, light green, 1,5-7 mm long and 0,6-3,5 cm wide. Flowers unisexual, very small, green or yellow-green; male flowers are single, female arranged in bundles. Fruit is a three-nodular capsule with six seeds. Seeds are smooth, blunt-triangular, with a thin skin, about 2 mm long.

The plant is commonly used in Chinese



Figure 5. *Securinega suffruticosa* (flowering stage)

herbalism, where it is considered to be one of the 50 fundamental herbs. It is used in the treatment of contusions and nervous paralysis and multiple sclerosis. The plant contains alkaloid securinine that acts as a stimulant on the central nervous system. [12].

In climatic conditions of Republic of Moldova experiments have shown that it is easily propagated by seeds sown in the last decade of November. First seedlings appear in late April. The intensive growth of seedlings begins in July and lasts until the end of September. In the first growing season, plant height reaches 50-65 cm. In the following vegetation periods beginning of the vegetation is noted in third decade of April. Unlike other far eastern species, for *Securinega suffruticosa* plants are characteristic stable rhythms of vegetative and generative development in our conditions. The flowering phase begins in the first decade of June and lasts until the middle of July. The fruits ripen in August.

CONCLUSIONS

Under the conditions of the Republic of Moldova all introduced adaptogenic species are well naturalized, as manifested the entire ontogenetic cycle passing consecutively all life periods (latent, pregenerative, generative, postgenerative).

In our conditions the growth rhythm of *Aralia mandshurica* plants is being observed at normal rate, reaching a height of 3-3,5 m. Siberian Ginseng (*Eleutherococcus senticosus*) within the Republic of Moldova encounters quite favorable climatic conditions. The plants are characterized by a low rate of fruiting and seed reproduction is not promising but it can be successfully propagated in the vegetative way, by the fragments of the rhizomes at the second year of vegetation. Taking into account the low seed productivity of *Schizandra chinensis* plants in the conditions of R. Moldova a reliable method of reproduction is separation of layering sprouts from the mother plants and planting them in the autumn. *Securinega suffruticosa* is easily propagated both by seeds and the vegetative way providing the possibility to be grown on a large scale.

BIBLIOGRAPHY

1. Bodrug M. Araliaceae species introduced in the Botanical Garden of R. Moldova. // Acta Phytotherapica Romanica. 2000. N.1-2, p. 3-4.
2. Davydov M., Krikorian A.D. *Eleutherococcus senticosus* (Araliaceae) as an adaptogen: a close look. J. Ethnopharmacol., 2000, vol. 72, p. 345-393.
3. Duke J. A., Ayensu E. S. Medicinal Plants of China. Ref. Public. 1985.
4. Gaffney B.T. et al. The effects of *Eleutherococcus senticosus* and *Panax ginseng* on steroidal hormone indices of stress and lymphocyte subset numbers in endurance athletes. // Life Sci, 2001, vol. 70, nr. 4, p. 431-442.
5. Kuo J. et al. The effect of eight weeks of supplementation with *Eleutherococcus senticosus* on endurance capacity and metabolism in human. // Chin. J. Physiol., 2010, vol. 53, nr. 2, p. 105-111.
6. Mamedov M. Adaptogenic, geriatric, stimulant and antidepressant plants of Russian Far East // J. of Cell and Molecular Biol. 2005. N 4, p. 71-75.
7. Oliynik S., Oh S. Actoprotective effect of ginseng improving mental and physical performance. J. Ginseng Res., 2013, vol. 37, nr. 2, p. 144-166.
8. Panossian A., Wikmam G., Wagner H. Plant adaptogens: earlier and more recent aspects and concepts on their modes of action. // Phytomedicine 1999, vol. 6, p. 287-300.
9. Panossian A. G. Adaptogens in Mental and Behavioural Disorders. // Psychiatric Clinics of North America, 2013, vol. 36, p. 49-64.

10. Sparks T. H., Menzel A., Stenseth N. C. European Cooperation in Plant Phenology. // Climate Research, 2009, vol. 39, 12 p.
11. Бейдеман И.Н. Методика изучения фенологии растений и растительных сообществ. / Методические указания, Изд-во «Наука», 1974, 155 стр.
12. Дикорастущие полезные растения России /Отв. ред. Буданцев А. Л., Лесиовская Е. Е. СПб.: Издательство СПХФА, 2001, стр. 347-349.
13. Гаммерман А. Ф., Кадаев Г. Н., Яценко-Хмелевский А. А. Лекарственные растения. М.: Высш. шк., 1983, стр. 151-152.
14. Методика фенологических наблюдений в ботанических садах СССР //Бюл. ГБС АН СССР, 1972, вып. 113, стр. 3-8.
15. Универсальная энциклопедия лекарственных растений / сост. И. Н. Путырский, В. Н. Прохоров. М.: Махаон, 2000, с. 56-58.
16. Турова А. Д., Сапожникова Э. Н. Лекарственные растения СССР и их использование. 2-е изд, М.: Медицина, 1982, 288 стр.
17. Флоря В. Н. Интродукция и акклиматизация растений в Молдавии. К., 1987. 295 с.
18. <https://pfaf.org/user/plant.aspx?latinname=Schisandra+chinensis>