PARTICULARS OF GROWTH AND DEVELOPMENT AT *LYCIUM BARBARUM* L. “ALEXANDRU CIUBOTARU” IN THE NATIONAL BOTANICAL GARDEN

DATE DE CREȘTERE ȘI DEZVOLTARE LA *LYCIUM BARBARUM* L. “ALEXANDRU CIUBOTARU” ÎN GRĂDINA BOTANICĂ NAȚIONALĂ

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Rezumat. *Sunt descrise particularitățile de creștere și dezvoltare ale taxonilor de Lycium barbarum L. 'New Big', 'Amber Sweer' în Grădina Națională Botanică (Institutul) „Alexandru Ciubotaru”, a Universității de Stat din Moldova. Acești arbuști cresc bine, înfloresc, fructifică, se pot utiliza ca plante fructifere, medicinale, meliferă, cu înflorire de lungă durată și ornamentale. Fructele sunt delicioase, ecologice, cu efecte terapeutice benefice, bogate în substanțe biologice prețioase, în condițiile Republicii Moldova se coc treptat din iulie până în octombrie în funcție*

de condițiile climatice. Se disting prin conținutul ridicat și variat în produși bioactivi care poate servi ca materie primă autohtonă, pentru industria alimentară și farmaceutică.

Taxonii cercetați se disting după nuanța culorii petalelor florilor, dimensiunile, și culoarea fructelor. Ei se multiplică prin microclonare și vegetativ – prin marcotaj, butași semilignificați și lignificați, pentru a păstra proprietățile calitative ale plantei mamă.

***Cuvinte-cheie*:** *Lycium barbarum* L., 'New Big', 'Amber Sweer', introduction, fruit, cultivation.

INTRODCTION

It is known that horticulture in the Republic of Moldova is one of the main branches of agriculture that aims to provide the population with quality apples, both fresh and industrially processed. During several decades in the "Alexandru Ciubotaru" National Botanical Garden (Institute) (NBGI) collections of plants with multiple uses were founded, including collections of fruit bushes.

The upward trend in consumer demand and the international scientific interest shown for the fruits of *Lycium barbarum* L., known as Goji, are the main motivations for choosing the research material, due to its curative and gustatory capacities [1, 2]. The pedo-climatic conditions of the Republic of Moldova are relatively favorable for the introduction and cultivation of non-traditional fruit bushes, which easily adapt to the environment and can be introduced without great expense in various branches of the national economy.

The fruits of *Lycium barbarum* L. have a higher beta-carotene content than carrots and contain more iron than soybeans and spinach. They are officially recognized as having the highest amount of antioxidants. Goji ranks first in the ORAC (*Oxygen Radical Absorbance Capacity*) scale. ORAC is the standard test conducted by the US Department of Agriculture to measure the level of antioxidants in foods. A portion of 25 g of goji fruits (the recommended daily amount for consumption) provides the human body with 45% of the recommended daily dose of vitamin A- 8% of the daily dose of vitamin C- 4% of the daily dose of calcium and 12% of the daily dose of iron [3, 1, 4].

Nutritional values of Goji berries/100 g: energy value – 1390 kj/339.09 kcal; proteins – 14.42 g; carbohydrates – 69.99 g, of which sucrose 44.2 g; fats -1.05 g; saturated fatty acids -0.46 g and fiber - 2.0 g.

The benefits of Goji fruits are multiple: acceleration of metabolism; regulation of blood cholesterol level, reduction of blood pressure; protection from cardiovascular diseases; blood sugar regulation. Helps in case of respiratory diseases, asthma, bronchitis, whooping cough; detoxifies the body (liver, kidneys); removes heavy metals from the body; prevents eye diseases; protects the skin, helps heal dermatitis, reduces the risk of malignant tumors. It reduces the negative effects of chemotherapy, helps in the treatment of inflammatory, rheumatic diseases, arthritis, etc. Fresh fruit reduces fatigue, acts as a natural energizer, reduces stress, helps with insomnia, relaxes muscles, calms the nervous system, improves blood circulation, helps prolong life. It is contraindicated for people with pollen allergies and kidney diseases [5, 6]. Semi-ripe fruits contain toxins and can

be poisonous, they are harvested when fully ripe when they are deep red or orange. The fruits cannot be transported fresh over long distances, being perishable. Dried fruits are practically available anywhere and anytime. Drying goji berries does not reduce their properties and benefits for the health of the body [6].

The purpose of this work was to research the particularities of growth and development of the new taxa of *Lycium barbarum* L. introduced in ”Alexandru Ciubotaru” NBGI.

MATERIALS AND METHODS

The research was carried out during the years 2018-2024 within the research project 20.80009.7007.19, with the continuation within the subprogramme 010101 in the nursery of the introduction of the Dendrology Laboratory and the Embryology and Biotechnology Laboratory of NBGI. *Lycium barbarum* L. (′Amber Sweet′ and ′New Big′) cultivars of Chinese selection, which are currently growing and developing vigorously in the collection of non-traditional fruit shrubs of NBGI, served as study material. he mentioned varieties serve as biological material for in vitro multiplication. The fruits are harvested in July to determine the morphological parameters, 100 fresh fruits each in 3 repetitions. The vegetative material obtained was transplanted into containers for fortification. The phenological observations were carried out according to the method developed by the Botanical Garden.

RESULTS AND DISCUSSION

Lycium barbarum L. is a 2-3 m tall shrub with trailing roots. The new Goji varieties introduced in the NBGI in 2018 have stems up to 2 m high, strongly branched, with long, thin branches (macroblasts), at first straight, later arched, thorny. Leaves solitary or fasciculate, shortly petiolate, lanceolate or oblong-elliptic, glabrous, adaxially green, abaxially gray, 2-6 cm long. It blooms from May-June to October. Flowers solitary or grouped by 2-6, pedicellate, lilac or pink-violet. Calyx campanulate, 4-5 mm long, with 2-3 (4-5) unequal lobes. Corolla infundibuliform, 5-lobed, with the cylindrical tube slightly dilated towards the base, 1.5 times longer than the limb. The 5 stamens and the style slightly exserte. The fruits are ovoid and oblong-ellipsoidal berries of 1.5 cm, yellowish in color in the variety ′Amber Sweet′ and red-orange in the variety ′New Big′ depending on the cultivar and with a sweet taste when fully ripe. Reniform, yellow-brown seeds, about 2.5 mm in diameter. The growth of the plants is fast and they dredge very abundantly. The more vigorous dragons were planted in containers for fortification. The most popular varieties of Chinese selection ′New Big′ with large fruits (ranging from 20-23 mm long and 7-8 mm wide) and ′Amber Swet′ (with fruit length 13-15 mm and width 7- 8 mm) both with early ripening were introduced into the collection GBNI in 2018. These varieties are distinguished by the shade of the color of the petals of the flowers, the sizes, and the color of the fruits. The fruits are sweet, they ripen gradually from the second half of July until the end of October depending on the amount of temperatures during this period.



Lycium barbarum L.
Flora spontană



Lycium barbarum
'New Big'



Lycium barbarum
'Amber Sweet'

An interesting property in these taxa as well as in the hedge buckthorn species is the coincidence of flowering and fruiting, when the first flowers in May produce fruits, which ripen in June–July, and flowering continues until late autumn. Depending on the climatic conditions and variety, having on the same plant flower buds, flowers, green fruits and ripe fruits, like citrus fruits. Due to this particularity, the fruit is harvested every 3-4 days during the fruiting period. These varieties are hardy and vigorous, prefer warm, sunny places. It reacts positively to moisture, but the root system does not withstand stagnant water and surface water. Even in the driest periods, only 1-2 waterings per week are necessary. It behaves loyally with any type of soil, it prefers light soils with pH - 6-8. We conclude that the researched varieties are unpretentious to the type of soil, resistant to drought and frost. Goji shrub very well multiplies generatively, but the varieties do not inherit the qualitative biological capacity, for this reason vegetative multiplication is applied - by cuttings, drajons, marcots and *in vitro*. The most widespread and effective method was multiplication by meristem culture and less by lignified, semi-lignified cuttings collected in early spring and summer. The yield of the rhizogenesis process depends on several factors: the age of the donor plant, the younger the donor plant, the greater the rooting capacity, the fertilization of the soil around the donor plants, which stimulates the rooting process of the cuttings, the light that favors rooting of cuttings. The water regime, it is necessary to maintain high values of both the air and the substrate.

Preferable to plant on light soil, if the soil is heavy, then the pits are dug bigger and in this case the plants do not suffer [5]. The main factor is the pH, which should be from weakly acidic to strongly alkaline. The semi-intensive plantation requires 1000-1200 units per hectare, but the intensive one - about 3000 plants. The planting scheme is 2x2 or 2x3 m depending on the soil care mechanism. Gojis have strong, branched roots, so it is necessary that the pits are 20 cm deep and 30-40 cm wide for better development of the root system. Young plants, in the first years, require irrigation and fertilization with nitrogenous mineral or fermented organic fertilizers. The operations of cutting and cleaning the plants are the most important, and flowering and fruiting depend on them. The first cuts are recommended from the first year after planting. At the height of 60-80 cm the top is removed to allow the development of lateral branches, after which the branches are removed for a length of 40-50 cm from the ground to form an obvious

mono-stemmed trunk if desired. The tip of the lateral branches is cut to obtain a plant as branched as possible. In the following year, the plant must have about 6 main branches (the skeleton) arranged 2 in 3 floors, the rest of the branches must be removed. From the third year, the plant is only cut horizontally, thus forming a tree-shaped structure with several floors. Sun rays and air currents easily penetrate into such a crown favoring a higher productivity of the plant. The optimal period for cutting and cleaning dry branches is late autumn - early spring, when the plant is at rest, 1 kg of fruit is obtained per bush, and productivity will increase. The distinctive feature of this species is the gradual ripening of the fruits and their harvesting every 3-5 days. The main enemy of the fruits are birds and underground rodents, therefore methods must be tested to avoid being devoured. Fruits are frozen or stored in dry, well-ventilated rooms for their gradual drying and not artificially dehydrated at high temperatures. The investigated taxa, such as the spontaneous species of *Lycium barbarum* L., their varieties and hybrids are resistant to diseases and pests. Powdery mildew is rarely possible in high humidity. Very rarely, lice can appear. Sanitary treatment is not necessary.

CONCLUSIONS

The researched varieties can be successfully used as fruiting, medicinal, honeydew, long-flowering and ornamental plants. Due to the high and varied content of bioactive products, sea buckthorn can serve as a domestic raw material for the food and pharmaceutical industry. The delicious, ecological fruits, with beneficial therapeutic effects, rich in precious biological substances, in the conditions of the Republic of Moldova ripen gradually from July to October depending on the climatic conditions. Varieties are multiplied by microcloning and vegetatively - by grafting, semi-lignified and lignified cuttings, in order to preserve the qualitative properties of the mother plant. In our conditions, microcloning was the most effective. Planting is carried out in autumn, in lands protected from strong winds and with groundwater at a depth greater than 1m. The land must be sunny, the more sun, the greater the quantity and quality of fruits, delicious and sweet.

The researched varieties are shrubs immune to diseases and pests, which do not need special maintenance, only the loosening of the soil, the administration of organic or mineral fertilizers every 2-3 years, and to preserve regular and uniform fruiting, some of the greedy overgrown shoots are liquidated.

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