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THE PECULIARITIES OF DEVELOPMENT AND MULTIPLICATION OF *SOPHORA JAPONICA* L. SPECIES IN THE REPUBLIC OF MOLDOVA

Abstract. In the present paper, the peculiarities of fructification and of reproduction, during the years 2012–2015, of *Sophora japonica* species from different green areas of the towns Chisinau and Orkhey, and also the perspectives of cultivation as an ornamental, melliferous and forestry plant in the reconstruction of the non-corresponding arboretums of the Republic of Moldova are described.

Key-words: *Sophora japonica* L., productivity, fruit, germinative capacity.

Introduction

Sophora japonica L. is an exotic species, native to China and Japan, from where it was introduced in America and Europe as ornamental and honey tree for gardens and parks. In the Republic of Moldova is cultivated in parks, green areas due to its ornamental characteristics during the whole growing season, as a highly resistant species (more than 4, 5) in polluted environmental conditions [1, 2], as a promising species for creating plantations for pharmaceutical purposes and as a melliferous plant. The flowers in pharmaceutics for extracting *rutin* and other biological active substances which are contained therein are used. The *rutin* has properties of vitamin P, increasing the resistance of the capillaries and reducing their permeability, it plays an important role in the hydric and ionic metabolism. The flowers in recipes relating to mixes of plants for obtaining a decoction necessary for the treatment the edemas are used. As a honey plant for the quantity of nectar between 0.5–1.0 mg/flower with an average concentration of about 40% glucides is appreciated [4]. The purpose of the present paper is to study the particularities of fructification of trees from different zones of Chisinau town and the elaboration of the multiplication technology of present species.

Material and Methods

As study subjects served the trees from which fruits and seeds were collected. Phenological observations were made according to the methodology [6], during the years 2012–2015. The collected seeds were cleaned by various methods, kept in different variants and treated according to the methodology [3]. Before the incorporation into the well loose soil, the seeds were treated with

hot water of 70 °C, with gibberellins (GA) solutions of 0.01% and 0.03%, and exposed for 24 hours. The sowing was carried out in spring, directly into seed beds. The fruits and seeds, collected during the year of study, were analyzed according to many morphological parameters.

Results and Discussions

The studied trees are about 40 years old, most of them possess large, dense crowns, grow and develop normally, reaching 25–30 m in height. In the heavy drought conditions of 2012, during the summer, an annual average growth of stems, reaching 40–45 cm; during the 2013–2015 years, a higher growth of stems, the average being 60 cm it was registered. The glabrous shoots are green, with prominent cushion-like swellings, but being scratched, emit an unpleasant smell. The buds are alternate, small, hairy, situated in the middle of the horseshoe-shaped scar, by three fascicular traces. The leaves are alternate, pinnate, consisting from 7 to 17 leaflets, at the end of the growing season reaching 11 to 25 cm in length. Leaflets are ovoid-shaped to lance-ovate, acute, broad cuneate to rounded at base, reach 2.5–5.0 cm in length and are closely appressed-pubescent. Flowers are greenish-white, relatively small (1.0–1.5 cm), fragrant, grouped in long panicles (35 cm), pyramidal, erect and terminal. Flowers are papilionaceous, with 5-toothed calyx, 5 greenish white petals, with yellow shades, which surround the 10 free stamens.

The species flourished in the first days of July and lasted until the first days of September. The fruits are some pods, bright green, fleshy, 5–10 cm long, polyspermous, narrowed between the seeds and indehiscent; the number of pods in one inflorescence was 20–30

units in 2012, but varied between 87–97 units in 2015. The seeds are ovate, black, reach 8–10 mm in length. It has been established that 1 kg contained 800 units in 2014, up to 1176 fresh fruits, harvested in November 2012. Trees prefer warmer areas, deep soils up to sandy-clay. It supports salty soils. This species is resistant to drought and smog, and grows best in sunny locations. It is appreciated for its flowers in large panicles, melliferous qualities, ornamental and decorative appearance, ensured by the soft green foliage, late flowering, distinguished shape of the fruits and the preservation of the copper-coloured pods on trees until spring. Begins to blossom and fructifies from the age of 5–7 years. Trees are growing rapidly and at 15 years of age reach 10 meters in height and 30 cm in diameter, maintaining their decorative qualities more than 50 years [5]. As a result of phenological observations on the growth and development of plants, obtained from seeds, treated and untreated, in the first and the second years, as well as on trees, taken in the study, from the green spaces of the towns Chisinau and Orkhey, that the trees have resumed their growth at the beginning of April and continued until November it was established.

The mature plants from the green spaces of Chisinau town flourished on 10.07.2014 (Railway Station), while the mature plants, which grew and developed in the Botanical Garden (Institute) of A.S.M. and the Dendrological Park (Arboretum) started flowering 7 days later (17.07.2014). The abundance of flowering on the plants was higher in the southern part of tree crowns and in the upper part of the trees, the number of flowers in inflorescences on the plants varied between 50–150 units. The phenological observations carried out by our team allow us to conclude that the abundance of flowering and fructification depends on the sum of temperatures and on the quantity of precipitations during that period. Depending on the soil conditions and on the age of trees, the number of harvested fresh seeds, contained in the 1 kg, varies between 800–1300 seeds. The productivity and the quality of the seeds have a close link to the climatic conditions during flowering and fruit set.

The mass of 1000 fresh fruits was 810–1300 g, but the weight of 1000 fresh seeds, extracted from pods ranged between 110–165 g. 1 kg contained 800–1235 freshly collected pods, from which were extracted 6061–9091 fresh seeds. The seeds, which were extracted freshly from the pods, were gathered after the frost and ranged between 9% and 35%. The

linking percent of the fruits gathered after the frost was approx. 50%. At the trees from the green spaces of the towns Chisinau and Orkhey, the number of pods in one inflorescence varied between 26–78 units. From those reported above, we can conclude that seed productivity and quality at the studied species were higher in 2013 and 2015 comparatively with 2012 and 2014. The data presented denote that the climatic conditions from 2013 had a positive impact on the process of ontomorphogenesis of the seeds. The weight of 1000 seeds was 155–165 g, comparatively with the 2014–2015 years, at the trees which grow and develop in different stationary conditions. The seeds were soaked in hot water (70 °C) and sown in pots, crates and seed beds. As a result of the seeds treatment with 0.01% solution of gibberellins, 0.03% of gibberellins and 0.01% of KMnO_4 , it has been established that the best variant was 0.03% solution of gibberellins. The percentage of germination of the seeds treated with 0.03% solution of gibberellins per 24 hours has reached 25–50%, whereas in the variant of hydrothermal treatment of the seeds it was 10–15%. In the first growing season, the height of plants, grown from seeds, treated hydrothermally and then grown in containers in substrate, slightly varied between 35–60 cm, accounting on average 50 cm, the length of the roots of first order was 15–30 cm, the average being 20 cm. The diameter of the plantlets, grown in containers, in the first year of vegetation, ranged from 15 to 30 mm, averaging 20 mm. In the first year of vegetation, the height of the plants, obtained from the seeds treated with 0.03% solution of gibberellins and grown in seed beds, according to the technology, varied between 35 and 182 cm, on average, 20 mm.

Conclusions

A distinctive peculiarity of the seeds treated with solution of gibberellins is that the seeds germination has been more uniform, the germination rate — higher (35–50%) and the growth of the plantlets — more intensive. The plants at the end of the first year of vegetation are characterized by a more developed root system, the diameter of the root-collar reaching 15–50 mm, and by a greater leaf area. The optimal and cost-effective option for obtaining qualitative and uniform seedlings of *Sophora* is when the seeds are kept in cold storage, soaked in hot water of 70 °C and then treated with 0.03% solution of gibberellins, applied for 24 hours.

1. *Sophora japonica* L. is a species resistant to drought and frost, and can be used as an ornamental plant, for

creating plantations for pharmaceutical purposes and as a melliferous plant.

2. The optimal and cost-effective option for obtaining qualitative and uniform seedlings of *Sophora* is when the seeds are kept in cold storage, soaked in hot water of 70 °C and then treated with 0.03% solution of gibberellins for 24 hours.

3. The distinctive peculiarity of the seeds treated with solution of gibberellins is that the germination of seeds has been more uniform, the germination rate — higher (35–50%) and the growth of the plantlets — more intensive. The plants at the end of the first year of vegetation are characterized by a more developed root system, the diameter of the root-collar reaching 15–50 mm, and by a greater leaf area.

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ОСОБЕННОСТИ ВЫРАЩИВАНИЯ И РАЗМНОЖЕНИЯ *SOPHORA JAPONICA* L. В РЕСПУБЛИКЕ МОЛДОВА

В настоящей работе рассмотрены особенности плодоношения и воспроизводства в период 2012-2015 гг. *Sophora japonica* из разных зеленых зон городов Кишенева и Орхей, а также перспективы выращивания в качестве декоративного, мелиорированного и лесного материала, используемого для реконструкции дендрариев Республики Молдова.

Ключевые слова: *Sophora japonica* L., продуктивность, плод, способность к прорастанию.

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ОСОБЛИВОСТІ ВИРОЩУВАННЯ І РОЗМНОЖЕННЯ *SOPHORA JAPONICA* L. У РЕСПУБЛІЦІ МОЛДОВА

У даній роботі розглянуті особливості плодоношення і репродукції *Sophora japonica* в період 2012-2015 рр., яка походить з різних зелених зон міст Кишенева і Орхей, а також перспективи вирощування в якості декоративного, меліорованого і лісового матеріалу придатного для реконструкції дендраріїв Республіки Молдова.

Ключові слова: *Sophora japonica* L., продуктивність, плід, здатність до проростання.