Scientific Papers. Series B, Horticulture. Vol. LXI, 2017
Print ISSN 2285-5653, CD-ROM ISSN 2285-5661, Online ISSN 2286-1580, ISSN-L 2285-5653

CHARACTERISTICS OF GROWTH AND DEVELOPMENT OF THE SPECIES *SPARTIUM JUNCEUM* L. IN THE REPUBLIC OF MOLDOVA

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Abstract

This article describes the characteristics of growth and development of the species Spartium junceum L. (weaver's broom, Spanish broom), which can be used in various branches of the national economy. The most effective method of propagation was sowing the seeds, which had been previously treated hydrothermally with hot water of 70°C for 16 hours and with 0.01% gibberellin solution for 24 hours, in trenches, in spring – in April or May.

Key words: *generative propagation*, *Spartium junceum L.*

INTRODUCTION

In relation to climate change, dangerous processes of vegetation degradation and worsening conditions for the development of woody plant species occur, making the continuous mobilization, conservation and rational use of biodiversity more necessary than ever.

The family *Fabaceae* L. includes trees, shrubs, subshrubs, perennial and annual grasses. Over 700 genera and 17,000 species, spread almost all over the globe, are part of this family.

The genus *Spartium* L. includes only one species. *Spartium junceum* L. (common names: weaver's broom, Spanish broom) was introduced in the Republic of Moldova in 1867 [1, 2]. Bast fibres extracted from this plant may be used as raw material for making thick fabrics and weaving baskets. This ornamental, melliferous shrub has been ranked "A" for its decorative qualities and can be cultivated in central and southern districts of Moldova, but, for unknown reasons, it isn't widely used. In the north of the country, this species is affected by low temperatures.

It is native to the Canary Islands and the Mediterranean Basin. That is why we decided to study the peculiarities of growth, development and reproduction of this species, in order to use it in various sectors of national economy.

MATERIALS AND METHODS

Plants of 5-6 years-old that grew and developed in the collection of the Botanical Garden (I) of the ASM from Chisinau served as research materials.

Phenological observations were carried out according to methodical indications [5], in 2013-2016. The seeds, collected in August and September, were stored differently, cleaned by various methods and treated according to the methodology [3]. Prior to the incorporation in fine loose soil, the seeds were treated with hot water of 70°C for 30, 60 minutes and 16 hours, until the water chilled, and with 0.01% and 0.03% gibberellin solution - for 24 hours. The seeds were sown in two periods, in February-March, in boxes, in greenhouses, in a mixture of soil, sand and peat in a ratio of 2:1:1, and in April-May, depending on climatic conditions. The fruits and seeds collected during the years of research were analyzed by several morphological parameters, in the Dendrology Laboratory of the Botanical Garden (Institute) of the ASM.

RESULTS AND DISCUSSIONS

***Spartium junceum* L.** is an evergreen shrub, which grows up to 2-3 m tall. Its stems are erect, cylindrical, light-green, glabrous and leafless or with few leaves. The leaves are

simple, narrow-lanceolate or lanceolate, glabrous or sparsely hairy, ephemeral, blue-green, 1-2.5 cm long. The growing season started, in 2014-2016, 10-15 days earlier than the multiannual average. The leaves developed in April-May (Table 1.). The stems remained green throughout the growing season until next spring. In the years of the research, the leaves fell in October. The flowers are papilionaceous, yellow, fragrant, 2-2.5 cm across, in erect terminal racemes. The calyx is bilabiate, the upper labium is double-toothed and the lower – undivided during flowering. The wings are longer than the keel (carina), the keel – acuminate or curved, the stamens – monadelphous, the anthers – hairy, the ovary – sessile, multiovulate, with linear style, slightly curved at the tip, elongated stigma. The fruits mature in August-September (Table 1).

Table 1. Phenological stages of the species *Spartium junceum* L.

Phenological stages	2013	2014	2015	2016
Bud swelling	18 April	1 April	6 April	2 April
Bud opening	20 April	9 April	25 April	10 April
Beginning of flowering	18 May	16 May	20 May	9 May
End of flowering	18 June	24 June	20 June	15 June
Beginning of fruit maturation	10 August	5 August	11 August	8 August
End of fruit maturation	10 September	3 September	6 September	5 September

The abundance of flowering and fruiting is in close correlation with the air temperature and the amount of rainfall during the respective stages. The flowers develop on annual shoots.

The fruits are polyspermous, linear pods, 4-8 (10) cm long and 0.5-0.7 cm wide, at first villous, then glabrescent. Depending on the climatic conditions in the years of research, the percentage of fruiting ranged between 48 and 65 %. Temperature fluctuations had a negative impact on the process of ontomorphogenesis of seeds and only half of them were viable, the rest - sterile. The viable seeds differed from the sterile ones in colour, size and weight.

Spartium junceum L. is an evergreen shrub, very decorative in the flowering stage, with fragrant flowers, which contain essential oil. It flowers and bears fruit from the age of 3-4 years. *Spartium junceum* L. grows fast in the first 3-4 growing seasons and reaches a height of 2 m, is light tolerant, drought resistant, grows on arid soils and develops well on slopes exposed to the sun. In cold winters, a part of the plant may be affected, but it recovers by producing root sprouts. After pruning, the number of shoots increases and the flowering stage starts later than usual. Hydrothermally treated seeds, sown in February-March in the greenhouse, germinated evenly in 15 days, while those sown in April-May germinated unevenly in 20-25 days. The germination of the seeds, treated with 0.01% gibberellin solution for 24 hours and sown in trenches, was more even and by 10-15% higher as compared to the untreated seeds. The 0.01% gibberellin solution influenced positively the germination capacity of seeds and the germination percentage, in the years of research, constituted 85-90%.

Before sowing, the seeds had been soaked in hot water for 16 hours, until the water cooled. Transplanting the 5-7 cm tall seedlings, obtained from the seeds sown in February-March, did not give the expected results. The seedlings obtained from seeds treated with hot water for 16 hours had a less developed root system as compared with those obtained from seeds treated with gibberellin. The seedlings obtained from seeds treated with 0.01% gibberellin solution for 24 hours, sown in trenches, in April-May, reached a height of 30-35 cm, by the end of the growing season, and had a well-developed root system.

These seedlings were planted in loose soil. The survival rate of seedlings was about 80-90%, depending on climatic conditions and compliance with the technology in the years of research. The weight of 1000 fruits was 350-420 g and the weight of 1000 seeds ranged between 14 and 30 g.

Analysing the data from Table 2, we can conclude that the fluctuations in temperature and the amount of rainfall in the years of research, 2013-2014, had a negative impact on the morphological parameters of fruits: the percentage of fruiting, the share of seeds in the mass of fruits, the number of viable seeds in a fruit. The lowest percentage of fruiting was recorded in 2015.

Table 2. Morphological characteristics of fruits of *Spartium junceum* L.

Morpho-biological characteristics	2013	2014	2015	2016
Weight of 1000 fruits, g	350	420	400	380
Weight of 1000 seeds, g	14	30	18	22
Share of seeds in the mass of fruits, %	4.0	7.14	4.5	5.8
Seed diameter, mm	4.0	3.0	4,0	4.0
Number of seeds in a fruit, units	11	15	12	16
Fruiting percentage, %	60	65	48	50
Peduncle length, mm	6.0	8.0	7.0	8.0
Fruit length, mm	75	73	65	81

The seeds were sown about 2 cm deep. The norm of pure and fertile seeds was 3-4 g per linear meter. Transplanting can be carried out in the first 2-3 growing seasons because the survival rate decreases by 40-50% as the plants get older. The well developed and deep root system hinders transplanting of mature plants in the field.

CONCLUSIONS

1. *Spartium junceum* L. is a heliophile, melliferous species, decorative in the flowering stage. It grows fast and is undemanding to soil, can be transplanted in the first 2-3 growing seasons.
2. The duration of the flowering stage of this shrub, the abundance of flowering and fruiting is in close correlation with the climatic conditions at the time.
3. The optimal method of propagation of *Spartium junceum* L. was sowing in spring, in April or May, the seeds that had been previously treated hydrothermally with hot water of 70°C for 16 hours and with 0.01% gibberellin solution for 24 hours.
4. *Spartium junceum* L. can be used as an ornamental plant in landscape architecture, planted in groups with other, taller species or along small alleys.

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