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THE PROPAGATION OF *REYNOUTRIA SACHALINESIS (*F.SCHMIDT) NAKAI BY NURSERY TRANSPLANT UNDER THE CONDITIONS OF THE REPUBLIC OF MOLDOVA

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Rezumat. Răsadurile de *R. sachalinensis*, obţinute în condiţii protejate, au fost transplantate în sectorul experimental al Laboratorului Resurse Vegetale, Grădina Botanică Naţională "Al. Ciubotaru" pentru a crea o mini-plantaţie cu scopul cercetări ulterioare ale particularităţilor biologice de creştere şi dezvoltare în condiţiile climatice ale Republicii Moldova. Răsadurile au fost plantate în teren deschis la începutul lunii aprilie, iar după 80-84 zile, acestea au devenit plante sănătoase, de 20 cm înălţime, cu 4-6 frunze adevărate. Plantele s-au aclimatizat uşor la condiţiile climatice ale Republicii Moldova.
Cuvinte cheie: *Reynoutria sachalinensis*, seminţe, semănat, răsad.

Abstract. Seedlings of *R. sachalinensis*, started in a nursery bed, were transplanted in the experimental sector of the "Plant Resources" Laboratory, of the "Al. Ciubotaru" National Botanical Garden (Institute), to establish a mini-plantation for the further research on biological features of development and growth under the climatic conditions of the Republic of Moldova. The seedlings were planted in the field in early April and, over 80-84 days, they developed into healthy plants, about 20 cm tall, with 4-6 true leaves. The plants have easily acclimatized to the environmental conditions of the Republic of Moldova
Key words: *Reynoutria sachalinensis*, seeds, sowing, seedlings.

Introduction

Sakhalin knotweed (*Reynoutria sachalinensis* (F.Schmidt) Nakai) has several synonyms: *Polygonum sachalinense* F.Schmidt ex Maxim, *Fallopia sachalinensis* (F.Schmidt) Ronse Decr.; *Pleuropterus sachalinensis* (F.Schmidt) H. Gross. [11]. It is a species in the order Polygonales, family Polygonaceae [2, 5, 6]. It is a perennial, herbaceous plant, tolerant to frost and heat. Due to its biological and physiological features, it can be recommended as a valuable plant, being one of the non-traditional forage crops, which produces fresh mass that can be easily ensiled alone or mixed with other plants [7, 8]. In the spontaneous flora, it occurs only in the far east of Russia (southern areas of Sakhalin and the Kurile Islands) and Japan [9]. Every year, it produces new shoots, which can grow about 3-4 m tall, it blooms and bears fruit. This species, under the climatic conditions of the Republic of Moldova, can be cultivated on the same land for more than 15 years. The plants grow and develop fast and can provide forage for a long period – from early spring to late autumn. Sakhalin knotweed biomass can be used to produce thermal energy and electric power [3, 4]. Transplanting is the technique of starting plants from seeds in an optimal

environment, such as a greenhouse or a protected nursery bed, and then replanting them in the final growing location. In addition to the possibility of obtaining early harvests, another advantage is a reduction of material and labour expenses when growing plants. In addition, the plants are found in the fields for 1-2 months less, and thus the land intended for growing the Sakhalin knotweed can be used for other purposes until planting [1].

Materials and Methods

The seedlings for transplanting were produced from seeds according to the traditional techniques. In the framework of the experiments, several variants of soil type, pH, density, humidity and light were tested and all the necessary maintenance work was done to support the development of vigorous seedlings to be replanted in open ground. According to the chosen methodology, the production of seedlings for transplanting consisted of several steps: - filling the cell trays with soil; - sowing; - covering; - irrigation; - covering the trays with plastic wrap and placing them in the greenhouse [10]. After the seedlings have emmerged, other steps followed: - care; - hardening.

The seedlings raised in the greenhouse, after acclimatization, were transplanted outdoors, namely, on the experimental plot of the Botanical Garden. The seeds used to produce seedlings were harvested in 2014 and 2019; before sowing, their germination capacity was checked and at that time it constituted 85-90 %.

Results and discussions

A B C

Figura 1. *Reynoutria sachalinensis*: A – seedlings in a tray; B – 55-day-old seedling; C – seedling transplanted in the field (90-day-old)

In the Republic of Moldova, *R. sachalinensis* reproduces vegetatively, by rhizome segments and by transplanting seedlings. In open field, at temperatures lower than +15, the seeds do not germinate, for this reason, the reproduction of this species by direct sowing is difficult to achieve. To plant the *R. sachalinensis* seeds, we used three types of seed starting mixes: 1 – chernozem (forest soil) with sand, in proportion of 60 % chernozem to 40 % sand; 2 – peat and ash; 3 – peat. The pH of the peat, in comparison with the mixes: peat +

ash and chernozem + sand, varied from 5.5 to 7 (from slightly acid to neutral). The cells of the trays were filled with the well-homogenized mixes and then the seeds were sown. To obtain seedlings of *R. sachalinensis* (Fig. 1), the seeds were sown by three in each cell, at a depth of 0.5-0.8 cm.

After covering them with another layer of seed starting mix, it was pressed down slightly, to pack the soil closer, and wetted with water heated at room temperature of about 20-22 C. Then, the trays were covered with plastic wrap to keep the moisture in for longer and to promote germination. The first seedlings sprouted 8 days after sowing. The cotyledons emerged at the soil surface on the 10th day. The first true leaf began to take shape 20-28 days after sowing and the second leaf appeared on day 35-40. From the appearance of the first true leaves, it is considered that the plants pass to the next stage of development – the stage of seedling life (Fig. 1). If in a single cell several seedlings had sprouted, the weakest looking ones were removed or replanted in other cells of the tray, where no seed had germinated.

Table 1. The biometrics of plants obtained from seedlings transplanted in open field

Period	Biometric parameters	Statistical parameters					
		Min.	**Max.**	**Average**	**Sx**	**δ**	**CV**
Planting	Height of the stem (cm)	14	18	16	±1,16	2	12,5%
	Number of internodes	-	-	-	-	-	-
	Number of ramifications	-	-	-	-	-	-
	Number of leaves	4	6	5	±0,58	1	20%
	Length of the leaves (cm)	3	4	3,4	±0,23	0,4	10,5%
	Width of the leaves (cm)	4	5	4,7	±0,17	0,3	6,4%
30 days after planting	Height of the stem (cm)	15	23	19,3	±3,93	6,8	35,2%
	Number of internodes	2	3	2,3	±0,39	0,67	0,29%
	Number of ramifications	-	-	-	-	-	-
	Number of leaves	6	7	6,3	±0,38	0,81	19,2%
	Length of the leaves (cm)	8	13	10,3	±1,51	2,62	0,3%
	Width of the leaves (cm)	7	10	8,7	±2,20	1,95	22,4%
55 days after planting	Height of the stem (cm)	33	50	41,7	±4,48	8,38	20%
	Number of internodes	5	8	6,7	±0,41	0,71	0,11%
	Number of ramifications	1	2	1,7	±0,29	0,5	29,4%
	Number of leaves	7	9	8	±0,58	1	15,5%
	Length of the leaves (cm)	10	17	14	±2,09	3,61	25,6%
	Width of the leaves (cm)	8	14	11,3	±1,82	3,15	27,8%
90 days after planting	Height of the stem (cm)	40	62	51,7	±6,30	10,9	21,1%
	Number of internodes	10	12	11	±0,58	1	9,1%
	Number of ramifications	2	4	3	±0,58	1	33,3%
	Number of leaves	9	11	10	±0,58	1	10%
	Length of the leaves (cm)	13	18	15,3	±1,37	2,37	15,5%
	Width of the leaves (cm)	9	16	12,3	±2,31	3,99	32,5%
130 days after planting	Height of the stem (cm)	64	80	71,3	±4,24	7,34	10,3%
	Number of internodes	10	15	12,3	±2,16	3,73	30,3%
	Number of ramifications	3	5	4	±0,58	1	25%
	Number of leaves	18	25	21,3	±2,12	3,66	17,2%
	Length of the leaves (cm)	14	20	17	±1,73	3	17,6%
	Width of the leaves (cm)	10	16	13,3	±1,69	2,92	21,9%

Note: Sx – standard error; δ –standard deviation; CV – coefficient of variation

This was done to provide enough space and nutrients for each seedling to grow and develop a strong root system. To prevent transplant shock, the seedlings were hardened off by gradually exposing the trays to the outdoor environment over 10-12 days before the transplant date.

From the moment of sowing the seeds until the seedlings were ready to be transplanted to the final place, it took about 80 - 85 days. When transplanting seedlings in open ground, the age and quality of the seedlings should be taken into account, that is, they should be normally developed, with strong and healthy roots, with dark green leaves, without spots on the leaves and free of pests. At the time when the seedlings were replanted, their height was about 18-20 cm, of which 4-6 cm was the length of the roots, the segment from the root collar to the base of the root; they had 4-6 leaves with the length between 3,8-4,5 cm and the width of 3,5-3,8 cm (Tab.1). The seedlings were fixed well in soil, planted in 20-25 cm deep holes, in straight rows, at even distances between seedlings of 0.7 / 0.7 m.

After a period of 30 days from planting, the plants reached a height of about 13-20 cm above the ground and had 5-7 leaves. The length of the leaves varied from 8 to 10 cm, and the width – 6-8 cm. After 55 days, the plants were 33-50 cm tall and had 6-8 leaves and 5-8 internodes. In the same period, the 1st-order branches started growing from the nodes 4, 5 and 6; each of them developed 3-4 leaves. The lower part of the stem lignified and became brown. After 90 days of development in open field, a growth dynamics was observed at all biometric parameters analyzed. The height of the plants was 51,7±6,30 cm, the maximal number of leaves – 11, the length of the leaves was 15,3±1,37 cm and the width – 12,3±2,31 cm. The number of internodes increased (10-12) and the maximum number of lateral ramifications was 4.

After 130 days, the height of the plants was 71,3±4,24 cm. The number of leaves doubled (21,3±2,12). All the analyzed parameters indicated an intense growth rate, both for the seedlings obtained from seeds harvested in 2014 and from 2019. At the end of October, when the average temperature was +8...+ 10°C, the leaves of the plants turned brown and, in November, they fell definitively from the shoots, thus the growing season ended.

Conclusions

The data on the techniques of production of *Reynoutria sachalinensis* planting material will be used for further research on the biological features of this species. These techniques will help setting up productive plantations, with minimal loss during plant propagation and plantation establishment stages. The propagation of this species by direct seeding in open field is not possible under the climatic conditions of the Republic of Moldova. By transplanting seedlings raised in a nursery, in 2-3 months, we get viable plants with healthy roots, which adapt easily to outdoor conditions. This method does not require special care for the land, except for the weed removal during the first period of plant growth.

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