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GROWTH AND DEVELOPMENT OF *RUTA GRAVEOLENS L.* DEPENDING ON THE METHOD OF MULTIPLICATION

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ABSTRACT. During the period 2002-2004 a study on the possibilities for cultivation of the species *Ruta graveolens* was carried out. Plant seedlings were used as a generative material, which was produced both from seeds and through in vitro techniques. The study was carried out in the experimental field of the Institute of Plant Genetic Resources – Sadovo. The phenology and the performance of some morphological traits were established. The results show that the plants grow successfully under cultivation. More intensive plant growth and development was established in the plants reproduced through *in vitro* techniques.
KEY WORDS. *Ruta graveolens*, plant growth and development, seed and *in vitro* multiplication

INTRODUCTION

The wild species *Ruta graveolens* is a perennial plant that belongs to the family *Rutaceae*. The plant characterizes by a strong unpleasant smell. The distribution of the species is restricted in our country, it can be found on dry rocky and stony sites (Kutanov & Vitkova, 1978; Petkov *et al*., 1982). It's included in the Bulgarian Data Red Book as rare species (Dakov *et al*., 1984).

The plants have a lot of branches and flowers and are used in the floriculture for planting (Stojanov, 1973; Thomas, 1992). Upper sprigs with the leaves and flowers possess medicinal properties. They contain biological active substances, which are used in the conventional medicine and in the homeopathy (Kleijnen & Knipschild, 1991). The main activities of the IPGR-Sadovo are collecting, studying and preservation of rare and endangered medicinal plant species (Dimitrova *et al*., 2001, 2002; Varbanova *et al*., 2001a;b).

The main objective of the present study is to establish suitable approaches for multiplication of the species as well as its conservation through cultivation.

MATERIAL AND METHODS

The study was carried out in the experimental field of the Institute of Plant Genetic Resources-Sadovo during 2002-2004 on maroon-wood soil type with pH 6,5. Plant seedlings were used as a generative material, which was produced both from seeds and through *in vitro* techniques. A three-years trial was conducted according to the block method, in 2 variants with 4 replications and plot size 5m². Field observations on the plant growth and development as well as morphological description were made.

RESULTS AND DISCUSSIONS

The observations show that there were differences between the phenological periods of the plants depending on the climatic conditions as well as the method of multiplication (fig. 1). Higher temperatures and lower humidity during the year of 2003 lead to the acceleration of the flowering period and the plants characterized by a prolonged flowering and vegetation periods (fig. 2). The result show that the plants grow better when the climatic conditions are more favourable – warm and dry climatic conditions. Differences were observed also in the phonological periods in the individual variants. The plants that were reproduced from seeds have late flowering period and their vegetation period is shorter than those of plants reproduced through *in vitro* techniques.

The results from the morphological characters of the plants show that their values are influenced in higher degree from the years of the investigation and comparatively low from the method of multiplication (tabl. 1).

According to the results, more significant differences were observed in the plant height and width as well as in the number of branches. Comparatively stable were the following traits: stem width, length and width of the leaves. The method of multiplication does not cause morphological differences regarding to the stem width and the characters of the leaves.

The plants that were reproduced through *in vitro* techniques are taller, wider and have more branches per plant than those grown up from seeds.

The results show that the formation of branches depends more strongly on the climatic conditions than from the method of multiplication. The climatic conditions during the months May – April in 2004 (high temperatures and low humidity) were favourable for increasing the number of branches (V1 – 9,2 and V2 –10 number branches) (fig.3). The plants reproduced through *in vitro* techniques formed more branches than those reproduced from seeds both during the two experimental years.

A great variation in the plant traits was established. Most significant differences were established in the plant height during the year 2004 – the difference between *min* and *max* values were respectively 17 cm for V1 and 24 cm for V2. The same trait was comparatively stable between both methods of multiplication during the year 2003. The similar results were obtained during the year 2004 according to the plant width (D=9 cm for V1 and 14 cm for V2) and the number of branches (D=7 for V1 and 3 for V2). More stable and with a little variation between plants were the following traits: diameter of the plant stem and the leaf stem.

CONCLUSIONS

1. The plants of *Ruta graveolens* reproduced from seeds characterized by a slower growth than those reproduced through *in vitro* techniques.
2. The performance of morphological traits shows that the species has a good adaptability for introducing as a crop under the climatic conditions of the town of Sadovo.
3. The plants that were reproduced through *in vitro* techniques characterized by better growth and development than those reproduced from seeds.

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Table 1. Morphological traits of *Ruta graveolens* L. plants (2003/2004)

Year	Variant	Plant			Plant stem		Leaf stem		*Leaf*	
		Height (cm)	Width (cm)	Number branches	Length (cm)	Diameter (cm)	Length (cm)	Diameter (cm)	Length (cm)	Width (cm)
	V-1									
2003	**x**	**21,6**	**30,3**	**3,4**	**11,6**	**2,0**	**2,6**	**0,2**	**7,4**	**5,5**
	max	23,5	30,5	4,0	13,1	2,3	5,1	0,3	8,5	6,5
	min	19,2	24,5	3,0	7,0	0,8	2,0	0,2	6,2	5,0
	D	4,3	6,0	1,0	6,1	1,5	3,1	0,1	2,3	1,5
2004	**x**	**62,6**	**74,6**	**9,2**	**14,0**	**1,7**	**4,0**	**0,2**	**7,5**	**4,4**
	max	86,0	78,0	12,0	15,0	2,1	4,2	0,2	8,5	5,5
	min	69,0	69,0	5,0	9,0	1,1	3,2	0,2	6,5	4,0
	D	17,0	9,0	7,0	6,0	1,0	1,0	0,0	2,0	1,5
	V-2									
2003	**x**	**31,7**	**35,1**	**6,0**	**13,6**	**2,0**	**3,6**	**0,2**	**8,2**	**7,4**
	max	36,5	36,5	7,0	15,4	2,4	4,5	0,3	9,5	9,5
	min	28,5	32,0	5,0	12,3	1,6	2,5	0,1	6,4	5,8
	D	8,0	4,5	2,0	3,1	0,8	2,0	0,2	3,1	3,7
2004	**x**	**77,0**	**75,2**	**10,0**	**18,8**	**1,8**	**4,2**	**0,2**	**7,8**	**5,9**
	max	92,0	82,0	12,0	20,5	2,2	5,2	0,3	8,5	6,4
	min	68,0	68,0	9,0	13,0	1,4	3,4	0,2	6,8	3,3
	D	24,0	14,0	3,0	7,5	0,8	1,8	0,1	1,7	3,1

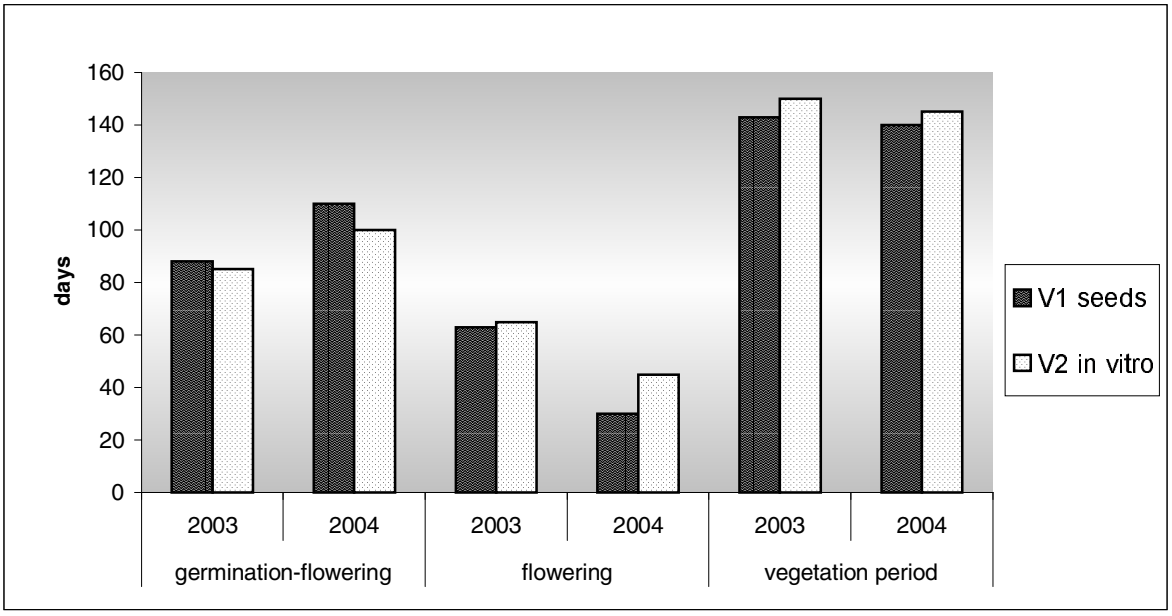

Figure 1. Phenological periods in *Ruta graveolens* L. plants (number days)

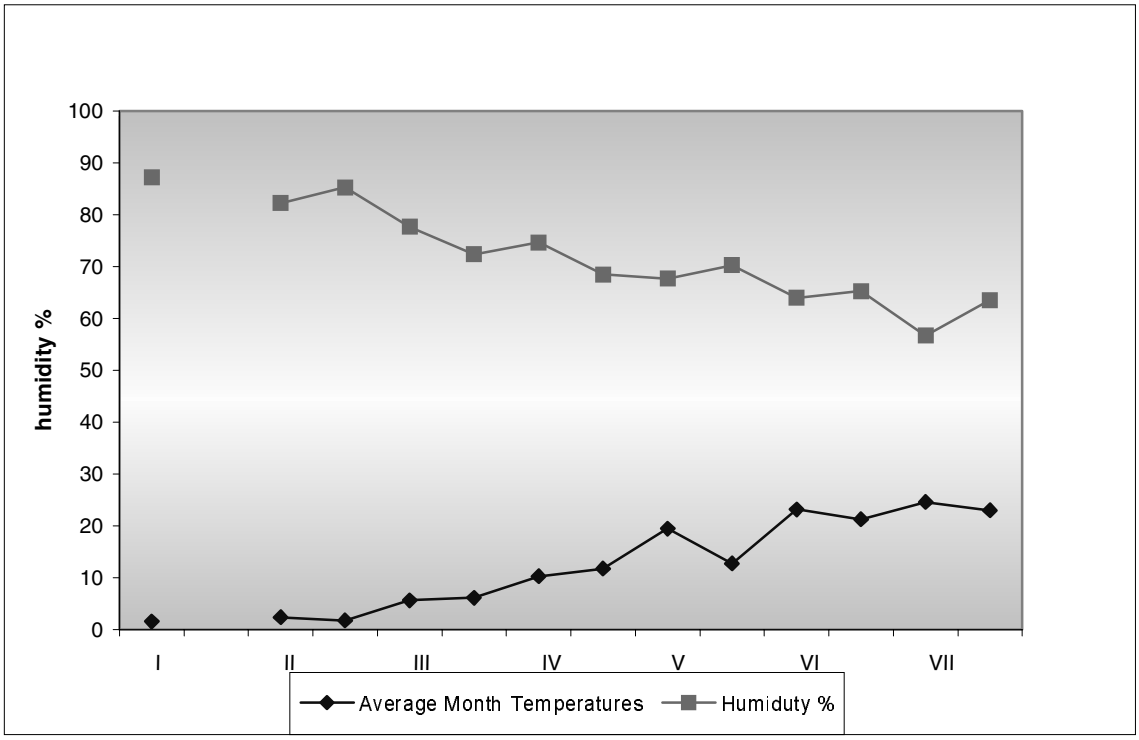

Figure 2. Climatic data during the vegetation period in the region of Sadovo (2003)

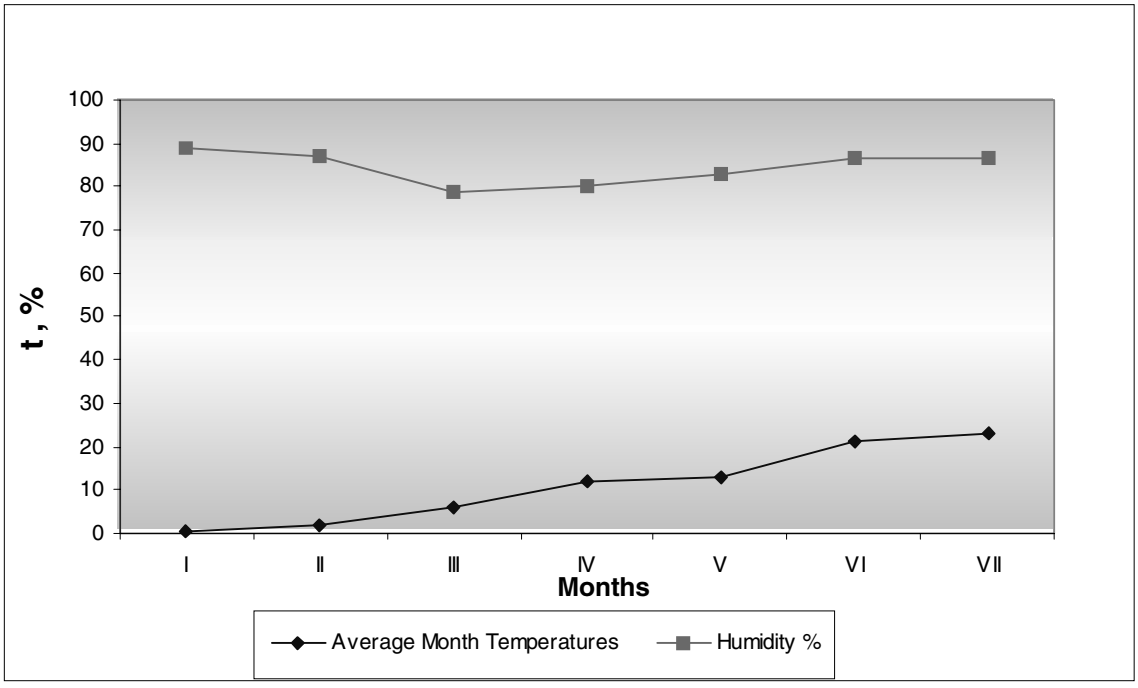

Figure 2. Climatic data during the vegetation period in the region of Sadovo (2004)