A STUDY ON THE SEED GERMINATION AND PLANTLES SPRING AT RHUBARB SPECIES (*RHEUM RHABARBARUM* L.)

STUDII ASUPRA GERMINAȚIEI SEMINȚELOR ŞI RĂSĂRIRII PLANTELOR DE REVENT (*RHEUM RHABARBARUM* L.)

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Abstract. *Seed germination and plantlets spring at rhubarb species were studied in the standard conditions on a peat substrate. Results revealed that the germination rate was of 90%, and spring rate was of 82%. Germination period had 12 days, starting in the 7-th day of experiment, and the spring was done in 10 days.*
Key words: rhubarb, cultivar, seeds germination

Rezumat. *Germinația semințelor şi răsăririi plantelor de revent au fost studiate în condiții standard de lucru, pe un strat de turbă. Rezultatele arată că rata de germinare a fost de 90%, iar cea de răsărire de 82%. Germinația a durat 12 zile, începând cu a şaptea zi de la semănat, iar răsărirea a avut loc în 10 zile.*
Cuvinte cheie: rubarbă, cultivar, germinarea semințelor

INTRODUCTION

The culture of rhubarb in Romania has a tradition less developed and less known (Ciofu *et al.*, 2004). The establishment of this culture is the key to promoting the rhubarb, with the knowledge of how to use this herb in the human nutrition (Stan *et al.*, 2003; Henriksen and Bjorn, 2004).

The knowledge regarding germination helps us define and calculate seed cultural value and the knowledge regarding the emergence process provides information on seed strength, as well as on germ ability to evolve into seedlings (Munteanu and Falticeanu, 2008).

As biological material for the establishment of a culture, there can be used seedlings or cutting roots (Ivanova, 1975; Frenz and Lechl, 1977). The process of getting seedlings requires some knowledge on the processes of rhubarb seed germination and the way in which plant emergence arises. Responding to this need, in this paper we proposed as objective the study of rhubarb seed germination.

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MATERIAL AND METHOD

The biological material in this experiment is the seeds of rhubarb.

The substrate germination was red composted peat, with the adjusted pH to 6.5 and eutrophized according to the standards of a manufacturing company.

The study of seed germination – the determination of seed germination and plant emergence was necessary to have enough information to assess seeds quality.

The germination temperature varied between 20-22^{o}C, the humidity was approximately 70% (68-71%), and the light had an intensity of 3000 lux (Stan and Stan, 2010). During experimentation they have not been made any additional watering. The ventilation was automated for the regulation and equalise of ambient temperature germination.

The evaluation of the germination and emergence of seeds and plants was carried out using the following indicators: the rate of germination / emergence, growth rate of germination / emergence, the velocity coefficient and the velocity of germination and germination / emergence.

From the start of plant emergence observations and determinations have been made about the dynamics of emergence until the moment when 2-3 consecutive measurements showed the same number or percentage of emerged plants (fig. 1).

Fig. 1 Plant emergence (original photo)

The germination rate is the percentage of emerged plants every day in part or percentage of plants emerged from one day to another.

The velocity of germination (the germination velocity or speed of germination) represents the percentage of germinated plants per unit of time (day) and is calculated using the following formula:

$V_G = \frac{Gi}{n}$, where:

G_i = germination at a certain date;

n = number of days in which germination was achieved Gi

The coefficient of germination velocity represents the germination velocity relative to the final germination of seeds and it is calculated using the following formula:

$CV_G = \frac{Gi}{Gf \cdot n}$ x 100, where:

G_i = germination at a certain date;

n = number of days in which germination was achieved Gi

G_f = the final germination.

RESULTS AND DISCUSSIONS

Results of seed germination and emergence of rhubarb seedlings.

The study of rhubarb seed germination and emergence of seedlings has highlighted a number of elements relevant for the planting rhubarb production technology.

The results obtained are presented analytically in table 1.

The seeds germination began after seven days from sowing (from 07/02/2013) and lasted four days, up to 11.02. From a total of 150 seeds the germination process by that date began only for 135 seeds, so a rate of 90%. The rate of 50% was achieved in the first observation germination (7.02), when, in fact, the percentage of germinated seeds was 65%.

Table 1

Results regarding the germination and plant emergence on a peat substrate (150 seeds, sown on 1.02.2013)

Indicators		Date of observation and calculations calendar													
		7.II	**8.II**	**9.II**	**10.II**	**11.II**	**12.II**	**13.II**	**14.II**	**15.II**	**16.II**	**17.II**	**18.II**	**19.II**	**20.II**
Germination rate	number	98	115	131	133	135	135	135	135	135	135	135	135	135	135
	%	65	77	87	89	90	90	90	90	90	90	90	90	90	90
Emergence rate	number	-	-	-	17	29	45	63	78	112	116	120	123	123	123
	%	-	-	-	11	19	30	42	52	75	77	80	82	82	82
Velocity germination		9,3	9.6	9.7	8.9	8.2	7.5	6.9	6.4	6.0	5.6	5.3	5.0	4.7	4.5
Velocity emergence		-	-	-	1.1	1.7	2.5	3.2	3.7	5.0	4.8	4.7	4.6	4.3	4.1
Germination velocity coefficient (%)		10.3	10.7	10.7	9.9	9.1	8.3	7.7	7.1	6.7	6.3	5.9	5.6	5.3	5.0
Emergence velocity coefficient (%)		-	-	-	1.34	2.11	3.05	3.94	4.53	6.10	5.87	5.74	5.56	5.26	5.0

The germination dynamics, for entire period of observations, from 1.02 to 20.02 is graphically represented in figure 2, from which we may observe an increase in the germination rate from the first observation made (7.02) until the maximum germination rate of 90%, registered on 11.02. The data from the table, as a graphic representation, after three consecutive observations, starting from 11.02, demonstrates that the germination stopped and therefore the rhubarb seeds from the Local population had a germination of 90%.

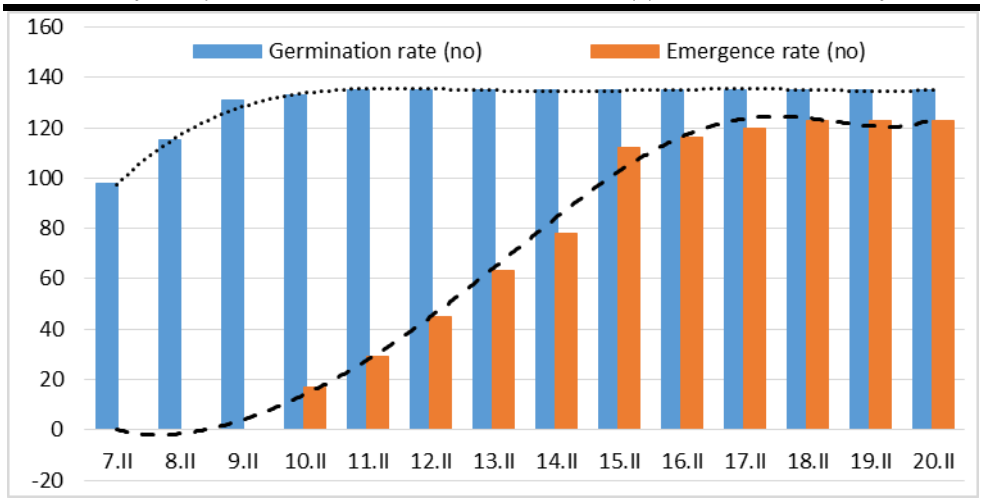

Fig. 2 The graphic representation of the germination and plant emergence rate

The analysis of germination speed, expressed by the velocity of germination, shows that it increases from 9.3 from the first observation (7.02), up to 9.7 at the third observation, then it decreases to 8.2 when germination has the maximum value (fig. 3).

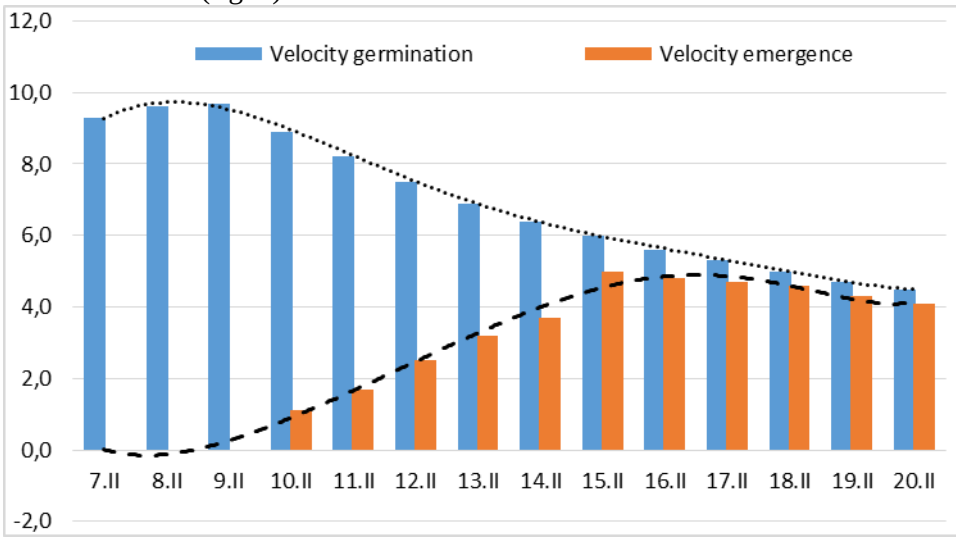

Fig. 3 The graphic representation of the germination and plant emergence velocity

So, under these circumstances rhubarb germination begins after seven days and lasts for 10-11 days, which allows us to state that rhubarb is a plant with rapid germination, for example, like species from the class of cabbages.

The coefficient of velocity of germination has values ranging between 9.1% germination of 10.7%. These figures confirm a high rate of germination,

sprouting like species with a relatively early germination. For example, these values are comparable (or even superior) to tomatoes, to which Stan (2010) reports a maximum coefficient of 8.96% for peat substrate. For the values on germination rate from the first day, the ratio is 10.3% and in the next two days reaches the maximum value of 10.7%, but in the day of 11.02 while recording the final germination 90%, the velocity ratio has a value of 9.1%, a value which indicates the high speed of germination (fig. 4).

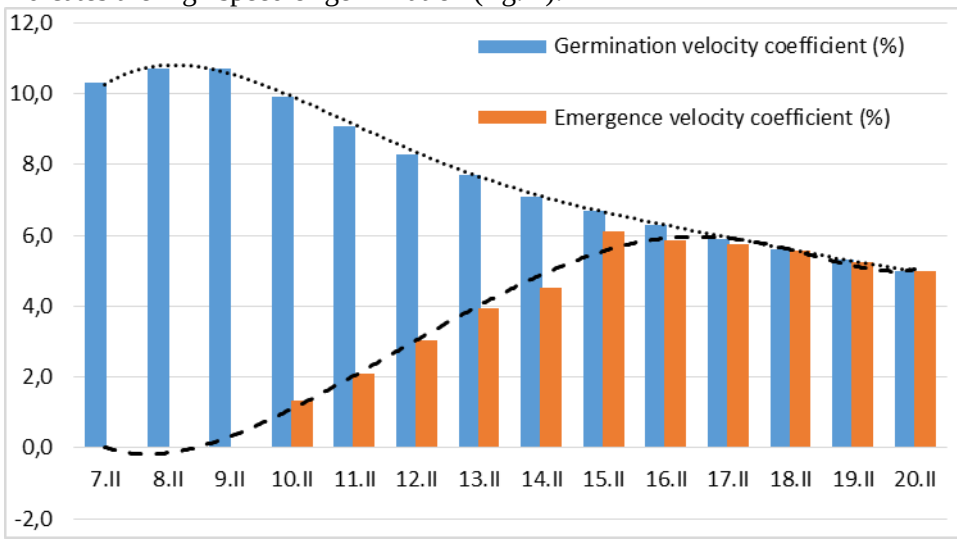

Fig. 4 The graphic representation of the germination and plant emergence velocity Coefficient

The characterization of plant emergence on a peat substrate results analytically from table 1.

The plant emergence starts from the tenth day from sowing, respectively from the fourth day from germination. I have considered the plant to be emerged if it already has the two primary leaves above the soil surface.

The plant emergence lasts quite some time, that is eight days, and starting from the ninth day, a maximum number of emerged plants is registered, meaning 82%. The plant emergence has an ascending rhythm, starting from 11% until 82%, compared with the total number of seeds placed for germination. Compared with the germination, which has a 90% rate, the plant emergence has a rate of 82%, which means that 8% of germs did not have the capacity to reach emergence.

The speed of emergence is relatively small at the beginning of the emergence period and it reaches values of over 50%, after the fifth day from emergence, respectively eight days at the beginning of germination and 14 days from sowing. The velocity grows from 1.1, in the first day, to up to 5.0, after 15 days from the moment when the seeds have been placed for germination.

The velocity coefficient, which offers us an image taking also into account the final percentage of emerged plants, has quite small values during the first days, which results into a small emergence, starting from values of 1.34% up to 6.10%, in the 15th day from sowing and 6th day from the onset of emergence, respectively.

The results presented demonstrate a fast germination (4-5 days), but the emergence is slower – 8-9 days, which shows that the germ, as well as the seed, has a more reduced emergence force, exposing the seedlings for more time to possible adverse factors.

CONCLUSIONS

1. The seed germination started from 7 days from sowing (on 7.02.2013) and lasted 4 days, until 11.02, which shows that the rhubarb is a plant with fast germination.

2. The plant emergence starts from the 10th day from sowing, respectively the 4th day from germination. I have considered the plant to be emerged if it already has both cotyledons above the soil surface.

3. The results presented demonstrate o fast germination (4-5 days) but the emergence is slower – 8-9 days, which shows that the germ, as well as the seed, has a more reduced emergence force, exposing the seedlings for more time to possible adverse factors.

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