QUANTIFYING THE INFLUENCE A SOME DIFFERENT ORGANIC SUBSTRATES ON SEED GERMINATION OF *ORIGANUM VULGARE* L.

CUANTIFICAREA INFLUENȚEI UNOR SUBSTRATURI ORGANICE ASUPRA GERMINĂRII SEMINȚELOR DE *ORIGANUM VULGARE* L.

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Abstract. *Germination is one of the most important technological phase, in order to get a quality harvest. Knowing that the oregano seeds presents a low germination, this study aims to find the best organic substrate whose formula is best suited to a level as high germination. Thus, there was used seven soil mixing formulas which have in their composition, peat, manure, perlite and sand in different proportions. Quantifying the influence of organic substrates on seed germination of oregano was estimated through the rate of germination (emergence, dynamic of germination rate, dynamic of germination velocity and germination velocity coefficient).*
Key words: *Origanum vulgare*, germination, organic substrates

Rezumat. *Germinația este una dintre cele mai importante secvențe tehnologice in vederea obținerii unei recolte de calitate. Ştiut fiind că semințele de oregano prezintă un grad scăzut de germinare, acest studiu îşi propune să găsească cel mai bun substrat organic, al cărei formulă să fie optim pentru un nivel de germinare cât mai ridicat. Astfel, s-au utilizat şapte formule de amestec, având în componența lor turbă, mraniță, perlit şi nisip în diverse proporții. Cuantificarea influenței substraturilor organice asupra germinării semințelor de oregano s-a estimat prin prin rata de germinare (răsărire, dinamica ratei de germinare, dinamica velocității de germinare şi a coeficientului velocității de germinare).*
Cuvinte cheie*: Origanum vulgare*, germinație, substraturi organice

INTRODUCTION

Many studies made, such as Putievsky (1983) and Thanos et al. (1995), the germination of different species of *Origanum*, have confirmed their low germination capacity. This was previously observed by Theophrastus (371-287 B.C.), in his *Historia Plantarum*, who observed that the maximum percentage and germination speed were obtained under certain conditions, seeds germination in 62% of the five days.

Importance of sowing beds on the seed germination is well known (Stan and Stan, 1999) and have recently confirmed (Stan et al., 2008). In this respect, our studies are targeted on the influence of different organic soil mixing formulas on the oregano seed germination.

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MATERIAL AND METHOD

Experience was organized as a bifactorial type (3Ax7B) and was conducted in the Vegetable growing laboratory of University of Agricultural Sciences and Veterinary Medicine from Iasi, using oregano seeds from different origins (Romania, Italy and Greece).

Factor A was the cultivar, while factor B was the substrate of cultivation. Factor A consists in three unnamed cultivars from Romania, Italy and Greece. Factor B consist in sven combination of mixtures between peat, manure, perlit and sand. Mixtures were placed in sterile Petri dishes. In each Petri dish were sown with 100 seeds.

After sowing, the dishes were placed in germinator (SANYO MLR Germinatorul 351 H), ensuring oregano seed germination conditions (temperature, humidity, light). Thus, the temperature fluctuated between 22°C and 24°C, humidity ranging between 70-80%, and the light was about of 10.000 luxes, especially in the second part of the experience. Germination for all three cultivars was compared with standard germination (germination carried out at Inspectorate for Seed Quality from Iasi. Germination and emergence substrates are detailed in tabel 1:

Table 1

Substrates used in the study of the influence on the process of germination of the oregano seeds

Crt. no.	Variant	Specification	Composition of nutrient substrates (% volumetric)
1.	V_1	T_{100}- peat	100% peat
2.	V_2	$T_{75}+M_{25}$	75% peat +25% manure
3.	V_3	$T_{75}+N_{25}$	75% peat +25% sand
4.	V_4	$T_{75}+P_{25}$	75% peat +25% pearl stone
5.	V_5	$T_{70}+M_{20}+N_{10}$	70% peat +20% manure +10% sand
6.	V_6	$T_{70}+M_{20}+P_{10}$	70% peat +20% manure +10% pearl stone
7.	V_7	$T_{50}+M_{20}+N_{10}+P_{10}$	50%peat +20%manure +10%sand+10%pearl stone

Influence of nutritional substrates mixtures of crop was assessed by the rate of germination (emergence, growth rate of germination, growth velocity of germination and germination velocity coefficient). Velocity of germination (germination velocity or speed of germination) represents the percentage of germinated plants per unit time (day) and is given by:

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

G_i = germination in the time unit;

n = number of days the germination was achieved G_i.

Coefficient of germination velocity is velocity final germination compared with germination of seeds and is calculated (after Kotowski, 1926, cited by Stan, 2010):

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

CV_G = coefficient of germination velocity;

G_i = germination in the time unit;

G_f = final germination;

n = number of days the germination was achieved G_i.

In the assessment methods used in the study recognized and germination, in the present study we treated emergence of germination, emergence and appreciated that when the seed/soil strains surfaced about 0.5 to 0.7 mm.

RESULTS AND DISCUSSIONS

Dynamics emergence of oregano plants was strongly influenced by the composition of substrates (table 2). Start the process of emergence seeds was 3-4 days after sowing. Looking through the growing subtrates of crop was observed that the most important influence in Italy seeds was V_4 (T_{75}+P_{25}) where the germination percentage was 89%.

In second place, in the three categories of seed, was the nutritive substrate of peat 100%. The mixture V_5, the composition which is peat, manure and sand has led a number of seed germination considerably higher, whose Italian origin is (87%).

Table 2

Dynamics of germination/emergence of oregano seeds (population of Romania, Greece and Italy)

Variant		Dates / Germination rate (%)							
Specification	**Country**	**20.03**	**21.03**	**22.03**	**23.03**	**24.03**	**25.03**	**26.03**	**Total**
T_{100}	Romania	2	17	14	14	6	2	5	60
	Greece	4	14	20	18	1	1	12	70
	Italy	6	35	29	10	2	2	3	87
T_{75}+M_{25}	Romania	2	17	23	12	2	3	23	82
	Greece	2	15	20	22	5	3	0	67
	Italy	6	23	25	13	9	1	4	81
T_{75}+N_{25}	Romania	1	13	13	13	4	5	4	53
	Greece	6	12	13	7	1	1	7	47
	Italy	5	32	24	2	9	5	5	82
T_{75}+P_{25}	Romania	0	8	19	6	5	2	9	49
	Greece	1	13	18	16	2	2	0	52
	Italy	2	25	25	5	17	7	8	89
T_{70}+ M_{20}+N_{10}	Romania	6	6	9	4	0	1	15	41
	Greece	2	12	21	25	3	1	8	72
	Italy	3	26	47	2	4	1	4	87
T_{70}+ M_{20}+P_{10}	Romania	5	8	15	16	2	0	4	50
	Greece	2	7	30	17	5	1	6	68
	Italy	1	25	20	7	6	3	7	69
T_{50}+M_{20} +N_{10}+P_{10}	Romania	3	3	21	8	4	8	13	60
	Greece	0	12	31	9	4	0	2	58
	Italy	2	26	22	8	4	4	3	69

For the Romanian origin seeds the same substrate is in last place, with a germination percentage of only 40% as opposed to those of Greek origin where he obtained a value of 72%.

Table 3

Emergence velocity dinamics of oregano plants
(population of Romania, Greece and Italy)

Variant		Emerge-nce plants	v/cv*	Dates/velocity/velocity ratio							
Specif.	Coun-try			20.03	21.03	22.03	23.03	24.03	25.03	26.03	av.
T_{100}	Ro.	60	v	0,66	4,75	6,6	7,83	7,57	6,87	6,66	5,84
			cv	1,11	7,91	11	13,05	12,61	11,45	11,11	9,81
	Gr.	70	v	1,33	4,5	7,6	9,33	8,14	7,25	7,77	6,56
			cv	1,9	6,42	10,85	13,33	11,63	10,35	11,11	9,37
	It.	87	v	2	10,25	14	13,33	11,71	10,25	9,33	10,12
			cv	2,29	11,78	16,09	15,32	13,46	12,06	11,11	11,73
$T_{75}+M_{25}$	Ro.	82	v	0,66	4,75	8,4	9	8	7,37	9,11	6,75
			cv	0,81	5,79	10,24	10,97	9,75	8,99	11,11	8,23
	Gr.	67	v	0,66	4,25	7,4	9,83	9,14	8,37	7,44	6,72
			cv	0,99	6,34	11,04	14,67	13,64	12,5	11,11	10,04
	It.	81	v	2	7,25	10,8	11,16	10,85	9,5	8,55	8,58
			cv	2,46	8,95	13,33	13,78	13,48	11,88	11,11	10,71
$T_{75}+N_{25}$	Ro.	53	v	0,33	3,5	5,4	6,66	6,28	6,12	5,88	4,88
			cv	0,62	6,6	10,18	12,57	11,85	11,55	11,11	9,21
	Gr.	47	v	2	4,5	6,2	6,33	5,57	5	5,22	4,97
			cv	4,25	9,57	13,19	13,47	11,85	10,63	11,11	10,58
	It.	82	v	1,66	9,25	12,2	10,5	10,28	9	8,5	8,77
			cv	2,03	11,28	14,87	12,88	12,54	11,73	11,11	10,92
$T_{75}+P_{25}$	Ro.	49	v	0	2	5,4	5,5	5,42	5	5,44	4,1
			cv	0	4,08	11,02	11,22	11,07	10,24	11,11	8,39
	Gr.	52	v	0,33	3,5	6,4	8	7,14	6,5	5,77	5,37
			cv	0,64	6,73	12,3	15,38	13,73	12,5	11,11	10,34
	It.	89	v	0,66	6,75	10,4	9,5	10,57	10,12	9,88	8,26
			cv	0,74	7,58	11,68	10,67	11,87	11,37	11,11	9,28
$T_{70}+M_{20}+N_1$	Ro.	41	v	2	3	4,2	4,16	3,57	3,25	4,55	3,53
			cv	4,87	7,31	10,24	10,16	8,7	7,92	11,11	8,61
	Gr.	72	v	0,66	3,5	7	10	9	8	8	6,59
			cv	0,92	4,86	9,72	13,88	12,5	11,11	11,11	9,15
	It.	87	v	1	7,25	15,2	13	13,66	10,37	9,66	10,02
			cv	1,14	8,33	17,47	14,94	13,46	11,92	11,11	11,19
$T_{70}+M_{20}+P_{10}$	Ro.	50	v	1,66	3,25	5,6	7,33	6,57	5,75	5,55	5,1
			cv	3,33	6,5	11,2	14,66	13,14	11,5	11,11	10,2
	Gr.	68	v	0,66	2,25	7,8	9,33	8,71	7,75	7,55	6,29
			cv	0,98	3,3	11,47	13,72	12,81	11,39	11,11	9,25
	It.	68	v	0,33	6,25	9	8,66	8,28	7,62	7,55	6,81
			cv	0,49	9,19	13,23	12,74	12,18	11,21	11,11	10,02
$T_{50}+M_{20}+N_{10}+P_{10}$	Ro.	60	v	1	1,5	5,4	5,83	5,57	5,87	6,66	4,54
			cv	1,66	2,5	9	9,72	9,28	9,79	11,11	7,58
	Gr.	58	v	0	3	8,6	8,66	8	7	6,44	5,95
			cv	0	5,17	14,82	14,94	13,79	12,06	11,11	10,27
	It.	67	v	0,66	7	10	9,66	8,85	8,25	7,44	7,4
			cv	0,99	10,44	14,92	14,42	13,21	12,31	11,11	11,05

Comparing these results with those obtained from Inspectorate of Seed Quality Iasi, the inspectorate results were significantly lower in all three cases analyzed. Thus, germination of seeds from Italy determined was 63%, Greek seed representative result was only 46% and the Romanian seeds was 10 percent higher. During emergence of monitoring emergence that the highest rate of germination occurs within days of the beginning emergence. An important step of germination rate can be easily seen in variants V_1 (T_{100}-turbă) and V_2 (T_{75}+M_{25}) from the fourth day. Dynamics of emergence or "acceleration" of the oregano plant emergence, the regions of Greece and Italy have numbers higher than in this country, which was in close correlation with the particular requirements for temperature, but with some specific biological features.

Emergence velocity and coefficient of velocity were favorably influenced by the presence in all recipes and nutritional mixtures of peat, in different quantities, which were substrates for germination/emergence the oregano seeds.

A suggestive comparison of velocity coefficient values belonging the seeds of Greek and Romanian origin, is that the seeds of Greek origin values are between 9 and 10, unlike those whose origin is Romanian, where the range of values is more generous.

The aspect we show that the seeds of Greek origin have a more uniform emergence on the one hand, and a more obvious germination, on the other parte.În this experience, it seems that a positive for both varieties presented so far, has the composition of the nutrient, which is peat and manure (T_{75}+M_{25}). Very good results were recorded, especially if seeds of Italian origin from the second day, with a peak in the third day. Dynamics of average values of velocity of emergence falling from 6.81 plants/day, the V6 (T_{70}+M_{20}+P_{10}) to 10.12 plants/day, nutrient substrate composed of peat 100%. Clearly, this time, the speed of seed germination of oregano, Italian provenance amplitude shows a much higher average values seen in parallel with the other two varieties analyzed during this study. Velocity coefficient of dynamic emergence presents a similar evolution velocity, both from variant to the variant, but also in terms of seed origin. It may be noted that emergence best results were achieved by the entire experience, in order, the following: V_1 (CV=11.73 %), V_5 (CV= 11.19%) şi V_7 (CV=11.05%). The average value for all period of emergence of velocity coefficient of these variables ranged from 7.58% at version V_7 (T_{50}+M_{20}+N_{10}+P_{10}) for seeds of Romanian origin and 11.73% at V1 (T_{100}) for seeds from Italy.

CONCLUSIONS

1. From this study show that adding peat and manure the nutrient substrate causes an increase in both the average rate of germination and emergence. They are highest values in the early days, and are greatly diminished over time reaching a few percent in the last days of emergence, which shows a good uniformity of emergence.

2. Emergence velocity and velocity ratio were favorably influenced by the presence in all recipes and nutritional mixtures of peat, in different quantities, which were substrates for germination/emergence of the oregano seeds.

3. It notice that the velocity coefficient values are generally the same dynamic path, as velocity. This is possible in the final emergence has values close to all variants.

4. In this experience, it seems that a positive effect varieties in Greece and Romania present a nutritiv mixture, in the composition of which is peat and mraniță (T_{75}+M_{25}) and the crop substrate composed of peat 100% only seed from Italy.

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