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COMPARATIVE STUDY OF SEED GERMINATION OF TARAXACUM KOK-SAGHYZ RODIN AND TARAXACUM OFFICINALE WIGG. PLANTS IN LABORATORY CONDITION

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ABSTRACT

The article reveals the results of the study of seed germination of Taraxacum kok-saghyz Rodin and Taraxacum officinale Wigg. plants at different temperatures. The optimal temperature was determined for seed germination having considered biological peculiarities of Taraxacum kok-saghyz. On the basis of the results obtained, the seeds were suggested to be sown in open fields in the territory of Bustonlik district of Tashkent region.

Keywords: Taraxacum, seed germination, optimal temperature, cotyledon.

1. INTRODUCTION

Implementation of the task on increasing the nutritional value of food products in the world, as well as creating new types of products is leading to an increase in demand for a wide range of medicines and spices. In turn, one of the most crucial issues of today is to meet the demand for raw materials of medicinal plants at the expense of locally grown plants and to establish their export.

According to S.N.Kutuzova [1], Taraxacum kok-saghyz Rodin is one of the most promising and cost-effective plants. By its biological properties, it contains latex, rubber and inulin. In particular, rubber was found at 4-11% (25% under favorable conditions) and inulin up to 45% in kok-saghyz content.

Natural rubber is used in the automotive industry (in the manufacture of tires), while latex is used in the manufacture of hypoallergenic gloves, inulin is widely used in food and pharmaceuticals. It can be seen that the biological properties of *Taraxacum kok-saghyz* Rodin are high enough.

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The study of species of Taraxacum family vary in different countries and regions of the globe. In the study of data on species of Taraxacum family in scientific sources, it was found that in many countries there is a large-scale research of this plant, but in the Republic of Uzbekistan there is no specific research on the genus Taraxacum.

The seeds of medicinal dandelion from the genus Taraxacum do not have a dormancy period and can germinate immediately after shedding. The germination rate is 72–100%, so they do not accumulate in the soil [2]. During seed storage, initially the ability to germinate decreases slowly and then rapidly, especially sharply after 1,5 years of storage [2, 3]

During three years storage of seeds of *Taraxacum officinale* Wigg., seed germination was reduced by 88%. Seeds retain their viability in the soil for 20 months to 50 years [3, 4]. The seeds of the medicinal dandelion grow on the surface of the soil, as well as in shallow soils. Maximum germination occurs at 1,5 cm at 80% soil moisture, 3 cm at 60% moisture and 2,5 cm at 40%, 3 cm at 20% moisture [5].

T. kok-saghyz belongs to the family Asteraceae, which is mainly one of the endemic species in Kazakhstan. It is widespread in Kegen, Sarjas, Tekes and partly Karkara districts of Almaty region. It grows mainly at an altitude of 1800-2000 meters above sea level, in harsh continental climates, in saline soils [6, 7].

Based on the above data, for the introduction of *T. kok-saghyz* in the territory of Uzbekistan, acclimatization studies have been conducted in the laboratory and experimental fields of Tashkent State Agrarian University to study the germinability of the seeds of this species and its further extensive use in the food and pharmaceutical industries.

2. MATERIALS AND METHODS

The research aims to study seed germination of *T. kok-saghyz* Rodin and *T. officinale* Wigg. plants in the laboratory at different temperatures, as well as preparation for sowing them in the open field. Seed germination analysis was carried out using a method developed by the Research Institute of Botany at the Academy of Sciences of the Republic of Uzbekistan. The determination of the seed germination of plants and other laboratory experiments were conducted at the Department of Ecological Safety in Agriculture and Botany of Tashkent State Agrarian University.

3. RESULTS AND DISCUSSION

Seeds of *T. kok-saghyz* Rodin and *T. officinale* Wigg. plants were sown by 40 pieces in a Petri dish in the laboratory condition at a thermostat temperature +12-13°C on 19.08.2019 in 3 variants (Fig. 1, 2).

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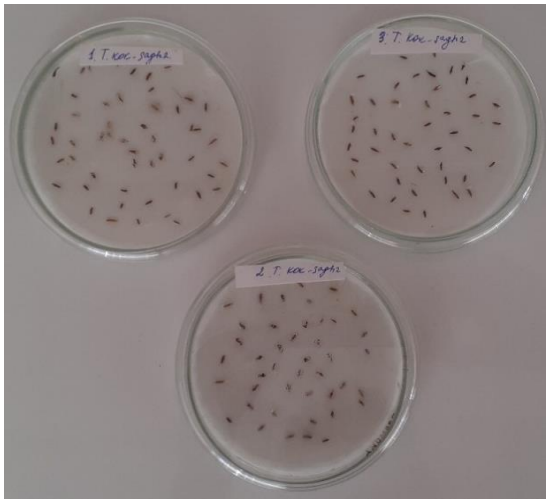

Fig. 1. The view of the seeds of *Taraxacum kok-saghyz* Rodin.

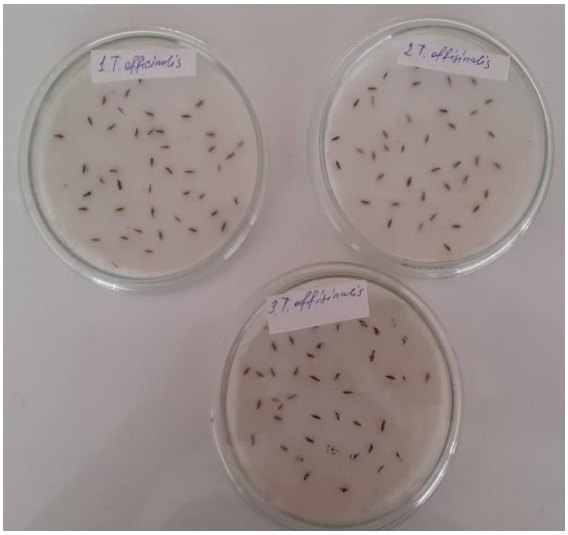

Fig. 2. The view of the seeds of *Taraxacum officinale* Wigg.

As can be seen from Table 1, on 22 August *T. kok-saghyz* sprouted by 1 seed from the seeds of the 1st and 2nd variant in Petri dish, while 4 seeds germinated from the seeds of the 3rd variant in Petri dish. No seed germination was observed in *T. officinae* Wigg. plant. On 23.08. at thermostat temperature +12-13°C, 11 seeds formed root out of 40 seeds in Petri dish in the 1st variant, 12 seeds had roots in the 2nd variant, while in the 3rd variants 10 seeds formed roots. In *T. officinale* Wigg. plant 3 seeds germinated in each 3 variants. On the day 24.08, 25 seeds germinated in *T. kok-saghyz* Rodin plant in the 1-and 2nd variants, while in the 3rd variant 30 seeds germinated. In case of *T. officinale* Wigg. plant, 16 seeds germinated in the 1st variant, 8 seeds in the 2nd, and 15 seeds in the 3rd variant. On the day 25.08, 30 seeds germinated in each 1 and 2nd variants, while in the 3rd variant 34 seeds formed roots. In the 1st and 3rd variants of *T.*

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officinalis Wigg. 30 seeds sprouted, and in the 2nd variant 15 seeds sprouted. On the day 26.08, in the 1st and 2nd variants of *T. kok-saghyz* Rodin plant, 38 seeds germinated out of which 4 seeds formed cotyledon sprouts in the 1st variant, in the 2nd variant 7 seeds formed cotyledon sprouts in Petri dish. In the 3rd variant 39 seeds germinated in Petri dish out of which 4 seeds had sprouted cotyledons. In the 1st variant of *T. officinale* Wigg. plant, 27 seeds germinated in Petri dish, and 2 out of them formed cotyledon. In the 2nd variant 21 seeds sprouted, and 2 seeds out of them formed cotyledons. 28 seeds germinated in the 3rd variant and 3 out of them made cotyledons.

On the day 27.08, I the 3rd variant of *T. kok-saghyz* Rodin plant the seeds also sprouted, 17 seeds formed cotyledons in the 1st variant, 16 in the 2nd variant and 20 seeds had cotyledons in the 3rd variant. The seeds of *T. officinale* Wigg. plant of 29 pieces germinated, out of which 5 made cotyledons, in the 2nd variant 26 seeds germinated of which 4 formed cotyledons, in the 3rd variant 32 seeds sprouted of which 5 formed cotyledons. On the day 28.08, seed germination of *T. kok-saghyz* Rodin plant was 100%. In the 1st variant of *T. officinale* Wigg. plant 34 seeds germinated, of which 19 seeds made cotyledons, while in the 2nd variant 30 seeds sprouted, of which 10 formed cotyledons. In the 3rd variant 35 seeds germinated, and 18 seeds out of them made cotyledons.

Table 1 .Seed germination rate of *Taraxacum kok-saghyz* Rodin and *Taraxacum officinale* Wigg. plants (at thermostat temperature +12-13 °C)

Plant	**Observation dates**									
T. kok-saghyz Rodin	19.08	20.08	21.08	22.08	23.08	24.08	25.08	26.08	27.08	28.08
The 1st variant	-	-	-	1	11	25	30	38	39	40
The 2nd variant	-	-	-	1	12	25	30	38	39	40
The 3rd variant	-	-	-	4	10	30	34	39	39	40
T. officinale Wigg	19.08	20.08	21.08	22.08	23.08	24.08	25.08	26.08	27.08	28.08
The 1st variant	-	-	-	-	3	16	20	27	29	34
The 2nd variant	-	-	-	-	3	8	15	21	26	30
The 3rd variant	-	-	-	-	3	15	20	28	32	35

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Fig. 3. Germination process of seeds of *Taraxacum kok-saghyz* Rodin plant.

According to the analysis presented in table 2, on the day 4.09 the seeds of *T. kok-saghyz* Rodin and Taraxacum officinale Wigg. plants were laid by 16 pieces in Petri dish at thermostat temperature +5-6 ℃ in two variants in laboratory condition. On the day 11.09, *T. kok-saghyz* Rodin plant seeds in the 2nd variant in Petri dish resulted one seed germination, in remaining variants no germination observed. In the seeds of the *T. officinalis* Wigg plant, 1 seed sprouted from the seeds in the Petri dish of variant 2, and no seed germination was observed in the seeds of the remaining variants, but the seeds in the variants were swollen from their previous state. On the day 12.09, seed germination of Taraxacum kok-saghyz Rodin plant was not noted in the 1st variant. While in the 2nd variant 3 seeds sprouted. In all 3 variants of *T. officinalis* Wigg. plant, 1 seed germinated in each. On the day 13.09, 1 seed germinated in the 1st variant of *T. kok-saghyz* Rodin variant in Petri dish, while in the 2nd variant 4 seeds sprouted. In both variants of *T. officinale* Wigg. plant 2 seeds sprouted in each. On the day 14.09, no changes were observed in plants. On the day 15.09, in the 1st variant of T. *kok-saghyz* Rodin plant 2 seeds germinated when thermostat temperature was 6℃, while in the 2nd variant 5 seeds sprouted (Fig. 3).

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Fig. 4. Germination process of seeds of *Taraxacum officinale* Wigg.

The seeds of *T. officinale* Wigg. plant in the 1-2nd variants germinated by 4 seeds. On the day 16.09, 4 seeds of *T. kok-saghyz* Rodin plant formed roots in the 1st variant, of which 1 formed cotyledon. In the 2nd variant 6 seeds germinated. From the seeds of *T. officinale* Wigg.plant in the 1st variant 2 seeds formed roots, while in the 2nd variant 5 seeds made roots. Till the day 17.10, no changes were observed in the seeds of *T. kok-saghyz* Rodin plant. On the day 18.10, in the 1st variant of the plant 4 seeds formed roots, of which 1 seed formed cotyledon. From the seeds of the 2nd variant, 6 seeds formed roots, and 2 of them formed cotyledons. In the 1st variant of *T. officinale* Wigg. plant 3 seeds germinated, 12 seeds made cotyledons. While from the seeds of the 2nd varaint 5 seeds formed roots, of which 2 formed cotyledons. On the day 19.10, no changes were observed. From the day 20.10. to 24.10, 7 seeds of *T. kok-saghyz* Rodin plant germinated in the 1st variant, of which 3 seeds formed cotyledons, while in the 2nd variant 8 seeds formed roots, and 7 of them formed cotyledons. From the seeds of *T. officinale* Wigg. plant of the 1st variant, 4 seeds formed roots, out of them 3 made cotyledons. From the seeds of the 2nd varaint 5 seeds formed roots, 5 out of them formed cotyledons. On the day 25.10, thermostat temperature was raised to +7°C. However, no changes were observed. Then, the temperature was again raised to +8°C. On the days 27 – 29.10, from the seeds of *T. kok-saghyz* Rodin plant in the 1-2nd variants, 8 seeds had roots. In both variants of the plant *T.officinale* Wigg. 5 seeds had roots. As it is clear from the table-3 that on the days 30.10.-1.11, in both variants of *T. kok-saghyz* Rodin plant 9 seeds formed roots, while in both variants of *T. officinale* Wigg. plant also 9 seeds formed roots. On the day 2.11, from the seeds of *T. kok-saghyz* Rodin plant 9 seeds formed roots in the 1st variant, while in the 2nd variant 10 seeds had roots. No changes were observed in the state of *T. officinalis* Wigg. plant. On the day 3.11, from the seeds of *T. kok-saghyz* Rodin plant of the 1st variant 11 seeds, in the 2nd variant 15 seeds formed roots. From the seeds of *T. officinale* Wigg.plant of the 1st varaint 11 seeds, in the 2nd variant 9 seeds formed roots. On the days 4 – 6.11, the seeds remained without changes. On the day 7.11, when thermostat temperature was +8°C, 13 seeds of *T. kok-saghyz* Rodin plant germinated in the 1st

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variant, of which 7 formed cotyledons, and in the 2nd variant 15 seeds formed roots, of which 10 formed cotyledons. From the seeds of *T. officinale* Wigg. plant 10 seeds made roots in the 1st variant, 8 out of them formed cotyledons. While in the 2nd variant, 13 seeds had roots, of which 12 seeds formed cotyledons (Fig. 3, 4).

Table 2 .Seed germination rate of *Taraxacum kok-saghyz* Rodin and *Taraxacum officinale* Wigg. plants (at thermostat temperature +5-6℃)

Plant	**Observation dates**														
***T. kok-saghyz* Rodin**	4.09	11.09	12.09	13.09	14.09	15.09	16.09	17.09	18.09	20.09	19.09	21.09	22.09	23.09	24.09
The 1st variant	-	-	-	1	1	2	3	3	4	4	5	5	6	7	7
The 2nd variant	-	1	3	4	4	5	6	6	6	7	7	7	7	7	8
T. *officinalis* Wigg	4.09	11.09	12.09	13.09	14.09	15.09	16.09	17.09	18.09	20.09	19.09	21.09	22.09	23.09	24.09
The 1st variant	-	1	1	2	2	2	2	2	3	3	4	4	4	4	4
The 2nd variant	-	1	1	2	2	4	5	5	5	5	5	5	5	5	5

Table 3 .Seed germination rate of *Taraxacum kok-saghyz* Rodin and *Taraxacum officinale* Wigg. plants (at thermostat temperature +7-8℃)

Plant	**Observation dates**									
***T. kok-saghyz* Rodin**	25.09	26.09	27.09	28.09	29.09	30.09	01.11	02.11	03.11	04.11
The 1st variant	7	7	8	8	8	9	9	9	11	11
The 2nd variant	8	8	8	8	8	8	9	10	15	15
***T. officinale* Wigg**	25.09	26.09	27.09	28.09	29.09	30.09	01.11	02.11	03.11	04.11

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The 1st variant	4	4	5	6	8	9	9	9	10	10
The 2nd variant	5	5	5	7	8	9	9	9	9	9

Table 4 .Seed germination of *Taraxacum kok-saghyz* Rodin and *Taraxacum officinale* Wigg. plants

Germination temperature +℃	*Taraxacum kok-saghyz* Rodin	*Taraxacum officinale* Wigg
	Germination within 10 days (31 days)	Germination within 10 days
12-13	40	35
7-8	15	10
5-6	8	5

4. CONCLUSION

Despite the fact that we conducted the research for a year, we summarized the results of the observations and came to the following conclusion that +12-13℃ degree was found to be maximal temperature for *T. kok-saghyz* Rodin plant when seed germination rates of the plants. *T. kok-saghyz* Rodin and *T. officinale* Wigg. were observed by comparing them. Seed germination was 100% in *Taraxacum kok-saghyz* Rodin plant, while for *T. officinale* Wigg. plant the indication was 87%. At +7-8℃ temperature the seeds of *T. kok-saghyz* Rodin plant germinated for 93%, in *T. officinale* Wigg. plant for 62%. At +5-6℃ temperature this indication was 50% in *T. kok-saghyz* Rodin, in *T. officinale* Wigg. plant it made 31%. This temperature was considered a minimal temperature for the plants.

Analysis of the literature and the results obtained show that *T. kok-saghyz* Rodin seed germination has a high rate at all temperatures. The optimal temperature for seed germination is + 12–13℃. Taking into account the bioecological features of this plant, it can be said that it is suitable for the Bustonlik area of Tashkent region, and we recommend planting it in this area.

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