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Morphology and Germination Biology of Khorasan Asparagus (Onobrychis chorossanica Bge) Seeds

D. Khujakulov, A. Rabimov

Scientific Research Institute of Karakul Sheep-Breeding and Desert Ecology

Abstract: *The article provides information on the quality of seeds of Khurasan spartet, Onobrychis chorossanika Bge, which is a valuable nutritious plant, fertility in laboratory and field conditions, planting depth, methods of increasing seed fertility.*

Keywords: *nutritious plants, seeds, scarification, fertility, planting time, planting depth.*

Introduction. The territory of the Republic of Uzbekistan, located at an altitude of 500-1200 m above sea level, belongs to the hills, that is, the pre-mountain semi-desert region. This is 7.2% of the total land area. The soils of the region are pale gray soils, almost non-saline, humus content is relatively low (1-1.5%), nitrogen content is from 0.05% to 0.09%. The highest amount of carbonates is observed in the layers of the soil at a depth of 20-30 cm and 60-80 cm (up to 20%, taking into account the amount of lime). In the deeper layer there is a gypsum horizon. The vegetation cover of the lands up to 800 m above sea level consists mainly of ephemeroid and mixed herbaceous associations and forms thick turf. The hilly region of the republic includes the foothills of Tashkent, Fergana, Samarkand, Jizzakh, Surkhandarya, Kashkadarya regions. The economically based area of agricultural use of the lands of the sub-mountainous semi-desert region is pastoralism, and the pastures of the region are used almost all year round. In the hill pastures of Samarkand, Kashkadarya, Navoi, Jizzakh, and Surkhandarya regions, various breeds of sheep and goats, large horned livestock, and yearlings have been raised for several centuries. In desert-pasture animal husbandry, especially in cattle breeding, the main part (65-75%) of the animal's need for food is met at the expense of natural pastures. Hill pastures are characterized by a vegetation cover consisting of grass-forming ephemeral and ephemeroid plants, suitable for use in short seasons. Also, the productivity of the hill pastures varies dramatically, depending on the amount of precipitation in different years. The region has an average rainfall of 200-400 mm in different years, and in dry years the yield of pasture is 1.5-2.0 t/ha, while in wet years this indicator can be up to 4-5 t/ha. In the region, in different years, when the vegetation periods of ephemeral-ephemeroid species end, there is a shortage of nutrients in the pasture. In the autumn and winter seasons, the hill pastures do not have enough feed reserves. Therefore, livestock farms located in the Adir region are forced to feed their livestock by hand during the autumn and winter seasons, and for these purposes, there is a need to stockpile sufficient quality fodder. Local conditions are not guaranteed to create nutritious hay reserves. Hay is usually made from yantak plant in the hilly region. However, hayfields are not found in all lands and do not provide the opportunity to prepare the required amount of hay. Therefore, the intensification of feed production through the cultivation of plant species that are well adapted to growth in hilly conditions and allow obtaining high hay yields is one of the urgent problems.

Research sources and methods. The source of the research was the seeds of Onobrychis chorossanika Bge, which spread wildly in the hills of Kitab district of Kashkadarya region. Generally accepted methods in seed science [1,2,] were used in the study of quality indicators of seeds. In studying the

germination of seeds in laboratory conditions, 100 seeds were collected in Petri dishes in a thermostat at variable temperatures of 5-300 C in 3 repetitions. Fertilization of seeds in field conditions was studied by determining the number of grasses that germinated by sowing 100 seeds at different depths (1-5cm) in 3 replicates. Sandpaper was used for mechanical scarification of seeds.

Analysis of research results. One of the plants that grow in the climate of the hills and allows to collect a high yield of hay is Khorasan espartet. According to the data [3] (Mustafoev, 1982), the productivity of Khurasan espartate can be 163.7 centners of green mass or 41.64 centners of hay per hectare. Asparagus is a valuable nutritious plant belonging to the legume family. Their hay is well eaten by all livestock in all seasons, it contains 10-25% protein, 1.6-5.6% fat, and 20.9-34.5% fiber. [4,5,6] Unlike alfalfa, it does not cause tympanitis in livestock. Another important and valuable biological property of spartites is that they form nitrogen-fixing root nodules and enrich the soil with natural nitrogen, increasing soil fertility. Such nodules are more abundant in spartaceae than in other leguminous plants, including alfalfa.

Taking into account the above-mentioned valuable economic properties of Khorasan saffron, as well as the fact that it is wild in the Kitab hills, it is well adapted to growing in these soil and climate conditions, we conducted research in order to develop effective agrotechnical measures for its cultivation.

Khorasan asparagus seeds develop in kidney-shaped pods (Fig. 1).

Figure 1. Khorasan asparagus beans

The diameter of pods is 1.3 ± 0.09 mm, the mass of 1000 seeds is 14.2 g. Usually 1 seed is developed in a pod, and 20-25% of pods can have 2 seeds. Khorasan saffron seeds have the characteristic hardness characteristic of leguminous plants, which means that it can be classified as macrobiotic seeds, which means that their viability is preserved for a long time.

The following data were obtained during the study of the germination of Khorasan safflower seeds in laboratory and field conditions. In laboratory conditions, seeds were collected in a TS-80M thermostat at a variable temperature of 10-30oC. Different methods of treatment were used for the seeds before sowing: soaking the seeds without pods in water for 1-2 days, mechanical scarification of the pods (rubbing with sandpaper), control - seeds separated from the pods. The results of the experiment showed that soaking the seeds in tap water for 1-2 days ensured 28-29% germination, but the duration of the experiment was extended to 90 days. The results of the experiment are presented in Table 1.

Table 1. Fertilization of Khorasan safflower seeds under laboratory conditions

Experience options	Fertility, % and duration of experiment, days								
	10	20	30	40	50	60	70	80	90
Freezing a day	2,0	4,0	5,3	11,3	15,3	19,2	22,8	23.3	28.7
Freezing 2 days	2,0	7,1	7,2	9,0	15,0	22	22	29,0	29,0
Seeds isolated from pods (control)	16,0	32,0	35,0						
Seeds separated from the pods and mechanically scarified	86,6	96,6	100,0						

Fertilization was 35% in the variant whose seeds were separated from pods (control) and the duration of the experiment was 30 days, and the germination of mechanically scarified seeds reached 100% during 30 days. Mechanical scarification also ensured higher germination energy (86.6%

germination in 10 days). The analysis of the data obtained from the experiment shows that the seeds of Khorosan spartite are characterized by hardness, and mechanical scarification of the seeds before sowing (rubbing with sandpaper and crushing the seed coat) allows to increase their germination in laboratory conditions up to 3 times.

Fertilization of seeds in field conditions. In experiments to study the germination of seeds under field conditions, seeds were sown without separation from pods. In experiments to study the germination of Khorasan saffron seeds in field conditions, 100 seeds are sown at depths of 1, 2, 3, 4, 5 cm in each option, and the number of sprouted grasses is evaluated. The experiment was repeated 3 times. Data from this experiment are presented in Tables 2 and 3. As it can be seen from the data of Table 2, Khorosan espartate seeds have the feature of germination in all variants (1-5 cm deep). In 2021, which was relatively dry, the highest fertility was observed in options for planting seeds at 2, 3, and 4 cm depths, fertility at 2 cm depth was 10.0%, 15% at 3 cm, and 13.3% at 4 cm. At a depth of 1 cm, the permeability was only 5.3%, and at a depth of 5 cm, this indicator was 10.3%. In the 2022 experiments, seeds were sown at depths of 1, 2, and 3 cm. The obtained data (table 3) show that in 2022, when the amount of precipitation is abundant, the fertility rate will increase sharply in all options, and this rate will reach 28.6-35.3%.

Table 2. Fertilization of Khorasan safflower seeds at different depths, %.

Planting depth, cm	The number of sprouted grasses, pcs			M±m
	I	II	III	
1	4	7	5	5,3±1,9
2	10	9	11	10,0±0,8
3	15	14	16	15,0±0,8
4	12	15	13	13,3±1,9
5	9	12	10	10,3±1,9

Tabl 3. Fertilization of Khorasan safflower seeds at different depths, %

Planting depth, cm	Униб чиққан майсалар сони, дона			M±m	Liveability, %
	I	II	III		
1	30	29	27	28,6±1,9	28,6
2	27	30	25	27,3±5,2	27,3
3	35	38	33	35,3±5,2	35,3

Nevertheless, the highest fertility (35.3%) was observed in the option of planting seeds at a depth of 3 cm. Therefore, regardless of the time of year, it is advisable to bury the seeds at least 3.0 cm in order to achieve high fertility.

Viability of lawns. Turf viability was determined by comparing the number of existing plants in experiments planted in 2021 with the number of surviving turf in 2022 (spring) (Table 4). As can be seen from the data, it was found that the viability of lawns in the variants planted at different depths was much higher (72.6-95.0%) in the 2nd year of life. However, the highest viability was observed in options for planting seeds at a depth of 3 and 4 cm (90.3 and 95.0%, respectively). These data also indicate that the optimal depth of burying Khorasan espartet seeds in the soil is 3-4 cm.

Table 4. Viability of Khorasan safflower lawns, %

Planting depth, cm	The number of sprouted grasses, pcs (2021) M±m	The number of sprouted grasses, pcs (2022)	Яшовчанлиги, %
1	7,3 ± 1,9	5,3±1,9	72,6
2	11,6 ± 1,7	10,0±0,8	86,2

3	16,6 ± 3,5	15,0±0,8	90,3
4	14,0 ± 2,4	13,3±1,9	95,0
5	12,3 ± 1,9	10,3±1,9	83,7

Conclusion:

1. The analysis of available literature shows that Khurasan saffron is a drought-resistant, high-yielding, high-yielding, valuable pasture and hay plant, which is not inferior to alfalfa in terms of nutritional value, and it is desirable to cultivate it for the purpose of growing hay in hilly conditions.

2. Khorasan saffron seeds have very high sowing qualities, and in order to increase their fertility, it is possible to increase the fertility to 100% by mechanical scarification of the seeds separated from the pods using sand paper.

3. Fertilization of non-scarified seeds in field conditions depends on the arrival of the year and the depth of planting them in the soil.

It was observed that in a dry year, the highest fertility was 15.0-13.3% in the options where the seeds were buried at a depth of 3-4 cm. In years with abundant rainfall, this indicator was much higher, and the highest rate was 35.3% in the option where the seeds were buried at a depth of 3 cm.

4. The viability of grasses in the 2nd year of life was 72-95% in different options, the highest viability was observed in the option of sowing seeds at a depth of 3 cm (95%).

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