Creation of primary resources for creation of early, high-yield varieties of sesame for the northern regions of Uzbekistan

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Abstract. This article addresses a crucial concern regarding the limited availability of raw materials and the underutilization of alternative oil-bearing plants, which hampers the establishment of a robust and competitive environment. This issue has significant implications for broadening the production spectrum of diverse oil products and fostering a sustainable, accessible supply of high-quality vegetable oils for the population. To address this imperative need for a comprehensive and affordable range of vegetable oils, the creation of novel oilseed varieties assumes paramount importance. Such varieties must possess a constellation of traits, including high oil content, remarkable yield potential, resilience against various environmental stressors, suitability for export markets, and the capability to sustainably support primary and variety seed production. The focal objective of this research initiative revolves around assembling a diverse collection of genetic resources from across the globe. Specifically, the study seeks to gather 170 world collections of sesame varieties, alongside 122 locally adapted Tashkentsky varieties that have been regionalized within Uzbekistan. By consolidating this vast array of genetic material, the research endeavors to unlock new avenues for enhancing oilseed crop productivity, bolstering quality parameters, and establishing a foundation for progressive agricultural practices. This strategic endeavor embodies a critical step towards transforming the landscape of oilseed cultivation and production in Uzbekistan, ultimately paving the way for an augmented supply of healthful vegetable oils, economic vitality, and food security for the nation's populace.

Keywords. Sesame, world collection, local varieties, early fertile, fertile, large-seeded.

1 Introduction

Sesame (*Sesamum indicum* L.) is a versatile and economically important oilseed crop that holds a significant place in global agriculture due to its rich nutritional content and diverse industrial applications [1]. Among the myriad of oil-bearing plants, sesame stands out as an invaluable source of edible oil, protein, and other bioactive compounds that contribute to

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human health and well-being. With its adaptability to diverse climatic conditions, this crop has found a steadfast presence in various agroecological zones, including the northern regions of Uzbekistan [2].

The economic prosperity and dietary diversity of a nation significantly hinge on the availability of high-quality, locally-produced vegetable oils [3]. In Uzbekistan, as in many other countries, sesame holds immense potential as a vital contributor to the agricultural landscape, offering an opportunity to bridge the gap between demand and supply of edible oils [4]. However, to fully harness the potential of this crop and cultivate sesame varieties tailored to the specific agroclimatic conditions of the northern regions, it becomes imperative to create a robust foundation of primary resources [5].

The creation of early maturing, high-yielding varieties of sesame that are well-adapted to the northern regions of Uzbekistan requires a comprehensive approach that amalgamates genetic diversity, breeding methodologies, and meticulous agricultural practices. The development of such varieties can revolutionize local agriculture by augmenting sesame production, enhancing yield, and ensuring food security [6].

This manuscript aims to delineate the strategic initiative undertaken to create primary resources for the development of early, high-yield sesame varieties [7]. The focus of this endeavor is on collecting, evaluating, and harnessing the genetic diversity of sesame germplasm from diverse sources, including both regionalized varieties and global collections [8]. By meticulously assembling and analyzing this wealth of genetic material, we aim to lay the groundwork for a dynamic breeding program that targets the unique challenges and opportunities presented by the northern regions of Uzbekistan [9].

In this manuscript, we will elucidate the significance of sesame as a cash crop and its potential to address the growing demand for edible oils in Uzbekistan [10]. We will outline the objectives and methodologies behind the creation of primary resources, shedding light on the collection, evaluation, and characterization of sesame germplasm. Furthermore, we will highlight the anticipated outcomes and the potential impact of our research on the agricultural landscape of the northern regions, emphasizing increased sesame production, economic prosperity, and the overarching goal of achieving sustainable food security [11].

Through a comprehensive exploration of the creation of primary resources for early, high-yield varieties of sesame, this manuscript aims to contribute to the growing body of knowledge in plant breeding, agriculture, and sustainable development [12]. Our research endeavors to open new horizons for oilseed cultivation in Uzbekistan, fostering resilience, innovation, and agricultural growth that can propel the nation towards a future of agricultural prosperity and food self-sufficiency.

2 Materials and methods

The following phenological observations were made during the growing season: initiation of germination (10%), complete germination (75%), initiation of flowering (10%), complete flowering (75%), period of tuber browning (10%) complete browning (75%) [13]. The uniformity of each sample, i.e. general flatness, the shape and height of the stem, the degree of hairiness of the stem and leaves, the color of the plant, the size of the leaf, the color of the petals and pollen grains were determined. At the beginning of the maturation period, the following measurements and calculations were carried out on 10 plants [14]. The height of the main stem (cm), the number of side branches of the 1st, 2nd and 3rd orders, the number of panicles per plant, the average length of panicles and the number of seeds per panicle [15]. In laboratory conditions, the productivity of one plant, the weight of 1000 seeds was determined.

The research carried out on seed production - the State variety test of agricultural crops [16], and the biochemical composition of the seeds of the collection samples. The method of Ermakov, N.P.Arasimovich and others [4] and the statistical analysis and dispersion analysis of the obtained results were carried out and analyzed using the method of B.A.Dospekhov [3].

Before planting, ammophos was given at 200 kg per hectare. Cultivation and foliar feeding with micro and biofertilizers twice during the growing season. 2020 - 2022 years For the first time, 170 varieties of sesame from the National Gene Fund of the Research Institute of Plant Genetic Resources were studied for valuable economic traits in the climatic conditions of Khorazm region.

These samples of sesame are from various countries around the world, including: India, China, Afghanistan, Mexico, Turkmenistan, Uzbekistan, Armenia, Israel, Germany, Iran, Egypt, Ukraine, Yugoslavia, France, Russia, Pakistan, Hungary, Bulgaria, South Korea, Tajikistan, It was imported from Venezuela, Syria and Kenya and was studied for morphobiological and valuable economic characters during the entire growth period, and primary sources were selected for different aspects of selection (earliness, yield, fertility, large seed size, tolerance to heat and salt).

3 Results and discussion

The Tashkentsky 122 variety regionalized in Uzbekistan was used as a model for the sesame samples studied in the nursery of sesame collection samples. The growing period of this variety is 130 days in the conditions of Khorezm region in Uzbekistan.

When studying the height of the main stem in the plant, it was found that the height of the Tashkentsky 122 variety was 140 cm. In 120 of the 170 samples studied, the length of the main stem was from 100 to 138 cm, in 32 samples it was 150-176 cm, and in the remaining 18 samples it was found that it was 141-149 cm.

The height of plant stems is up to 100-127 cm in samples from Uzbekistan (k-23; k-27; k-29; k-78, k-86; k-86; k-90), Turkey (k-133; k-126; k-138; k-286) up to 117-125 cm in Ukrainian samples (k-304; k-305) 118-128 cm, Yugoslavian (k-307) 110 cm, Turkmenistan (k-408; k-251) ; k-1194) 110-128 cm, France (k-712) 124 cm, Afghanistan (k-753) 126 cm, Pakistan (k-833) 124 cm, Mexico (k-849) 122 cm, Peru (k- 866) 120 cm, Hungary (k-896; k-908; k-920) 117-119 cm, Korea (k-1157; k-1362; k-1363) 122-128 cm, Tajikistan (k-1287) 122 cm, Mexico (k-1336) 123 cm, Kenya (k-1369; k-1371; k-1373) ; k-1375; k-1382) 117-122 cm, Spain (k-330) 121 cm, Venezuela (k-1435), Israel (k-41) 127 cm.

According to the VIR methodology, according to the duration of the growing season of the pea crop: vegetation period 90-100 days; the mid-vegetation period is 100-110 days; The period of mid -season vegetation is 110-120 days 120-140 days of late vegetation period is conditionally allocated. It is known that in irrigated lands, the dead water period of sesame varieties is extended by 10-15 days.

Early and mid-season samples were not distinguished from the samples involved in the research. In the middle of the evening, 5 samples were selected. These include k-78 (Uzbekistan), k-330 (Spain), k-695 (Turkey), k-866 (Peru), k-1371 (Kenya) and k-222 (Israel) samples, the growth period of these samples is 115 day and ripened 15 days earlier than the sample (Table 1).

The number of side branches in the selected samples was on average from 2 to 4, and this indicator was 4 pieces in the sample Tashkentsky-122 variety. The height to the first spikes was 28 cm in 330 k-866 (Spain), 29 cm in (Peru), k-1371 (Kenya) samples, 34 cm in k-78 (Uzbekistan) and 30 cm in k-695. It was noted that it was equal to 48 cm.

Table 1. Valuable economic characteristics of the samples selected for early ripening.

Sample	**Origin**	**Growing period, day**	**Number of side branches**	**1st loop, cm**	**Number of pods**	**1 plant productive league, g**	**Weight of 1000 seeds, g**
St-122	Uzbekistan	130	4	48	76	14	2.6
78	Uzbekistan	115	3	34	68	14	2.6
330	Spain	120	4	28	130	26	3.2
695	Turkey	115	2	30	64	12	3
866	Peru	115	3	29	67	14	3.0
1371	Kenya	115	3	29	67	12	3.0

When analyzing the average number of tubers per plant in samples selected for early ripening, only one sample k-330 (Spain) had 130 tubers, and the model had an advantage with 54 more tubers compared to the variety.

In all the remaining samples, the number of cocci was 64-68, with 8-12 less results compared to the standard (Figure 1).

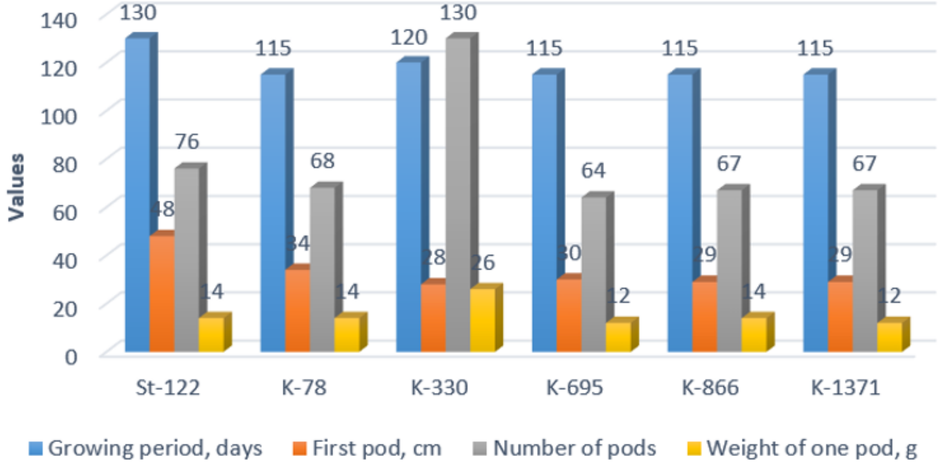

Figure 1. Valuable economic characteristics of the samples selected for early ripening.

These samples, selected for early maturity, will provide the opportunity to be used as a primary source for the creation of early varieties in the climatic conditions of the Khorezm region in the future.

Based on the results of one-year research, 18 sesame samples were selected based on the productivity of one plant. In these samples, the average productivity of one plant is up to 20-26 grams, and it was found that the sample is 6-12 grams more productive than the variety Tashkentsky-122 (Table 2).

Table 2. Main economic characteristics of the samples selected for the productivity of one plant.

Samples	Origin	Length to the 1st horn, cm	Height to the 1st tuber, cm	Number of pods	1 plant productive league, g
St-122	Uzbekistan	24	48	76	14
26	Uzbekistan	22	41	84	20
57	Uzbekistan	23	60	113	20
90	Uzbekistan	19	53	104	21
106	Armenia	11	36	105	20
170	Turkey	49	79	110	26
236	Azerbaijan	51	70	87	20
255	ETH	37	59	97	21
269	China	33	62	105	22
279	Egypt	46	68	104	23
285	Turkey	38	66	96	24
330	Spain	6	28	130	26
334	MMR	14	34	122	25
420	Turkmenistan	15	43	97	20
596	China	19	46	103	20
608	India	21	56	92	20
615	Mexico	22	41	84	20
691	Peru	23	60	113	25
723	Israel	18	53	115	23

The highest indicators of the average productivity of one plant were 26 grams observed in samples k-170 (Turkey), k-330 (Spain), and 25 grams in samples k-334 (MMR), k - 691 (Peru). In samples K-279 (Egypt), k- 723 (I s roil), this index was 23 grams, and k-269 (China) corresponded to 22 grams. K-285 (Turkey) was found to be 24 grams (Figure 2).

It was noted that 64 of the 170 studied varieties of sesame yield were higher than the standard (15-26 g), 42 were lower (5-13 g), and 64 of the remaining samples were almost the same as the standard (14 g).

It can be seen from Figure 2 that almost all of the samples selected for the productivity of one plant also achieved high results in terms of the number of tubers per plant. One of the characteristics of sesame seeds that is valued in the world market is its size. Although the large seed size of sesame plant is a characteristic of its variety, it has been confirmed several times in our previous studies that it changes under the influence of external environmental factors and applied agrotechnical measures.

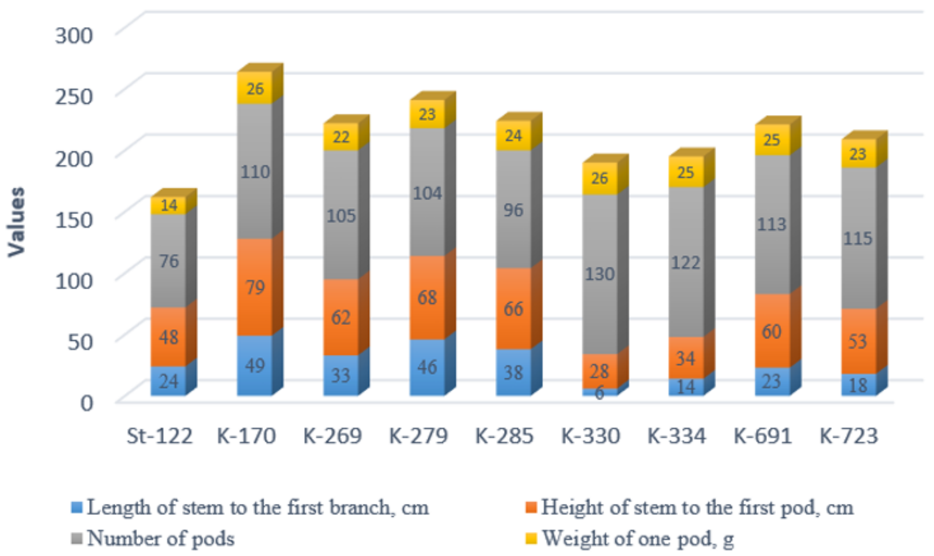

Figure 2. Main economic characteristics of the samples selected for the productivity of one plant.

From Tashkentsky 122 varieties, 1000 seeds weight is 2.6 grams, 15 of the studied samples have small seeds (2.3-2.5 g), 109 are relatively large (3-3.6 g), and 49 have a sample had almost the same results.

Among the 173 studied samples of the global sesame collection in the climatic conditions of Khorezm region, 17 samples were selected that showed high results in terms of 1000 mother seed weight as well as the productivity of one plant. The weight of 1000 seeds of these selected samples was 3.3-3.5 grams, and the model Tashkentsky achieved higher results by 0.7-0.9 g compared to 122 varieties (Table 3).

Table 3. Samples selected from the world sesame collection for their large seed size.

Sample	Origin	Number of pods	1 plant productivity, g	Weight of 1000 seeds, g
St-122	Uzbekistan	76	14	2.6
140	Turkey	87	16	3.5
217	Israel	78	16	3.3
219	Israel	85	18	3.3
236	Azerbaijan	87	20	3.3
254	Unknown	79	19	3.5
255	Unknown	97	21	3.3
278	Egypt	82	17	3.3
285	Turkey	96	24	3.3
334	MMR	122	25	3.5
507	Turkmenistan	84	17	3.3

615	Mexico	84	20	3.4
632	Vietnam	84	18	3.5
691	Peru	113	25	3.5
920	Hungary	68	14	3.4
1362	Korea	68	14	3.3
1409	Kenya	72	15	3.5

Among the studied sesame samples, 15 types of samples according to complex characteristics, including: k-90 (Uzbekistan), k-70, k-285 (Turkey), k-236 (Azerbaijan), k-255 (ETH), k-269, k-296 (Italy), k-279 (Egypt), k-330 (Spain), k-334 (MMR), k-608 (India), k -615 (Mexico), k-691 (Peru) and k-723 (Israel) samples were selected.

It was found that the samples of this selected variety were higher than the standard variety in terms of the number of pods up to 8-46 pieces, in terms of the productivity of one plant up to 7-12 grams and in terms of seed size, up to 0.4-0.9 grams (1000 seed weight) (Table 4).

Table 4. Valuable economic characteristics of sesame samples selected according to complex characteristics.

Sample	Origin	Main stem length, cm	Number of side branches	Plant productivity	1 plant productivity, g	Weight of 1000 seeds, g
St-122	Uzbekistan	140	4	76	14	2.6
90	Uzbekistan	163	4	104	21	3.2
170	Turkey	158	4	110	26	3.1
236	Azerbaijan	160	3	87	20	3.3
255	ETH	149	3	97	21	3.3
269	China	147	4	105	22	3.1
279	Egypt	166	3	104	23	3.1
285	Turkey	159	4	96	24	3.3
330	Spain	121	4	130	26	3.2
334	MMR	120	3	122	25	3.5
596	China	134	4	103	20	3.0
608	India	158	4	92	20	3
615	Mexico	131	3	84	20	3.4
691	Peru	153	5	113	25	3.5
723	Israel	139	4	115	23	3

In the future, sesame samples selected for these valuable economic traits will be presented to research institutes as a primary source for various lines of selection.

Selection works will be continued with some of the samples selected according to the complex characteristics and promising new varieties will be created for the northern regions of Uzbekistan.

4 Conclusions

In total, 170 varieties and samples of sesame introduced from different countries of the world were studied for the first time in the climatic conditions of Khorezm region according to valuable economic characteristics. On the early morning feature, including: k-78 (Uzbekistan), k-330 (Spain), k-695 (Turkey), k-866 (Peru), k-1371 (Kenya) and k-222 (I s roil) samples (ripened 15 days earlier than the sample). 18 by the productivity of one plant (k-170; k -285 (Turkey), k-330 (Spain), k-334 (MMR), k-691 (Peru), k-279 (Egypt), k-723 (I s rail) k-26; k-57; k-90 and k-269 (China), k-106 (Armenia), k-236 (O Azerbaijan), k-420 (Turkmenistan), k-596 (China), k-608 (India), k-615 (Mexico) samples were selected. It was found that the productivity of one plant of these samples is up to 8-12 grams higher than the model Tashkentsky-122 variety. 30 by seed size, including k-140; k- 170 ; k- 176 k-285 Turkey (3.3-3.5 g), k-217; k - 218 ; k-219 Israel (3.3 g), k-236 Azerbaijan (3.3 g), k-254, k-255 (3.-3.5 g), k-278 Egypt (3.3 g), k- 334 MMR (3.5 g), k-507 Turkmenistan (3.3 g), k-615 Mexico (3.4 g), k-632 Vietnam (3.5 g), k-691 Peru (3.5 g), k-920 Hungary (3.5 g), k-1362 J. Korea (3.3 g) and k-1409 Kenya (3.5 g) samples were selected. The weight of 1000 seeds of these selected samples was 3.3-3.5 grams, and it was found that it was 0.7-0.9 grams higher than the sample Tashkentsky 122 variety.

There are 15 types of sesame samples according to complex characteristics, k-90 (Uzbekistan), k-70, k-285 (Turkey), k-236 (Azerbaijan), k-255 (ETH), k- 269, k-296 (Italy), k-279 (Egypt), k-330 (Spain), k-334 (MMR), k-608 (India), k -615 (Mexico), k-691 (Peru) and k-723 (Israel) samples were selected that the samples of this selected variety compared to the standard variety have higher results in terms of the number of pods up to 8-46 pieces, in terms of the productivity of one plant up to 7-12 grams and in terms of seed size up to 0.4-0.9 grams (1000 seed weight).

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