

Study of vegetable beans collection in climatic conditions and selection of promising sources for breeding

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Abstract. During the span of 2018 to 2021, a comprehensive investigation was conducted encompassing the morphobiological and economically significant attributes of 20 distinct samples of vegetable beans. These samples were meticulously gathered through collaborative expeditionary ventures spanning the landscapes of Kyrgyzstan, Kazakhstan, and Uzbekistan. The interdisciplinary efforts of scientists hailing from the Scientific Research Institute of Plant Genetic Resources and the Rural Development Administration of the Republic of Korea (RDA) culminated in an in-depth analysis of these plant varieties. The outcome of this thorough exploration yielded noteworthy results, highlighting the identification and isolation of four early maturing and five high-yielding samples of vegetable beans. The amalgamation of expertise, fieldwork, and scientific scrutiny brought forth the delineation of these promising bean varieties with traits poised to contribute significantly to agricultural productivity and resilience across the studied regions. The collaborative nature of this endeavor underscores the significance of international cooperation in advancing agricultural innovation and enhancing the cultivation of vital crops.

Keywords. Vegetable beans, collection accessions, prospective accessions, ripe, medium-ripe, high-yielding.

1 Introduction

Today, when we talk about food safety in developed countries, we mean not only the amount of products grown, but also its variety, ecological purity, and the richness of minerals useful for the human body and health [1, 2]. In this regard, mutual integration of the processes of production, processing, storage, service and sale (export), development of clusters (cooperation), ensuring food safety and increasing the volume of export is of great importance in Uzbekistan. is being given.

Therefore, along with expanding the range of vegetable and fruit crops, radical improvement of scientifically based seed breeding systems of their created varieties, wide use in production, development of resource-saving technologies of seed cultivation remain one of the important tasks of today [3].

Every year in Uzbekistan, more than one million fields freed from grain crops are

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cultivated with vegetables, sugarcane, legumes, corn for livestock and sunflower products. Among these products, mash, beans and groundnuts are mainly exported [4]. However, due to the lack of early, high-yielding and exportable varieties suitable for the climate of Uzbekistan, the average yield is 12-15 t/ha in mash, 10-14 t/ha in beans, and 25-30 t/ha in groundnut [5].

One of the urgent tasks of today is to create and introduce into production new early, high-yielding, exportable varieties for the main and repeated planting periods suitable for the local climatic conditions in growing a high yield of vegetable beans in Uzbekistan [6].

The purpose of the research is to study the varieties and samples of vegetable beans introduced from abroad in the climatic conditions of the Tashkent region according to valuable economic characteristics, to select primary sources for different directions of selection.

Tasks of the research are to study the morpho-biological characteristics and valuable economic characteristics of the collected variety samples of vegetable beans in the climatic conditions of the Tashkent region and to select primary sources for different directions of selection.

2 Materials and methods

This research was carried out in open field conditions, in which "Methodology of conducting experiments in vegetable growing, potato growing and potato growing" [7-9] conducted on the basis of methodological manuals. The statistical analysis of the data was carried out using the Microsoft Excel program according to the "Metodika polevogo opyta" method by B. A. Dosphehov.

These studies were carried out in the cultivated fields of the "Educational-consultative center" of the Tashkent State Agrarian University, located in the Qibray district of the Tashkent region in Uzbekistan. According to the information provided by the Agrochemical Analysis Center of the Tashkent region, in the arable layer (0-30 cm) of soils where field experiments are conducted from the beginning of the growing season, humus is 1.6-1.87%, nitrogen-0.135%, phosphorus-0.37%, potassium-1, was 10%.

Tashkent region is located in the north-east of Uzbekistan, bordering the Republic of Kazakhstan to the north-west, Kyrgyzstan to the north-east, Namangan region to the east, Republic of Tajikistan to the south and Syrdarya regions to the south-west. The climate of the region is characterized by a sharp continentality, its winters are mild and wet, and summers are hot and dry.

Tashkent region has strong sunlight, the duration of sunny days during the year is 2800-2900 hours, 360-400 hours in summer months and 90-100 hours in winter months. Cloudy days occur in rare periods, they are observed mainly in the winter months, that is, from 10 to 25 days in December and January [10].

According to the data of the Qibray district "Aq Zukuk" weather station, the average annual air temperature of the region is 14-17 °C in March-April, May, June-August, September 28.2-32.4 °C, respectively and starting from September, the air temperature drops to 18.4 °C. Qibray district is located in the arid region, where a total of 250-500 years of rainfall is observed. The main part of precipitation periods corresponds to the winter-spring months. March is the busiest month. In these areas, snow piles are kept for 25-35 days.

3 Results and discussion

Samples were planted in the main crop in Kibray district of Tashkent region in 2018-2021 and studied for morpho-biological and economic characteristics.

Bean seeds were sown on typical gray soils on April 1 at a seedling thickness of 70x15 cm (in the feeding area) and 10% of the seeds germinated on April 7 and 75% of the seeds germinated on April 10. For the studied samples of beans, the local variety "Qaraqosh", widespread in Uzbekistan, was taken as a template (St).

The stem of the local variety "Qaraqosh" is a creeper, the length of the stem is on average 40-80 cm, the technical ripening period is 45-50 days, the physiological ripening of the seeds after the formation of pods is 65-70 days, and the growing period is 120 days. When planted for grain, the average yield is 20 ts/ha, it is also consumed during technical and biological ripening.

Important morphological characters. The inter-row irrigation method is widely used in growing beans in Uzbekistan. This, in turn, leads to a number of additional costs. The shape of the stem in bean varieties is one of the main economic characteristics, and the growth period of the creeping varieties is relatively long, and it causes certain difficulties in inter-row processing and harvesting.

The seeds of the 21 samples included in the research were planted in 3.5 m² experimental plots with a seedling thickness of 70x15 cm. 33 seeds were planted. Biometric measurements were taken on 10 plants during the harvest. 7 of the studied samples: Tabletka, Chipor, Kirmizi (small) (Turkiye), Rakushka (unknown), Lapatka (Kyrgyzstan), Krasnaya shapochka (Russia) and Kirmizi (Turkiye) have a creeping stem, the growth period is 100-120 days reached, the growth period was equal to 95-100 days in samples of semi-erect growing white mai (Kyrgyzstan) and Black Pearl (Bolivia) (Table 1).

Table 1. Valuable farm signs of bean collection samples (April 1).

#	Conditional name of the samples	Origin	Growth period	Shape of the stem
1	Productive	Uzbekistan	90	Steep growth
2	Ravot	Uzbekistan	75	An upright grower
3	Black eyebrow	Uzbekistan	1 2 0	A creeper
4	Tablet	Turkiye	120	A creeper
5	Cypress	Turkiye	115	A creeper
6	Rakushka	Unknown	100	A creeper
7	Cypress	Kyrgyzstan	90	An upright grower
8	Shovel	Kyrgyzstan	100	A creeper
9	Caesar	Unknown	80	An upright grower
10	Tomatnaya	Turkiye	80	An upright grower
11	Giant (white)	China	1 6 0	An upright grower
12	Small white	Kyrgyzstan	100	A semi-erect grower
13	Little Red Riding Hood	Russia	120	A creeper

14	Black prince	Kazakhstan	70	An upright grower
15	Korolevskaya 1	Kyrgyzstan	70	An upright grower
16	Black (small)	Bolivia	100	A semi-erect grower
17	Black (giant)	unknown	130	An upright grower
18	Swallow	Kyrgyzstan	80	An upright grower
19	Red (small)	Turkiye	100	A creeper
20	44444	Kazakhstan	85	An upright grower
21	Shahika	Ukraine	75	An upright grower
22	Zolnushka	Ukraine	75	An upright grower

Vegetative period lasted for 130-160 days, along with the stem growing upright. The pods of the white giant variety are very large, rough, and difficult to separate from the shell by hand. Black Giant is distinguished by its long flowering period compared to other bean varieties. The flowers are relatively large and bright red in color.

The shape of the stem of the plant is very important when growing high yields of beans in large areas. Creeping varieties are not suitable for inter-row cultivation during the growing season. It is recommended to grow such varieties in residential plots.

In order to harvest with the help of technology, it is necessary to grow varieties with upright stems, ripening at the same time, pods that are easily separated from the pods, and pods that are resistant to rotting. Bean seeds were sown in the collection nursery on April 1, and we observed that the germination of seeds was not the same in all samples.

Including 5% germination of seeds Productive, Rowat, Black brow (st), Tabletka, Chipor, Rakushka, Chipor-2, Lopata, Caesar, Tomanaya, White May, Krasnaya Shapochka, Black Prince, Korolevskaya 1, Black (small), In the samples of the varieties Swallow, Kirmizi, Shahika, Zolnushka, 5% of seeds germinated 5 days after sowing, and 75% of seeds germinated 8 days after sowing, while in Black and White giant samples, 5% of seeds germinated on 7-8 days, and 75% of seeds germinated on 10 and 11 days were recorded. The transition of plants to the flowering stage (10%) was observed on 28-35 days after seed germination, and 75% of plants entered flowering on 35-40 days after sowing. However, White and Black Giant cultivars were exceptions, with 10% of plants reaching 40-50 days in White Giant and 35-45 days in Black Giant, respectively.

In total, 75 days for Tomatnaya, Black Prince varieties, 80 days for Rovot, Caesar, Kirmizi, Shahika, Zolnushka varieties, 85 days for Swallow, Black Pearl, Korolevskaya 1 varieties, 90 days for Krasnaya Shapochka varieties, Chipor, Rakushka and Ravot varieties for 75% ripening of seeds. 95 days, while 100-105 days were needed for the varieties Black Brow and Tabletka, Lapatka, 150 days for White Giant, and 130 days for Black Giant (Table 2).

In the climate of Uzbekistan, it was observed in the studies that the duration of the growth period of creeping varieties is extended by 10-15 days in accordance with the external environmental factors. However, the flowering process was not recorded in the plants during this period.

When the samples of the collection of beans were studied according to valuable farm signs, 6 varieties and samples (Tomatnaya, Black Prince, Caesar, Kirmizi, Shahika and Zolnushka) were selected for early ripening. The growth period of these varieties is 75-80

days, and in the future, they will serve as a primary source for the creation of early bean varieties that can be ripened in the northern regions of Uzbekistan.

In Uzbekistan, bean plant is used in two ways, the first is when it is technically ripened with beans, and it is eaten with physiologically ripened grain in the fall and winter seasons (Table 2).

Table 2. Development stages of the samples of the studied collections.

Varietal name of samples	Origin	Irrigation days	Germination of seeds, one day after sowing		Wait for the plants to bloom		Physiological ripening of beans (from germination) days	
			10%	75%	10%	75%	10%	70%
Productive	Uzbekistan	100	5	8	30	40	80	95
Rawat (st)	Uzbekistan	85	5	8	31	35	72	80
Black eyebrow	Uzbekistan	110	5	8	32	38	75	100
Tablet	Turkiye	110	5	8	35	36	85	105
Cypress	Turkiye	100	5	8	31	39	85	95
Rakushka	Unknown	100	5	8	30	38	80	95
Cypress 2	Kyrgyzstan	100	5	8	28	35	85	95
Shovel	Kyrgyzstan	105	5	8	35	40	85	100
Caesar	Unknown	85	5	8	30	34	75	80
Tomatnaya	Turkiye	80	5	8	30	34	70	75
giant (white)	China	160	8	11	40	50	120	150
Small white	Kyrgyzstan	95	5	8	30	36	80	90
Little Red Riding Hood	Russia	95	5	8	30	34	80	90
Black prince	Kazakhstan	80	5	8	30	34	70	75
Korolevskaya 1	Kyrgyzstan	85	5	8	30	36	75	85
Black pearl	Bolivia	85	5	8	30	34	70	85
giant (black)	unknown	135	7	10	35	45	115	130
Swallow	Kyrgyzstan	90	5	8	30	40	80	85
Red (m)	Turkiye	85	5	8	30	35	75	80
Shahika	Ukraine	82	5	8	30	33	70	80
Zolnushka	Ukraine	82	5	8	30	33	70	80

During the growth period, when the pods were technically ripened, harvesting was carried out 3 times. The first time was 50 days after germination, the second time was 70 days after germination, and the third time was 90 days after germination.

Among the bean samples selected for early ripening, Caesar (0.55 kg/1 m²), Tomatnaya (0.54 kg/1 m²), Shahika (0.61 kg/1 m²) and Swallow (0.51 kg/1 m²) was found to have higher results than the standard Ravot variety in terms of productivity.

The yield of these bean varieties is up to 120-153 percent higher than the standard variety, and will serve as a primary source for the creation of early, high-yielding new varieties for future main and repeat seasons (Figure 1).

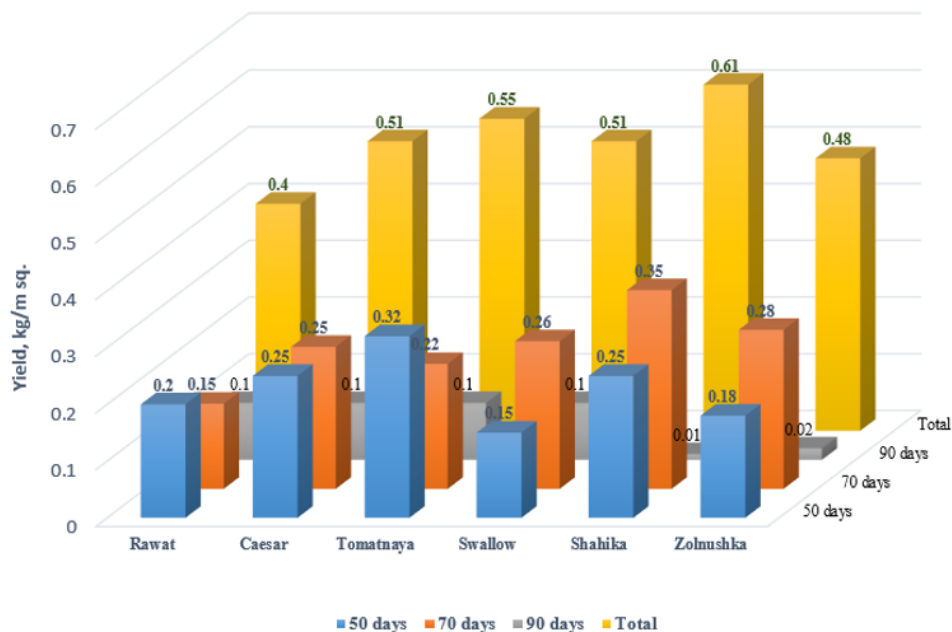


Figure 1. Yield of bean samples selected for early ripening, kg/m².

In total, 9 of the studied specimens with a yield of 20 grams per plant of the model Ravot variety were selected, including: Mahsuldor, Black Eye, Chipor, Caesar, Tomatnaya, White and Black Giant, Shahika and Zolnushka varieties. It was found that the productivity of one plant of these varieties and samples was on average 24-60 grams (Table 3).

Table 3. Valuable economic characteristics of bean collection samples during biological ripening of seeds.

#	Conditional name of the sample	Growth period	Productivity of one plant, g	1000 seed weight	Yield, kg/m ²
1	Productive	90	25	410	0.250
2	Rawat (st)	75	20	320	0.200
3	Black eyebrow	120	30	210	0.300
4	Tablet	120	22	350	0.220
5	Cypress	115	21	450	0.210
6	Rakushka	100	15	380	0.150
7	Cypress	90	26	410	0.260
8	Shovel	100	19	380	0.190
9	Caesar	80	27	370	0.270
10	Tomatnaya	80	24	350	0.240
11	giant (white)	160	60	980	0.600
12	Small white	100	18	250	0.180
13	Little Red Riding Hood	120	18	350	0.180
14	Black prince	70	18	310	0.180
15	Korolevskaya 1	70	18	340	0.180

16	Black pearl	100	12	275	0.120
17	Black (Giant)	130	47	850	0.470
18	Swallow	80	19	410	0.190
19	Red (small)	100	20	220	0.200
20	44444	85	19	300	0.190
21	Shahika	75	26	290	0.290
22	Zolnushka	75	25	300	0.250

In June, when the average air temperature exceeded 25 °C, it was noted that the flowering process of Lapatka, Krasnaya shapochka and Kara marvarid varieties almost stopped, and it was observed that they could not adapt well to local conditions.

From the studied samples, the following samples according to the productivity indicator, including: Black-browed 0.30 kg from kg/m², Cypress 0.26 kg, Caesar 0.27 kg, Shahika 0.29 kg, Zolnushka 0.25 kg, Black (giant) 0.47 kg and Giant (white) 0.60 kg were selected. This indicator was 0.20 kg/m² in the Rivot variety.

The seeds of the studied vegetable bean collection samples were divided into 4 groups according to their size, including small (≥ 300 g), medium large (301-450 g), large (451-600 g), very large (600 \leq).

Today, the scientific research work with Gigant (white), Shahika and tomato varieties of beans is continued, and the selection process for creating early, fruitful new varieties, suitable for planting in the main and repeated periods suitable for the climatic conditions of Uzbekistan.

4 Conclusions

In the central and southern regions of Uzbekistan, it is recommended to plant Shahika, Zolnushka, Kara Kosh, Tomatnaya, Caesars, and Mahsuldornavs in order to produce a high yield of beans in the spring and repeated crops.

The central regions of Uzbekistan, it is effective to plant Shahika, Zolnushka, Kara Kosh, Caesarlar, Tomatnaya, Mahsuldar, Aq and Kara giant varieties to produce a high yield of beans. In the northern regions of Uzbekistan, it is recommended to plant Shahika, Tomatnaya, Caesarlar and Ravot varieties in order to obtain a high-quality harvest of beans in fields free from grain.

In the northern regions of Uzbekistan, it is effective to plant Black Prince, Korolivskaya 1 and Tomatnaya varieties to produce a high yield of beans in a repeated crop.

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