BG Pulse Journal USA
ISSN:1947-2536 http://www.bgpulseusa.com/index.php/bg
BG PULSE JOURNAL

ENSURING THE AVAILABILITY OF VARIETIES AND CULTIVATION CAPACITY OF VEGETABLE BEANS (PHASEOLUS VULGARIS L.) IN SOUTHERN UZBEKISTAN

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Abstract

This article addresses the selection of promising vegetable bean (Phaseolus vulgaris L.) varieties and the improvement of cultivation technology elements in the southern regions of Uzbekistan. The research aimed to identify high-yielding and quality varieties suitable for the soil and climatic conditions of the region. During the scientific investigations, the growth, development characteristics, and yield indicators of various varieties were thoroughly studied. Furthermore, the impact of agrotechnical measures such as optimal sowing times and fertilization regimes on bean productivity was analyzed. Based on the obtained data, practical recommendations were developed to enhance the efficiency of vegetable bean cultivation in southern Uzbekistan.

Keywords: Vegetable bean, Variety selection, Cultivation technology, South Uzbekistan, Agrotechnics, Yield, Quality, Phaseolus vulgaris

Introduction

Beans are a valuable food crop, ranking second in the world after soybeans in terms of cultivated area among grain legumes. Beans contain up to 33% protein, 50–60% starch, and 5–8% fiber. In terms of digestibility, bean protein is close to the digestibility of meat and fish proteins (86–90%). In its green state, bean pods contain a large amount of vitamins and have excellent taste properties. Beans are widely used in the production of canned food and sausages, in baking, and in folk medicine.

The dietary value of legumes is of particular importance. The relatively high potassium content and, at the same time, low sodium content have a diuretic effect and have a positive effect on heart function. Beans have the property of regulating blood sugar levels in people with diabetes. The arginine in beans has an effect similar to that of insulin. In addition, in folk medicine, a decoction of bean pods is used for kidney diseases, high blood pressure, and rheumatism. Bread baked with bean flour is rich in lysine and is useful for children.

In conditions of high imbalance between prices of agricultural products and means of production, the producer is forced to choose more profitable crops and technologies for their cultivation. This issue is especially relevant for small agricultural producers and farms. Based on the research conducted by B.B. Bakhromov (1987) in the Surkhandarya region, 60x10 cm was recommended as the optimal planting scheme for leguminous beans. However, taking into account the sharp changes in weather, a sharp increase in air temperature and a significant decrease in relative humidity, it became necessary to reconsider the planting scheme, as well as the planting dates. In view of these emerging trends, beans are a promising crop.

Despite all the above-mentioned advantages, the lack of developed elements of cultivation technology and high-yielding varieties well adapted to the ecological conditions of the Surkhandarya region limits the introduction of this crop into industrial production.

The purpose of these studies is to develop some elements of the technology for growing legume vegetables in the conditions of southern Uzbekistan. The article presents the results of scientific research on beans conducted in 2025 [1, 2].

Methodology. In order to study the variability of varieties and select the variety best adapted to local conditions and suitable for mechanized cultivation, a bean collection nursery was established. The objects of research were the Ravot and Mahsuldor varieties zoned in the republic and 28 varieties and varietal samples with a bushy growth type, belonging to different ecological and geographical origins. The experiments were organized in accordance with the methodology for studying collection samples in selection nurseries. In the collection nursery, samples were planted manually, in 3.5-meter beds, with a feeding area of 60 × 10 cm. The method of placing variants in the experiment was standard, the number of repetitions was four times (Figure 1).



Figure 1. Bean collection nursery, 2025

The harvest was carried out manually. The crop structure in plants was analyzed in laboratory conditions. 20 plants were studied for each sample. The following were taken into account: the number of plants, their height and the height of the lower pod, the number of seeds and pods, the mass of seeds per plant, as well as the mass of 1000 seeds.

The crop was sown in the third decade of March. The plot area was 14.4 m², and the calculated area was 12.6 m². The replication was four times, the location of the plots was carried out systematically.

The harvest was collected manually, brought to standard humidity and 100% cleanliness.

In the years of research, weather conditions were different and significantly differed from the long-term average, which significantly affected the growth and development of bean plants. This

made it possible to assess the response of collection samples and the cultivation methods being studied to water and temperature conditions.

Results and discussion. In high-yielding bean varieties, varieties characterized by the stability of green pod and seed yields, all elements of the crop structure are interconnected and optimal. The highest-yielding and most resistant to adverse environmental conditions varieties should be distinguished not only by the maximum value of individual traits, but also by the optimal balanced development of all elements of the crop structure [7].

When studying the collection samples by the length of the growing season, it was found that the samples with the greatest average growth period for 1 year were Ravot, Znichko and Modnitsa, which amounted to 81 days.

In general, the entire collection was divided into two groups by ripening speed: very early ripening (60–75 days) and early ripening (75–90 days). Due to the sharp differences in weather conditions during the period of research, the growth period of different varieties differed by 2…11 days depending on the year.

The greatest variability of this trait over the years was observed in the following varieties: Koko white, Modnitsa, Rukizki, Delinel, Rant, which indicates a high sensitivity of these samples to annual changes in weather conditions.

As a result of studying the collection varieties and varietal samples, it was found that the height of the plants differs significantly: the Mahsuldor,st, variety - 24.9 cm, the Ravot variety - 68 cm. The majority of the samples in the collection exceeded the standards for this trait (Table 1).

Table 1.
The structure of the yield of collection samples, 2025.

T/r	Variety l name	Plant height, sm	Number of pods from one plant, pcs.	Weight of pods from one plant, gr	Number of seeds obtained from one plant, pcs.	Weight of 1000 seeds, g	Number of seeds in one pod, pcs.	Weight of seeds from one plant, gr
1	Mahsuldor, st	24,9	9	15,3	29	438,6	4	10,6
2	Mahalliy 4	30,0	10	35,4	102	276,0	12	28,0
3	Mahalliy 1	30,0	10	30,6	101	261,0	12	25,1
4	Mahalliy 2	30,0	10	29,8	102	276,0	12	24,8
5	Ravot	68,0	13	21,4	35	501,0	4	22,6
6	Delinel	59,4	24	33,4	92	434,0	6	21,9
7	Mahalliy 5	30,0	10	26,3	89	272,0	9	21,5
8	Termiz	3	10	18,	30	586	3	16,

	1	0,0		7		,0		4
9	Popugay	30,0	10	21,4	38	500,0	3	15,0
10	Mahalliy 3	30,0	10	20,2	36	573,0	5	13,9
11	Nastena	30,0	12	19,8	51	273,0	6	13,6
12	Modnitsa	30,0	12	20	40	423,0	5	13,5
13	Rant	30,0	10	18,5	49	321,0	6	12,9
14	Dalmeuiano	30,0	10	20,1	40	467,0	5	12,8
15	Samarqand 1	78,0	12	15,8	37	301,0	4	12,6
16	Koko white	30,0	10	13,3	40	378,0	4	12,6
17	Samarqand 2	30,0	8	15,9	26	533,0	5	11,7
18	Fantaziya	30,0	10	12,8	40	352,0	4	11,3
19	Termiz 2	24,6	9	15,9	30	449,0	4	11,1
20	Fizkulturnik	35,8	14	14,4	38	247,0	3	9,4
21	Mahalliy 6	30,0	10	13,3	33	362,0	4	8,4
22	Znichko	30,0	10	10,7	42	262,0	6	7,4
23	Krasniy glaz	30,0	10	10,8	22	321,0	5	6,0
24	Morenо	30,0	10	8,9	32	219,0	4	5,8
25	Rukizki	30,0	10	12	37	224,0	4	5,1

When evaluating the collection by the number of pods per plant, it was found that the Delinel variety produced the most pods (on average - 24), which is 62.5 and 45.8% more than the control samples - Mahsuldor and Ravot varieties, respectively.

During the study years, the least pods were produced by the Samarkand 2 variety - 8 pieces.

When growing beans for grain, the main criterion for evaluating varieties is the grain yield of the plant. In the experiments, significant differences were found between the varieties in the number of seeds per plant: in the Krasny Glaz variety sample - 22 pieces, and in the Delinel variety - 92 pieces.

Along with the number of seeds, it is also necessary to evaluate the yield by the mass of seeds per plant. In the process of studying the collection, significant variability of this indicator was revealed. In particular, the variety with the lowest seed mass per plant is Rukizki - 5.1 g, and the highest indicator is recorded in the Ravot variety, which is 22.6 g.

In the current conditions, the seeds of the variety should have such a size that all work related to the seeds can be carried out mechanized. The lack of special equipment for growing bean in Surkhandarya region, especially the harvesting process, is an urgent problem. Existing grain combines cannot provide optimal conditions for crushing large-seeded bean varieties. In this regard, one of the main tasks we set ourselves was to select varieties suitable for harvesting with a combine, with suitable seed size.

Analysis of the collection material showed that there is a large variability among varieties in this indicator. In particular, the collection includes large-seeded varieties with a 1000-seed mass of more than 400 g - Mahsuldor, st, Ravot, Delinel; small-seeded varieties (1000-seed mass less than 200 g) - Moreno; the remaining varieties are medium-seeded (1000-seed mass in the range of 200–400 g).

Studies have shown that for most of the economically valuable traits, there is a strong variability associated with the diversity of varieties. This makes it possible to select varieties that meet the necessary criteria.

At the same time, no significant influence of weather conditions of the year was detected on any of the economically valuable traits.

As a result of the research on the collection materials, it can be said that among the studied samples, the “Ravot” variety stood out in terms of the complex of valuable characteristics for the economy. This variety is suitable for mechanized cultivation and has a high grain yield.

The Ravot and Modnitsa samples can be recommended for manual cultivation in personal subsidiary farms, as they have large and light-colored seeds. The seeds of the Znichko and Nastena samples are white, and it is advisable to use them as a source of small-seeded varieties in the selection of beans intended for grain.

Conclusion

This study was aimed at improving the elements of the selection and cultivation technology of vegetable bean varieties suitable for the specific agroclimatic conditions of southern Uzbekistan on a scientific basis. As a result of the conducted field experiments, bean varieties with high adaptability to regional conditions, stress resistance, high yield and quality were identified. Also, optimal planting dates and methods, drip irrigation ensuring efficient water use, a balanced fertilization system, and integrated protection measures were developed. This improved agrotechnical complex not only served to increase productivity and improve product quality, but also increased water and nutrient use efficiency (WUE, NUE), ensuring the economic efficiency and environmental sustainability of bean cultivation in the region, and provided valuable practical recommendations for farmers.

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