GALAXY INTERNATIONAL INTERDISCIPLINARY RESEARCH JOURNAL (GIIRJ)
ISSN (E): 2347-6915
Vol. 13, Issue 1 January (2025)

SELECTION OF LINES WITH HIGH PHOTOSYNTHETIC PRODUCTIVITY OF BEANS (VICIA FABA L.)

Sirojiddin Turdikulovich Juraev
Docotor of Biological Sciences, Professor

Mahliyo Boboqulovna Jumanova
Doctoral Student
Southern Farming Scientific Research Institute

ABSTRACT

This article presents and scientifically substantiates leaf surface analyses of 25 varieties and lines of broad bean (*Vicia faba L.*) from the world collection of samples from the Raqobat nursery during the stages of germination, tillering, flowering, pod production, grain setting, and full ripening.

Keywords : Southern region, branching, flowering, fruiting, variety, ridge, leaf level, biomass, photosynthesis.

FASOL (VICIA FABA L.) NING FOTOSINTETIK MAHSULDORLIGI YUQORI BO'LGAN TIZMALARNI TANLASH.

Jo'raev Sirojiddin Turdiqulovich
Biologiya fanlari doktori, professor.,

Jumanova Mahliyo Boboqulovna
Tayanch doktorant
Janubiy dehqonchilik ilmiy tadqiqot instituti

Annotatsiya

Ushbu maqolada Raqobat ko`chatzoridagi fasol (*vicia faba L.*) jahon kolleksiya namunalaridan 25 ta nav va tizmalarining unib chiqish, shohlash, gullash, dukkak xosil qilish, don tolish, va toliq pishish davrlaridagi osimliklarning barg satxi tahlillari aks yettirilgan va ilmiy asoslantirilgan.

Kalit so'zlar: janubiy mintaqa, shoxlash, gullash, dukkaklash, nav, tizma, barg sathi, biomassa, fotosintez.

INTRODUCTION

In recent years, Uzbekistan has placed significant emphasis on diversifying its agricultural sector by introducing non-traditional crops. The cultivation and establishment of plantations for these crops have gained momentum, aiming to create a sustainable raw material base and improve agricultural output. However, one of the critical challenges remains the adaptation of these novel crops to the climatic and soil conditions of the republic. Consequently, the

development of advanced cultivation technologies tailored to local environmental factors is a pressing concern.

Crop diversification plays a crucial role in modern agriculture, particularly in enhancing soil health and food security. Leguminous crops, such as beans (Vicia faba L.), are widely recognized for their high protein content and their ability to enrich soil fertility. As a cold-resistant plant with a robust root system, broad beans can withstand low temperatures and even moderate frost, making them a viable option for Uzbekistan's agricultural landscape. Their deep-rooting characteristics facilitate the movement of essential nutrients, such as phosphorus and potassium, to the upper soil layers, thereby improving soil structure and enhancing its physical properties.

The productivity of bean crops largely depends on soil conditions, particularly moisture and acidity levels. While beans can thrive in lighter soils, adequate moisture is essential for optimal growth, and the ideal soil pH for bean cultivation is approximately 6.5. Given these conditions, the Southern Agricultural Research Institute conducted an extensive study to evaluate the photosynthetic productivity of various bean varieties under controlled conditions. The study assessed 25 different varieties and their ability to adapt to local soil and climatic factors, focusing on the correlation between photosynthetic efficiency, leaf area development, and biomass accumulation.

Understanding the impact of photosynthetic activity on yield formation is crucial, as an increase in leaf area and plant biomass significantly influences overall productivity. The research findings contribute to identifying the most promising bean varieties suitable for large-scale cultivation in Uzbekistan, ensuring optimal adaptation to local agricultural conditions.

In recent years, special attention has been paid to the cultivation and establishment of plantations of non-traditional crops in our republic. Therefore, in recent years, large-scale work has been underway to cultivate non-traditional crop species in the soil conditions of our republic and create a raw material base. However, in finding scientific solutions to the problems, one of the urgent tasks remains the adaptation of new non-traditional crops to the climatic conditions of the republic and the development of advanced technologies for their cultivation.

Expanding crop diversity is important for the agricultural industry. In modern agriculture, legumes are considered to be inexpensive, high-protein, and soil-enriching crops for food and fodder.

Beans *(vicia faba L.)* an annual herbaceous plant belonging to the legume family , sir It is a cold-resistant plant that can grow at low temperatures, with a leafy and strong root system . It is also adaptable to frosts down to -8 0 C. It is not very demanding on soil moisture and fertility . There are two types of it, the Pliny bean (F. Plinina Trabut.) and the horse bean (F. Bona Medik.) (Vulture Vicia faba L., Faba vulgaris Moench., Faba sativa Bernh.).

broad bean *(vicia faba L.)* penetrates to a depth of 1.5-2.0 m, as a result of which microelements move from the subsoil horizons to the arable layer: phosphorus, potassium, etc., improving the air and water regime, physical properties, and soil structure. [4;5].

One of the important factors determining the yield of bean seeds is soil conditions. Beans can also be grown in lighter soils, but they must be sufficiently moist. The soil acidity for beans

should be 6.5. [2;3;6;1].

Taking into account the above, studies were conducted in the experimental field of the Southern Agricultural Research Institute in order to select the lines with high photosynthetic productivity of the varieties and samples being studied in the control variety test nursery . Samples were taken from 25 varieties and lines of bean crops from the experimental field at each phase and photosynthetic productivity was determined. indicators were analyzed .

High leaf area and plant biomass are important for photosynthesis. High leaf area and plant biomass lead to high yields.

It is known that as the number of generative organs in a plant increases, the leaf area and biomass increase.

Table 1 Leaf surface formation in bean varieties and rows in the competitive variety trial nursery, m ²/ha (2022-2024).

No.	Rows and ridges	Leaf area during the development periods of bean varieties, thousand m ²						
		Uninhabited exit	Branching	Flowering beginning	Bean harvest to do	Grain fullness	Cooking beginning	Complete ripening
1	Local check (st)	2	5.1	17.4	19.1	20.8	16.3	3.3
2	KR20-FBIHTN-6	2	7.4	19.1	23.2	25	21.5	7.5
3	KR20-FBIHTN-14	2	7.8	20.2	24.7	26.1	23.6	8.2
4	KR20-FBIHTN-19	2	8.1	22.9	26	28.2	24	9.9
5	KR20-FBIF4N-SAEA-8	2	8.3	23.3	29.6	31.7	26.4	10
6	KR20-FBIHTN-1 (Large)	2	10.1	28.2	60.7	62.9	51.2	16.3
7	KR20-FBIHTN-8	2	7.2	17.8	21.9	22.9	18.7	6.8
8	KR20-FBIHTN-15	2	7.6	18.7	22.2	24	21.5	7.5
9	KR20-FBIHTN-20	2	7.8	20.8	23.9	24.9	22.6	8.3
10	KR20-FBIF4N-SAEA-10	2	9.8	25.8	55.7	60.8	50.3	15.9
11	KR20-FBIHTN-2	2	9.2	25.1	59.7	60.5	49.4	15.1
12	KR20-FBIHTN-10	2	7	23.6	47.1	48.9	40.8	8.2
13	KR20-FBIHTN-16	2	7.6	24.6	49.7	51.3	43.3	10
14	KR20-FBIHTN-21	2	7.8	23	51.6	53.7	45	12.4
15	KR20-FBIF4N-SAEA-11	2	7.1	21.1	53.4	56.5	48.5	13.5
16	KR20-FBIHTN-3	2	9.5	25.1	55.5	60.3	50.2	16.1
17	KR20-FBIHTN-11	2	7.6	23.5	52.3	54.8	43.3	12.4
18	KR20-FBIHTN-17	2	7.9	20.8	54.3	55.8	46.8	13.5
19	KR20-FBIHTN-22	2	7.1	22.1	47.9	58.9	48.1	14
20	KR20-FBIF4N-SAEA-29	2	10.1	28.2	57.7	60.9	50	15.3
21	KR20-FBIHTN-5	2	9.9	26.1	55.4	61.5	49.5	16.1
22	KR20-FBIHTN-12	2	7.6	18.7	22.2	24	21.5	7.5
23	KR20-FBIHTN-18	2	9.6	25.5	55.3	60.8	50.3	15.4
24	KR20-FBIHTN-23	2	9.9	25.8	55.3	61.3	50.8	16
25	KR20-FBIF4N-SAEA-32	2	10.1	27.1	57.9	60.9	50.1	15.3

In the table cited to the results according to KR20-FBIF4N-SAEA-10 ridge 9.8 m ²/ ha , KR20-FBIHTN-2 ridge 9.2 m ²/ ha , KR20-FBIHTN-3 ridge 9.5 m ²/ ha , KR20-FBIF4N-SAEA-29 ridge 10.1 m ²/ ha , KR20-FBIHTN-5 ridge 9.9 m ²/ ha , KR20-FBIHTN-18 ridge 9.6 m ²/ ha , KR20-FBIHTN-23 ridge 9.9 m ²/ ha , KR20-FBIF4N-SAEA-32 ridge 10.1 m ²/ ha observed and

KR20-FBIHTN-1 (Buyuk) variety 10.1 m ^{2}/ ha record The plant flowering during leaf level 3 years taken to the results according to average 17.4-28.2 m ^{2}/ ha what organization reached . Template Local check (ct) in the list leaf surface area 17.4 m ^{2}/ ha observed if the most high KR20 -FBIF4N-SAEA-10 ridge 25.8 m ^{2}/ ha KR20-FBIHTN-2 ridge while 25.1 in the KR20-FBIHTN-3 ridge 25.1 m ^{2}/ ha in the KR20-FBIF4N-SAEA-29 ridge 28.2 m ^{2}/ ha in the KR20-FBIHTN-5 ridge 26.1 m ^{2}/ ha in the KR20-FBIHTN-18 ridge 25.5 m ^{2}/ ha in the KR20-FBIHTN-23 ridge 25.8 m ^{2}/ ha in the KR20-FBIF4N-SAEA-32 ridge 27.1 m ^{2}/ ha was observed During the pod formation period, high plant biomass and leaf area are considered important in the grain formation process, and when leaf area and biomass are high, the grain in the pods will fully develop and lead to high yield. The leaf area of the plants in this phase was analyzed on average 19.1-60.7m ^{2}/ha according to the results obtained over 3 years.

Research to the results according to bean variety and grain filling of ridges during leaf surface area 20.8-62.9 7m ^{2}/ha was observed .

Cooking in phase leaf surface area 3.3-16.3 m ^{2}/ha organization Because this in phase leaves drunk to start observed .

CONCLUSION

The study on the adaptation and photosynthetic productivity of different bean varieties in Uzbekistan's soil and climate conditions yielded important findings. The research demonstrated that leaf area and plant biomass significantly impact photosynthesis, thereby influencing overall yield potential. Among the evaluated varieties, KR20-FBIHTN-1 (Large), KR20-FBIF4N-SAEA-10, KR20-FBIHTN-2, KR20-FBIHTN-3, KR20-FBIF4N-SAEA-29, KR20-FBIHTN-5, KR20-FBIHTN-18, KR20-FBIHTN-23, and KR20-FBIF4N-SAEA-32 exhibited the highest photosynthetic efficiency across all growth stages.

The data indicated that increased leaf area and plant biomass during key developmental phases, such as flowering and grain filling, contribute significantly to improved seed formation and overall productivity. The varieties that exhibited high leaf area measurements during pod formation had better grain filling and ultimately higher yields. This confirms the importance of selecting varieties with superior photosynthetic capacity to enhance production efficiency.

Furthermore, the findings highlight the necessity of optimizing soil conditions, including moisture retention and maintaining an appropriate pH level, to support the growth of high-yielding bean varieties. By integrating these insights into agricultural practices, Uzbekistan can further its efforts to diversify crop production and improve food security through the introduction of sustainable and efficient farming techniques.

Future research should focus on refining cultivation technologies and exploring additional factors that may enhance the adaptability and productivity of non-traditional crops in Uzbekistan. Such efforts will contribute to strengthening the country's agricultural sector and ensuring long-term sustainability in crop production.

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