

LEAF SURFACE AREA OF CROTALARIA PLANTS TREATED WITH DIFFERENT BIOLOGICAL PREPARATIONS

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INTRODUCTION

In recent years, population growth in our country has directly led to an increase in the demand for food. Ensuring food security and delivering quality products has always been a critical issue. Providing the population with quality food is the fulfillment of their basic needs and is considered one of the top priorities in the agricultural sector. The reforms being carried out in the agricultural sector of our country are also rooted in the delivery of quality, nutritious, and affordable products to the population. The Decree of the President of the Republic of Uzbekistan No. PQ-273 dated June 7, 2022, "On Additional Measures to Effectively Organize the Implementation of the Tasks Set in the Strategy for the Development of Agriculture of the Republic of Uzbekistan for 2020-2030", outlined a number of priority tasks. [3]

Among these, plans have been developed to create effective mechanisms for the production and delivery of legume and oilseeds. In particular, the role of legume crops in meeting the demand for food and protein products, as well as in increasing soil fertility, is invaluable. Among legume crops, plants like mung beans, beans, and soybeans stand out for their high protein content and nutritional value. Additionally,

the characteristics of non-traditional plants like *Crotalaria* and *indigofera*, which are used as siderate crops to further enhance soil fertility, are being tested in experimental fields in various regions of our republic, revealing numerous beneficial properties for the population.

Crotalaria belongs to the legume family (Fabaceae), subfamily papilionoideae (Papilionoideae), genus *Crotalaria* (Crotalarieae), section calycinae (Calycinae) [7]. According to information from a comprehensive dictionary published in Moscow in 1981, the *Crotalaria* genus includes over 500 species worldwide.

They are mainly semi-shrubs, shrubs, and in some cases annual herbaceous plants. Six to seven species of *Crotalaria* have been domesticated and are cultivated for fiber, green manure, fodder, food, and medicinal purposes in India, Australia, Africa, and other tropical and subtropical countries. The main fiber producers from *Crotalaria* are India, Sri Lanka, and countries in South and Southeast Asia. In recent decades, fiber yield has reached 0.12-0.6 t/ha in India and 0.45 t/ha in Sri Lanka, while seed yield has ranged from 10-22 c/ha depending on soil conditions.

According to R. Joy [4], laboratory tests revealed that the toxic substances found in *Crotalaria* seeds are harmless to domestic animals and poultry. However, they are harmful to horses, and for cattle, hay consumption should not exceed 10%.

Several *Crotalaria* species are also cultivated globally as food crops for human consumption. According to K. Bhatt, A. Pandey, and others [2], the *Crotalaria* tetragonal species, known as "Tum-thing," is grown and consumed by tribal communities in the northeastern Indian state of Mizoram. Its flowers, shoots, and pods are consumed as vegetables. *Crotalaria* plants have also been used medicinally. The leaf juice of *Crotalaria*, a species of *Crotalaria* known as "royal bird flowers," was used by Aboriginal Australians to treat eye infections.

In Cambodia, the seeds of the *Crotalaria pallida* species are roasted and consumed as coffee, while the roots are used in Vietnamese cooking. In traditional medicine, root decoctions are used for joint pain, and extracts from the leaves are used to eliminate intestinal parasites [6].

Various research studies are underway in our country to explore this remarkable plant. For example, in typical gray soil conditions of Tashkent region, non-traditional legume crop *Crotalaria*, when sown in the third decade of April at a rate of 18 kg per hectare and cultivated with mineral fertilizers at a rate of $N_{120}P_{180}K_{120}$, resulted in a plant stem height of 240.0 cm, with an increase in stem height observed as the seeding and fertilizer rates increased [5].

In the conditions of gray meadow soils of Jizzakh region, to obtain a high grain yield from non-traditional legume crop crotalaria, it is recommended to sow it in the third decade of April at a rate of 14 kg per hectare and apply Geogumat biostimulator at a rate of 1.0 l/t during sowing, and at 1.6 l/ha when 3-4 true leaves appear and at the budding stage - 1.6 l/ha. This creates conditions for achieving higher grain yields from the plant [1].

It is important to note that crotalaria plants are crucial for the interests of humanity in all aspects. Therefore, it is extremely necessary to organize the agrotechnology of cultivating this plant and its primary seed production in various climatic conditions of our country.

MATERIALS AND METHODS

The research was conducted in the field of the Navoi Research and Experimental Station of the Scientific Research Institute of Cotton Breeding, Seed Production, and Agrotechnologies, following the guidelines outlined in the "Methodology for State Variety Testing of Agricultural Crops", "Methods for Conducting Field Experiments", and using mathematical analysis of yield indicators based on B.A. Dospekhov's manual "Field Experiment Methodology".

The experiment involved sowing crotalaria seeds treated with various biological preparations and studying their effect on leaf surface area during the flowering, budding, and podding stages.

RESULTS AND DISCUSSION

A leaf (Latin, folium) is one of the vegetative organs of higher plants, performing the functions of transpiration, photosynthesis, and gas exchange. The leaves of some plants have undergone metamorphosis under the influence of living conditions during evolution, adapting to perform additional functions such as food or water storage, clinging, and protection. Each function performed by the leaf, a vegetative organ, paves the way for the complete course of other important physiological processes in plants. The process of photosynthesis that takes place in a single leaf, where inorganic substances are converted into organic compounds under the influence of sunlight, serves as a source of food for humans, animals, and microorganisms all over the world.

Table

Effect of Bacterial Strains on Crotalaria Leaf Surface Area

No	Options	Number of Leaves, Seeds	Leaf Weight, g.	Sample (cut-out) weight, g	Leaf area of a single plant, cm ²
During the budding phase					
1.	Control	53,1	6,2	1,3	759,7
2.	Sample No. 03	65,3	7,7	1,6	942,7
3.	Sample No. 76	62,4	7,3	1,5	711,3
4.	Sample No. 15	72,2	8,7	1,8	1046,9
5.	Bentonite clays	58,5	7	1,4	877,5
During the bean formation phase					
1.	Control	80,8	9,6	2	1163,5
2.	Sample No. 03	74,2	9	1,9	1054,4
3.	Sample No. 76	90	11	2,3	1291,3
4.	Sample No. 15	100,1	11,1	2,4	1388,8
5.	Bentonite clays	84	10,2	2,1	1224
During the flowering phase					
1.	Control	120	14,6	3,1	1695,4
2.	Sample No. 03	125,5	15,2	3,3	1734,1
3.	Sample No. 76	132	16	3,5	1810,2
4.	Sample No. 15	158	19,2	4,2	2166,8
5.	Bentonite clays	130	15,7	3,4	1800,8

Based on this, in our experiment, the effect of leaf surface area and growth on photosynthetic productivity was studied using crotalaria seeds treated with different rhizosphere bacteria strains - Rhizobium No. 03, Rhizobium No. 76, Rhizobium No. 15, and bentonite clay. In our experiment, the leaf surface area of crotalaria was calculated during the budding, flowering, and podding periods.

During the budding period, the leaf surface area of a single crotalaria plant was 711.3-1046.9 cm², with the highest result achieved in the variant where Rhizobium strain No. 15 was used. The leaf surface area expanded as crotalaria began to flower, and the difference between the variants became noticeable. The leaf surface area was 1695.4-2166.8 cm² during the flowering period and 1054.4-1388.8 cm² by the podding period. The highest indicator for leaf surface area in all leaf stages was observed in variant 4, where Rhizobium strain No. 15 was used.

Unlike other crops, crotalaria retains its green color throughout the entire growing period. While growth and development are highest during the flowering period for all crops, it is highest during the podding period for crotalaria, as stated in the literature. The results of our experiment also showed that the leaf surface area was higher during the podding period, ranging from 1695.4 to 2166.8 cm² per plant across the variants, with the highest result obtained from variant 4, where Rhizobium strain No. 15 was used.

In this variant, the leaf surface area per plant was 471.4 cm² higher than the control variant and 366.0 cm² higher than the variant where bentonite clay was used..

CONCLUSION

In order to preserve and improve soil fertility and increase crop yields in the soil-climatic conditions of Navoi region, it is recommended to introduce a non-traditional legume crop - crotalaria into crop rotation systems, and to treat crotalaria seeds with Rhizobium strain No. 15 to enhance plant growth, development and photosynthetic activity.

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