



## Effect of Biostimulants on Pod Formation and Grain Yield In Indigofera

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**Abstract:** This article describes the importance of the non-traditional leguminous crop indigofera (*Indigofera tinctoria* L.) grown in the conditions of typical gray soils of Tashkent region, the importance of biostimulants for the formation of pods and grain yield in the plant. In order to obtain a high grain yield from *Indigofera*, when it is planted at 3 kg per hectare in the third ten days of April, and Geogumat biostimulant is applied to 10 l and during the tillering and flowering phases, the number of pods formed is 107, compared to the control option without biostimulant. 1000 grain weight is 0.5 g, additional grain yield is 7.2 t/ha, and high grain yield (20.9 t/ha) is scientifically proven.

**Key words:** *Indigofera tinctoria* L., Uzgumi, Fertilfe, Geogumate, legume, grain crop.

### Introduction:

Currently, out of the total area of 44410.3 thousand hectares of our republic, 22614.0 thousand hectares are used for agriculture, and irrigated land is 4278.0 thousand hectares. They are located in agricultural areas with different natural soil and climate, and intensive farming is mainly carried out on 4,278,000 hectares of irrigated land, where the ecological condition and fertility level of the soil are sharply different from each other. Unfortunately, in 65.9% of these areas, the state of land reclamation is unsatisfactory, more than 1.5 million hectares are deflated, including 0.7 million hectares are severely deflated, 660,000 hectares of land are subject to irrigation erosion, 40,000 hectares are subject to irrigation erosion. there is a trend of continuous decrease in soil fertility in the areas under construction.

In the decree of the President of our country No. PF-5742 dated June 17, 2019 "On measures for effective use of land and water resources in agriculture" important tasks aimed at expanding, significantly increasing the export potential of the agrarian sector.

In order to restore and increase the lost soil fertility, it is necessary to prioritize the selection of non-traditional grain-legume crops that are compatible with cotton and winter wheat as predecessor crops and increase soil fertility.

### Literature analysis

Soil fertility and crop yield can be increased by introducing new non-traditional crops into the crop rotation system, including indigofera.

This plant was once widespread in Southeast Asia and other parts of Japan, but now it can be found only in certain areas. It is still cultivated in Northeast and South India [5] and parts of West Africa, but the plant has almost disappeared in the Middle East, North Africa, and Central America, areas formerly known for Indigofera cultivation [6]. This is due to changes in the farming system, land and droughts.

An excellent dye is obtained from the perennial indigofera (*Indigofera tinctoria* L.), which grows wild in the most fertile lands of the Indonesian islands or in Nigeria. However, sensitivity was required at each stage of indigo cultivation to produce high quality commercial dye [7]. New quality seeds from other countries were needed to maintain the quality of the paint. Therefore, good land is allocated for seed cultivation [8; 9].

Depending on the differences between the Indigofera plant species, the size or hairiness of the leaves affected the quality of the dye. Even today, experiments are being conducted to restore natural Indigo and identify the best types [10].

In 2005, scientific advisor of TsEF/UNESCO "Environmental and economic improvement of use of land and water resources in Khorezm" international project prof. A. Ergashev [2; 3], a number of scientists carried out scientific research on the agrotechnics of plant cultivation and the technology of dye extraction.

Khorezm region [1; 4] in conditions of degraded meadow alluvial soils, obtaining a high yield from the indigofera plant as the main crop, in order to restore soil fertility, apply 10 t/ha of manure, 100 kg/ha of phosphorus and 30 kg/ha of potassium fertilizers under the autumn plow, and plant seeds in the spring, it is recommended to feed plants with 100 kg/ha of nitrogen during the growing season, to use mineral fertilizers at the rate of N<sub>120</sub>P<sub>100</sub>K<sub>30</sub> kg/ha when growing Indigofera as a repeated crop (without manure).

But the effect of biostimulants on the growth, development and yield of indigofera has not been studied.

### Research methods

The research was conducted in the conditions of typical gray soils of Tashkent region. The experiment consisted of 7 options and was carried out in 3 repetitions. In the experiment, the effect of different biostimulants on the growth, development and productivity of indigofera was studied when applied in different periods and rates (Table 1).

**Table 1**

**Effect of biostimulants on growth, development and yield of Indigofera**

№	Options	Along with planting, l\ha	In branching, l\ga	In bloom, l\ga
1	Control	-	-	-
2	Uzgumi	0,4	-	-
3	Uzgumi	0,4	0,3	0,4
4	Geogumat	1,0	-	-
5	Geogumat	1,0	1,6	1,6
6	Fertilife	7,0	-	-
7	Fertilife	7,0	0,4	0,5

Research is conducted in field and laboratory conditions, including "Methodology of the State Variety Testing of Agricultural Crops" (1964, Moscow: Kolos), "Methodology of field

experience" (Dospekhov, 1985), "Methods of conducting field experiments" (UzPITI, Tashkent, 2007) conducted on the basis of methodological manuals.

### Research results

It is known that the weight of the crop in the plant is determined by the quantity and quality of the elements of the crop collected in the crop. grain yield in indigofera also depends on the elements of the crop formed in the plant, i.e. the number of pods and the weight and quality of the grain in it. The formation of pods, the number and weight of pods, the number of grains in pods and the weight of 1000 grains were studied when stimulants were applied to Indigofera at different rates.

At the beginning of July, in Indigofera, the height of the main stem is 35-40 cm according to the options, 50-60 cm in some bushes, and 100-150 pods started to form in each of these bushes. 350-550, some up to 600 pods are formed on one bush of indigofera during the period of operation.



After the plant leaves a single leaf, the plant continues to produce flowers until the end of the growing season, with simple and compound leaves. Flowers are pollinated by insects and various factors. After fruiting, the color of the seed turns green, and the pod changes from red to brown. The length of the inflorescence is on average 2-3 cm, in which 3-18 pods are located in a row. On average, there are 2-4 seeds in each pod, and an average of 6 to 72 seeds are produced in one flower axis.

The period of application of biostimulant in the formation of pods also had an effect, the number of pods formed was 395.0 - 502.0 pieces on October 1, and a high result was observed in option 5, which was used with Geogumat biostimulant planting and in the phases of budding and flowering. The number of pods formed in this option is 502.0 units, compared to 107 units in the control option; 26-50 units compared to the option using the Uzgumi stimulator; Fertilife stimulator produced 22-27 pods more than the option used and Geogumat stimulator produced 8 pods more than the option used only with planting.

The yield of legumes is also related to the number of grains and the weight of the grain. However, the abundance of grains is not always the basis for growing a high yield. Because, only if the number of grains and their weight are at the level of requirements, the grown crop will be abundant and of good quality. Ripe grain can be evaluated by the weight of 1000 grains. For this reason, studying the number of grains and grain weight in indigofera pods is of great scientific and practical importance.

According to the phenological data obtained on October 15, the number of pods formed in one plant is 395-502; the number of grains in one pod is 2; The weight of 1000 grains is 9.0-9.5 g, and the best results are 9.5 grams in option 5, which is used with the planting of Geogumat biostimulator for indigofera and in the phases of tillering and flowering, which is 0.5 grams more than the control option. was observed. The weight of 1000 grains is 9.2 grams in the options used with Uzgumi and Fertilife biostimulants planting; Uzgumi and Fertilife biostimulants were 9.3 grams in the options applied at planting and during the tillering and flowering phases (Table 2).

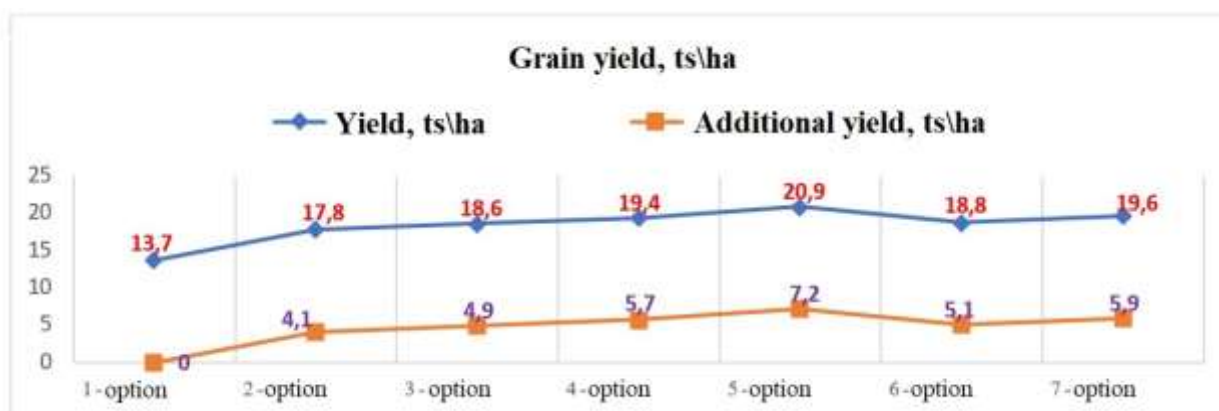
Table 2

The formation of pods on a plant

Options	Number of pods, pcs				The number of grains in one pod, grain	Grain weight in one pod, g	Weight of 1000 grains, g
	01.07	01.08	01.09	01.10			
1-option	97,0	194,9	272,0	395,0	2	0,018	9,0
2-option	106,7	203,1	310,9	452,0	2	0,0184	9,2
3-option	123,0	217,3	327,2	476,0	2	0,0186	9,3
4-option	122,0	234,9	303,7	494,0	2	0,0186	9,3
5-option	145,0	277,8	317,6	502,0	2	0,0190	9,5
6-option	115,0	224,8	301,2	480,0	2	0,0184	9,2
7-option	138,0	226,4	312,8	475,0	2	0,0186	9,3

The main task of agricultural research is scientific justification of the effect of agrotechnical measures and external influencing factors on plant productivity.

Indigofera is mainly used for leaf and grain (seed) crops. It is necessary to determine the period of harvesting of the Indigofera plant when the seed pods begin to ripen from the bottom of the bush. In this case, the formation process of the leaf mass has almost come to an end and it stands on the leaf bands without shedding. If indigofera is grown for seeds, it is necessary to delay its harvesting by 15-20 days. In this, most of the seed pods ripen and the color of the seed pods turns dark brown. In order to obtain plant seeds, it is advisable to harvest when the pods turn an average of 70-80% dark brown.



HCP<sub>05</sub>= 1,11 μ/га; HCP<sub>05</sub>= 6,0%

Figure 1. Grain yield of Indigofera, ts/ha

According to the data obtained on the grain yield of indigofera in the conditions of typical gray soils of the Tashkent region, it was found that it was 13.7-20.9 ts/ha when different biostimulants were used in different periods and rates (Fig. 1).

The highest result was 20.9 ts/ha in option 5, where indigofera was planted with 3 kg of seeds per hectare. From this option, 7.2 ts/ha compared to the 1st option, where no biostimulant was used; 1.5 ts/ha compared to the 4th option, when Geogumat biostimulant was used only with planting; 1.3-3.1 ts\ additional yield was obtained compared to the options using Uzgumi and Fertlife stimulants.

Conclusion

So, when planting indigofera plant and applying biostimulants during the flowering and budding phases, the growth and development of the plant is accelerated, and as a result of the production of more elements, i.e. pods, a higher grain yield can be obtained.

In order to obtain a high grain yield from the non-traditional leguminous crop indigofera in the conditions of the typical gray soils of the Tashkent region, it should be sown at the rate of 3 kg per hectare in the third ten days of April, with sowing (1.0 l/ha) and weeding (1.6 l/ha), flowering ( It is recommended to use Geogumat biostimulant in phases 1.6 l\ha).

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