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PHOTOSYNTHETIC ACTIVITY OF SOYBEAN VARIETY "VILANA" UNDER THE INFLUENCE OF NORMS OF PHOSPHORUS FERTILIZERS AND MICROELEMENT IRON

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Abstract:

In this article, data are given on the role of photosynthetic activity of plants, the need for soybean cultivation in Uzbekistan, the importance of soybean culture, conditions and methods of experiments, agro-technics of the experiment, the development of soybean leaves, the formation of the leaf area of one plant and the leaf area per hectare. The optimal norms of phosphate fertilizers are determined, and used references are listed.

Keywords: Soybean, Vilana variety, norms of phosphorus, iron micronutrient, number of leaves, leaf area, one bush plant

INTRODUCTION

A crop is created in the process of photosynthesis, when organic matter is formed in green plants from carbon dioxide, water and minerals. The energy of the sun's beam is converted into the energy of plant biomass. The efficiency of this process and ultimately the yield depends on the functioning of the crop as a photosynthetic system. In field conditions, sowing as a set of plants per unit area is a complex dynamic self-regulating photosynthetic system. This system includes many components, it is dynamic, as it constantly changes its parameters over time; self-regulating , Not all solar energy takes part in the process of photosynthesis, but only its visible part - photosynthetically active radiation (PAR) with a wavelength of 380 to 720 nm . These rays are absorbed by chlorophyll and are the energy basis of photosynthesis. The PAR energy is about 50% of the total energy of solar radiation [1, 3, 4].

An objective indicator of the yield value (high, medium, low) can be the PAR utilization factor. Good yields correspond to 2...3% of PAR use. When growing varieties of intensive type and optimizing all processes of crop formation, accumulation of 3.5-5.0% PAR and more in the crop is possible [3].

The influx of solar energy during the growing season depends on the geographic latitude. So, if we compare the northern and southern regions of Uzbekistan, then the arrival of PAR for a possible growing season differs by more than 2 times. In addition, it can be noted that on the fertile soils of the central zone of Uzbekistan, with a sufficient amount of heat and moisture, it is much easier to form a crop that absorbs 3 *% of* PAR on average during the growing season than in the northern regions on the saline soils of Khorezm or Karakalpakstan.

In the initial period of plant development, the assimilation surface is small and a significant part of the PAR passes by the leaves and is not captured by them. With an increase in the area of leaves, their absorption of solar energy also increases. When the leaf surface index is 4. …5, i.e. the leaf area in the crop is 40...50 thousand m ^{2} ha, the absorption of PAR by the crop leaves reaches its maximum value - 75...80%, or 40% of the total radiation . With a further increase in leaf area, the absorption of PAR does not increase [1, 3, 4].

MATERIALS AND METHODS

Laboratory and field experiments were carried out according to the following methods: "Methods of field experiments" (T. UzPITI 2007), "Methodology of field experience (B. Dospekhov, 1985) , "Methodology of the State and multi - variety testing of agricultural crops" (1985, 1989), "Methods of agrochemical, agrophysical studies of the soil of Central Asia" (1988. Phenological observations, biometric measurements, and necessary computational work were carried out experimentally.

Characteristics of the Vilana variety. It is highly productive stress-resistant mid-season soybean variety, widely cultivated in Uzbekistan as well. It is variety of VNIIMK. It is drought-resistant, and at the same time responsive to improving soil moisture. In the Krasnodar Territory, it occupies 70% of the soybean sown area. In average rainfall years, the grain yield is 2.5-3.0 t/ha, with optimal moisture it rises to 4.9-5.7 t/ha. In the Krasnodar Territory, with optimal sowing dates, maturation of plants occurs in the first - third decades of September. It is resistant to scattering and cracking of beans when ripe, resistant to downy mildew, ash rot and stem cancer. Main approbation features: gray pubescence of plants, purple flower corolla, brown bean wings. The seed coat is yellow, matte, without pigmentation. The seed hilum is medium in size, oval-elongated, light brown.

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The sum of the required effective temperatures is 2600-2700°C. The grain is large, the weight of 1000 grains is 150-160 g. During the growing season is 115-118 days. The grain contains 41% protein, 24% oil [1, 2].

The variety was sown on May 5 in a wide-row way with a row spacing of 60 cm, a norm of 400 thousand seeds per hectare. 50 kg of nitrogen and 100 kg of potassium, phosphorus were carried according to the experimental options. Spraying with iron was carried out twice during the growing season, three cultivations, two hoeing, irrigated 5 times.

RESULTS AND DISCUSSION

The soybean cultivation technology recommended for the Tashkent region was supported. Photosynthetic activity has been studied since the development of true leaves. The development of leaves was studied in dynamics in the phase of branching, flowering and pod formation. – In the branching phase, with an increase in the phosphorus rate to 120 kg, the number of leaves increased by 0.4 pieces, when the iron element was added to this option, the number of leaves increased by 0.9 pieces compared to the first option. In the flowering phase, the number of leaves increased by 1.3-1.6 due to the increase in phosphorus norms. Due to iron, in the first versions the number of leaves increased by 0.4-1.4 pieces, in the last version it decreased by 2.3 pieces. In the phase of pod formation, an increase in phosphorus norms increased the number of leaves by 1.2-0.8. Due to iron in the first two options (2 and 4), the number of leaves increased by 0.4-0.9 pieces, in the sixth option it decreased by 1.9 pieces.

Table 1
The development of real leaves in the variety Vilany under the influence of the norms of phosphorus fertilizer and the trace element iron, (Average, 2020-2021)

No.	Fertilizer rate	Development phases		
		branching	flowering	pod formation
1	$N_{50}P_{80}K_{100}$	3.5	23.2	33.9
2	$N_{50}P_{80}K_{100}$+Fe	3.5	23.6	34.4
3	$N_{50}P_{120}K_{100}$	3.9	24.5	35.2
4	$N_{50}P_{120}K_{100}$+Fe	4.4	25.9	35.6
5	$N_{50}P_{160}K_{100}$	3.9	24.7	33.8
6	$N_{50}P_{160}K_{100}$+Fe	3.6	22.8	31.5

An indicator of photosynthetic activity is the area of the leaves of one plant. It should be noted that the area of the leaves was determined in non-adjacent repetitions by the Nichiporovich cut-out method.

Table 2
The area of the leaves of one plant, depending on the norms of phosphorus and the trace element iron, cm 2, (Average over 2 years)

No.	Fertilizer rate	Development phases		
		branching	flowering	pod formation
1	$N_{50}P_{80}K_{100}$	151.0	816.0	1122.0
2	$N_{50}P_{80}K_{100}$+Fe	156.2	848.2	1141.4
3	$N_{50}P_{120}K_{100}$	162.0	957.4	1154.4
4	$N_{50}P_{120}K_{100}$+Fe	164.6	992.8	1188.0
5	$N_{50}P_{160}K_{100}$	164.4	980.0	1212.0
6	$N_{50}P_{160}K_{100}$+Fe	155.6	853.4	1114.8

In the branching phase due to iron leaf area increased by 4.8; 2.6 cm^2. But in the sixth variant, the indicator decreased by 8.8 cm^2. The leaf area of one plant in the flowering phase increased by 141.4-164.0 cm^2 due to the increase in the norm of phosphorus. In the flowering phase, the use of the trace element iron increased the leaf area by *32.2-35.4* cm^2. But in the sixth variant, the leaf area decreased by 125.6 cm^2 due to the introduction of iron. In the phase of bean formation, the use of the iron microelement increased the leaf area in the first variant by 29.4 and 33.6 cm^2. But in the sixth variant, the indicator decreased by 97, 3 cm^2. In the phase of pod formation, an increase in the phosphorus rate from 80 to 120 and 160 kg increased the leaf area by 32.0 and 90.0 cm^2, To the phosphorus rates of 80 and 120 kg on a basis of nitrogen and potassium, spraying with a suspension of iron contributes to an increase in the indicator, but with an increased phosphorus rate of 160 kg, the addition of iron causes a decrease in the index. This is apparently associated with a change in the reaction of the soil with the addition of iron (Table 2).

One of the important indicators of the photosynthetic activity of soybeans is the leaf area per hectare. This indicator was also determined in dynamics from the branching phase

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Table 3
Relationship between the leaf area of the Vilana variety and the norms of phosphorus and the microelement iron, thousand m^2/ha

No.	Fertilizer rate	Development phases		
		branching	flowering	bean formation
1	$N_{50}P_{80}K_{100}$	5.9	26.3	42.4
2	$N_{50}P_{80}K_{100}$+Fe	6.1	27.4	43.6
3	$N_{50}P_{120}K_{100}$	6.2	29.8	44.6
4	$N_{50}P_{120}K_{100}$+Fe	6.4	30.6	45.6
5	$N_{50}P_{160}K_{100}$	6.5	31.4	46.2
6	$N_{50}P_{160}K_{100}$+Fe	6.2	27.4	39.2

The area of leaves due to the increase in the rate of phosphorus increased in the branching phase by 0.3-0.6 thousand m^2/ha; in the flowering phase by 3.5 and 5.1 thousand m^2/ha and in the pod formation phase, the leaf area increased by 2.2 and 3.8 thousand m^2/ha. With an increase in the phosphorus rate to 160 kg, the addition of iron reduced the leaf area compared with the previous version. An increase in leaf area due to the use of iron was observed at phosphorus rates of 80 and 120 kg: 1.2 and 1.0. The addition of iron to the variant, where the norm of phosphorus was 160 kg, gave a negative result in all phases of development.

CONCLUSIONS

1. When cultivating the Vilana soybean variety, the photosynthetic activity of soybeans is active at phosphorus rates of 80 and 120 kg, with the addition of iron, the performance improves.
2. At a phosphorus rate of 160 kg, the indicators of photosynthetic activity decrease from the previous norms. The addition of iron to this rate gives a negative result.

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