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EFFECT OF MOISTURE LEVELS ON SOME PHYSIOLOGICAL CHARACTERISTICS OF SOYBEAN CULTIVARS

Amirbek Toshtemirov
Master's Student, Denov Institute of Entrepreneurship and Pedagogy, Denov, Uzbekistan

Fazliddin Kurbanov
Teacher, Bukhara State University, Bukhara, Uzbekistan

Abstract
The article presents the data obtained on the study of the influence of soil moisture levels on the physiological characteristics of different soybean varieties. The transpiration rate and total water content of leaves of 5 different soybean varieties were studied during the experiments. Based on the given results, it was noted that the above parameters change to different degrees in the section of varieties depending on the level of soil moisture and the biological and various characteristics of the varieties.

Keywords: soybean varieties, limited humidity, transpiration rate, total water content.

Introduction

The development and supply of vegetable protein are one of the biggest challenges in agriculture today. In solving this problem, the importance of soybean from leguminous crops is great. The soybean is an annual plant belonging to the family of leguminous crops, native to Central Asia. Soybeans play an important role in food, fodder and soil fertility. Soybean grain contains 38-52% protein, and 22-25% fat, the oil contains various vitamins, and husk contains 4-5% protein and up to 5% fat. Soybean contains 2.5 times more protein than wheat and 3.5 times more than corn and contains more than 10 amino acids. Blue mass is food for livestock. Soybean roots, like the roots of all legumes, develop nodules that can use nitrogen from the air.

Today, when there is a shortage of protein all over the world, the protein content of soybeans, the presence of all amino acids that cannot be exchanged for humans in the protein composition, is of particular importance, which further increases the nutritional value of soybeans. it is necessary to emphasize that it can be compared with food products. Soy is a source of vegetable protein, which is easily digestible and activates metabolism. Soy products are very nutritious and useful, with the characteristics of soy protein, it is close to meat, egg, and milk protein. Soybeans are rich in vitamins, especially plump soybeans contain 217-705 units of carotene. The amount of vitamin V1 is 3 times more than that of cow's milk, while V2 is found in wheat, barley, oats,

In our republic, measures have been developed to fully satisfy the needs of the population for food products grown in our country, and great attention is being paid to

their implementation and planting of soybeans in our country. Already in 2019, soybean areas in all regions increased by 19,500 hectares, and these numbers are increasing year by year. The main goal of this is to plant new soybean varieties adapted to different soil and climate conditions of the republic, to obtain high yields, to select the varieties to be planted on this basis, and to study the physiological processes and biochemistry of development. It is required to pay attention to providing oil plants with oil seeds by processing soybeans based on acceptable technologies and reducing the volume of soybeans imported from abroad. At oil plants in all regions, oil is extracted from soybeans, and its isolate is used as protein feed in poultry and cattle breeding. It is important to study soybean as an environmentally friendly product that provides quality food and improves soil fertility [2].

The reason why soybeans are grown in large areas in different countries is that their grain and green mass are nutritious, and soybeans can be used in food, fodder, and technical and medical fields. Depending on the type of soybean and growing conditions, its grain contains 30-48% protein and 17-26% fat. Soybeans contain 20-25% carbohydrates, 4-5% ash elements (including calcium, phosphorus, potassium, sodium, iodine, molybdenum, etc.), vitamins (E, V1, V2, V6, pantothenic acid, choline, folate, biotin and b.) occurs. More than a thousand products are obtained from soy. Soybean is one of the main crops in the production of food protein, oil, kunjara, and fodder [3,4].

Obtaining a high and quality harvest from soybeans requires solving complex problems. The main of these is the development of regional agrotechnics of soybean cultivation and the selection of soybean varieties suitable for certain soil and climatic conditions. This, in turn, requires determining the bioecological characteristics of soybean varieties and taking into account the soil-climatic characteristics of a particular region.

Lack of familiarity with the biological properties of soybean varieties leads to incorrect selection of planting dates and agrotechnical measures, ultimately leading to a sharp decrease in plant productivity.

Soy is a very demanding plant. The viability (fertilization) of seeds of genotype 139, which differ in the size and density (hardness) of soybeans, when stored under water absorption and unfavourable conditions, was studied. Depending on the density (hardness) of soybean seeds, their water absorption and germination change (the harder it is, the more resistant it is to storage in unfavourable conditions and the more water absorption was observed) [5].

Soybeans require relatively little water during the initial stages of vegetation - grass, first leaf emergence and budding. As soon as the flowering of the soybean plant begins, its demand for water increases dramatically. Lack of water at the beginning and in the middle of the generative period of soybean plants slows down their development speed, and the biomass of 1000 seeds also decreases dramatically [6].

After the beginning of flowering, the above-ground organs of the plant grow rapidly. Flowering, pod formation, and pod ripening use 60-70% of the water used throughout the growing season. The relative humidity of the air is also important for the good growth and development of the soybean plant. When the air is too dry, the flowers drop

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and the pods fall off. Although soybeans are demanding water, excessive watering is detrimental to high yields. Therefore, soybeans are mainly planted in irrigated fields in our republic.

If the soil moisture is too high, if the seepage water is close to the surface of the earth (80-100 cm), soybeans do not grow well in such soils. The stems of the plant are low and thin, and the flowers fall off and grow with a low yield. That is why it is necessary to work with a clear understanding of the biological properties of soybeans during irrigation [7-9].

In Phytotron, 2 drought-sensitive and moisture-resistant soybean lines were grown under normal conditions in vegetative containers. (Air temperature averaged 31±5 ℃ during the day and 22±1 ℃ at night, during the period of natural light, a sufficient amount of NRK was given.) Soybean plants were watered with tap water on the 3rd, 5th, 7th and 10th days at a rate of 1 cm above the soil surface. After 6 days of exposure to excess moisture, nitrogen uptake of soybean plants was dramatically reduced (chlorosis began to appear on the leaves) and the dry mass of soybean plants was dramatically reduced. The amount of nitrogen decreased more in the branches than in the roots. The number of chlorophylls was also dramatically reduced in the soybean line resistant to moisture stress. Also, under stress conditions, the amount of ammonium nitrogen increased, and the amount of nitrate decreased in the soil surface and roots [10].

Methods

Research work was carried out based on vegetative and field experimental methods. The research was carried out in the laboratory and field experiments of Bukhara State University "Ecological Physiology". 5 prospects of soy plant as an object of research (localSochilmas, Altintojand foreign Sava, Selekta-201 and Selekta-302) varieties were used. The experiments were carried out in conditions of 1) moderate humidity, and 2) limited humidity, and the rate of transpiration in the varieties and the total amount of water in the leaves were determined.

Results and Discussion

Transpiration is one of the main processes in managing the water balance of plants. It is known that transpiration is one of the important physiological processes and is of great importance in the water exchange of plants.

Under optimal conditions, that is, when there is enough water, the shade will transpire maximally. As a result, the absorption of water and nutrients from the soil increases, and the diffusion of SO_2 into the leaf mesophyll accelerates. In such conditions, photosynthesis accelerates and many organic substances are synthesized. During the experiments, the tillering, flowering, and poddingstagethe effect of optimal and limited humidity on the rate of transpiration was studied [11-14].

This indicator was determined in all soybean varieties grown in fields with optimal (control option) and limited (experimental option) soil moisture. The rate of transpiration in the Sochilmas variety at the stage of soybean transpiration was 130.1

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mg of water evaporated under optimal conditions, and 95.7.0 mg of water was evaporated under limited conditions. It was found that the Oltintoj variety evaporated 148.5 mg of water under optimal conditions, 107.9 mg under limited conditions, Sava variety evaporated 131.6 mg under optimal conditions, and 105.9 mg under limited conditions. Selekta-201navi evaporated 122.9mg of water under optimal conditions and 95.3mg under limited conditions.

It was observed that Selekta-302 limited Selekta-302 under optimal conditions, i.e., it evaporated 98.3 mg of water under water deficit conditions. The data obtained on the assessment of the effect of water deficit on the rate of transpiration at the tillering stage showed that high indicators, that is, the rate of water evaporation of plants, were determined in both humidity conditions in Oltintoj and Sava varieties. Low indicators were recorded in Selekta-201 and Selekta-302 varieties. Based on the obtained data, it was determined that the rate of water evaporation of soybean varieties changes depending on the moisture in the soil. In all soybean cultivars grown under optimal transpiration rate conditions, higher water evaporation was observed at the flowering stage than at the tillering and podding stages. For example, the Sochilmas variety evaporated 140.7mg of water in the flowering stage and 107.0mg in the podding stage, the Oltintoj variety evaporated 152.5mg in the flowering stage, and 108.9mg in the podding stage, the Sava variety 140.8mg in the flowering stage, and 114.5mg in the podding stage. It was found that the Selekta-201 variety evaporated 129.4 mg of water at the flowering stage and 118.2 mg at the podding stage, while the Selekta-302 variety evaporated 139.3 mg at the flowering stage and 119.2 mg at the pod stage.

Soybean varieties grown under optimal moisture conditions have a faster rate of water evaporation than plants grown under limited moisture conditions. In all varieties, the rate of transpiration increased with the increase in soil moisture level. Limited humidity, i.e., water shortage, had a negative effect on the water exchange properties of all studied cultivars. In optimal conditions, water consumption by plants is also more active than in variants under limited conditions. 104.9mg in the flowering stage of the Sochilmas variety, 121.3mg in the Oltintoj variety, and 117.3mg in the Sava variety, under conditions of limited humidity. Selection-20199.7mg in variety, Selecta-302 and it was found that 101.9 mg of water was evaporated in the grape.

As a result of the lack of water, it was found that the evaporation of water by soybean varieties is much lower than that of plants with optimal humidity. If we compare the varieties, even in extreme conditions, the Oltintoj variety is distinguished by its active transpiration compared to other varieties. According to this indicatorSelection-201andSelecta-302varieties are in last place. Sava and Sochilmas varieties occupy an intermediate position.

Most importantly, limited moisture, that is, lack of water, has a strong negative effect on the water exchange of cotton varieties, reducing the rate of transpiration. Under these conditions, the Oltintoj variety activates its metabolic processes by evaporating more water than other varieties. According to the rate of transpirationSelection-201variety took the last place.

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By determining the amount of water in plants, it is possible to observe the changes that occur in the water balance of plants under the influence of favourable and unfavourable factors. The water contained in the plant is mainly divided into two groups. These are free and bound waters. The sum of the two forms the total amount of water. Free water is often referred to as metabolic water. Because such waters are directly involved in the metabolic processes taking place in the plant body. Bound water does not take part in metabolic processes, it is mostly combined with high molecular substances. Therefore, depending on the amount of free water in the body of plants, it is possible to draw conclusions about metabolic processes. The amount of bound water often determines the resistance of plants to unfavourable factors. [15-20].

Based on the obtained data, it was observed that the total amount of water in the leaves varies depending on the growing conditions of soybean varieties. The total water content of all soybean cultivars grown under optimal soil moisture conditions was observed to be higher than that of soybean cultivars grown under limited conditions. High results for this indicator were found in Sochilmas and Sava varieties [21-34].

In the course of the experiments, high results in terms of total water content were observed in soybean varieties grown under optimal conditions of the flowering stage of all varieties. During our experiments, it was found that the total amount of water is much less in plants grown in limited moisture conditions than in varieties grown in optimal conditions.

Similar correlations were noted in the tillering and podding stages of soybean varieties. However, it was observed that the total water content was less in the tillering and podding stages than in the flowering stage.

Conclusion

The transpiration rate and total water content of the leaves during tillering, flowering and podding stages of soybean cultivars differed depending on the soil moisture level and biological characteristics of the cultivars. An increase in total water content was found in all cultivars under both moisture conditions with increasing soil moisture levels. It was found that the total water content in the leaves of soybean cultivars grown under limited moisture conditions was significantly lower than that of plants under optimal moisture conditions. So, the total amount of water in plants, being a moderate amount, activates all the physiological and biochemical processes that take place in the body of plants. In this case, high indicators of total water content were found in Sochilmas and Sava varieties.

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