IMPORTANCE OF USING SOIL CONTAINING NODULE BACTERIA AND FOSSTIM-3 BIOFERTILIZER IN SOYBEAN CULTIVATION

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ABSTRACT

This article emphasizes that the application of the phosphorus-decomposing bacterial biofertilizer FOSSTIM-3 in the form of a suspension for soybean plants improves the growth and development of soybean. It also increases the number of nitrogen-fixing bacteria (Bradyrhizobium japonicum) in the soil. As a result, positive changes are observed in plant growth and development in the existing soil, and crop productivity increases.

***Keywords**: soybean plant, FOSSTIM-3 bacterial biofertilizer, nitrogen-fixing bacteria, root system, growth indicators, development, agrophysical properties.*

АННОТАЦИЯ

В данной статье подчеркивается тот факт, что внесение фосфороразлагающего бактериального удобрения ФОССТИМ-3 в виде суспензии для растений сои с целью улучшения роста и развития сои, а также увеличения численности азотфиксирующих бактерий (Bradyrhizobium japonicum) в почве, в результате чего наблюдаются положительные изменения в росте и развитии растений на существующей почве и повышение продуктивности.

***Ключевые слова:** растение сои, бактериальное удобрение ФОССТИМ-3, азотфиксирующие бактерии, корневая система, показатели роста, развитие, агрофизические свойства*

ANNOTATSIYA

*Ushbu maqolada soya o‘simligining o‘sishi va rivojlanishini yaxshilash maqsadida fosfor parchalovchi **FOSSTIM–3** bakterial bioo‘g‘itini suspenziya shaklida qo‘llash samaradorligi o‘rganilgan. Tadqiqot natijalariga ko‘ra, mazkur bioo‘g‘it soya o‘simligi ildiz tizimida azot to‘plovchi **Bradyrhizobium japonicum** tuganak bakteriyalarining ko‘payishini rag‘batlantirishi aniqlangan. Shuningdek, bioo‘g‘it qo‘llanilgan sharoitda tuproqning agrofizik xossalari yaxshilanib,*

o‘simliklarning o‘sish va rivojlanish ko‘rsatkichlarida ijobiy o‘zgarishlar kuzatilgan. Natijada soya o‘simligi hosildorligining oshishiga erishilgan.

Kalit so‘zlar: *soya o‘simligi, FOSSTIM–3 bakterial bioo‘g‘iti, azot to‘plovchi bakteriyalar, ildiz tizimi, o‘sish ko‘rsatkichlari, rivojlanish, agrofizik xossalar.*

INTRODUCTION

In agricultural countries around the world, soybean seeds are treated with nitrogen-fixing bacteria (Bradyrhizobium japonicum) before planting. This practice allows atmospheric molecular nitrogen to accumulate in soybean-growing soils as a biological fertilizer. As a result, the application rate of nitrogen fertilizers can be reduced by up to 75%. At the same time, special attention is being paid to the development and widespread implementation of technologies aimed at preserving the fertility of soils that are gradually undergoing degradation. Soybean is considered a high-quality and nutritious feed in livestock production. One hundred kilograms of soybean grain contain 134.8 feed units, which is higher than that of many other cereal, legume, or oilseed crops. Importantly, soybean cultivation improves the meliorative condition of the soil and increases soil fertility, making it an important predecessor crop in crop rotation systems. Currently, soybean is cultivated on 127 million hectares worldwide.Therefore, expanding research aimed at developing technologies that enable symbiotic fixation of atmospheric nitrogen and the decomposition of phosphorus and potassium compounds in the soil is of great importance.

Degree of Study of the Problem

According to the research results conducted by M. Mannopova and J. U. Hamdamov, when soils taken from the rhizosphere of soybean plants were applied, the growth, development, and productivity of soybean improved under irrigated meadow-sierozem soils of the Fergana region.

In the varieties “Baraka”, “Tomaris”, and “Man-3”, the stem height of soybean plants grown using the traditional method (control variants 1–8) was analyzed at different growth stages:

Budding stage: 19.2–18.5 cm

Flowering stage: 44.7–43.2 cm

Pod formation stage: 82.6–66.4 cm

Ripening stage: 110.5–87.6 cm

When soil from the 0–15 cm layer containing nitrogen-fixing nodule bacteria (Bradyrhizobium japonicum) was applied at a rate of 1000 kg per hectare (variants 2–9), the stem height indicators were:

Budding stage: 20.6–19.7 cm
Flowering stage: 48.4–46.0 cm
Pod formation stage: 90.3–72.8 cm
Ripening stage: 119.4–95.4 cm
Compared with the control variants, plant height increased by:
1.4–1.2 cm during budding
3.7–2.8 cm during flowering
7.7–6.4 cm during pod formation
8.9–7.8 cm during ripening.

According to H. Ergasheva, soybean is an important crop for increasing soil fertility. Crops planted after soybean often show higher yields, and because soybean is a heat-loving plant, it grows well in the soils of our region.

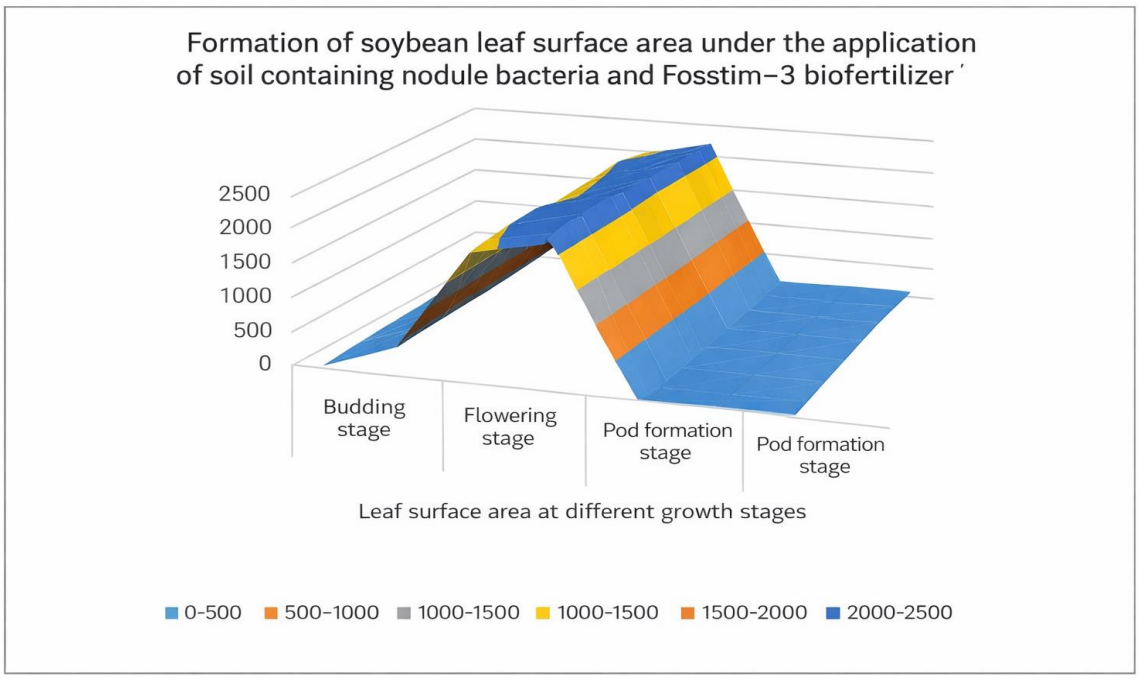
Research by A. Rakhimov and R. Rakhmonov showed that when soybean is grown as a repeated crop in soils affected by irrigation erosion, soil fertility increases, creating favorable conditions for the growth and development of crops in the following year.

Experiments conducted by N. Yodgorov and U. Mahmudov in irrigated light gray soils of the Kashkadarya region showed that planting peanut, soybean, and mung bean as repeated crops after winter wheat has a positive effect on soil bulk density and increases soil fertility.

Studies by B. Khalikov and L. Dusmatova found that increasing soybean sowing rates per hectare increased soil humus and nitrogen content. However, delaying sowing by 10–15 days compared with the optimal period of April 25–30 reduced soil humus by 0.002–0.003% and nitrogen by 0.003–0.005%.

The height of soybean plants varies depending on the biological characteristics of the variety, sowing dates, and applied agrotechnologies. Soybean roots contain a large number of nodule bacteria, which play a crucial role in enriching soil with nitrogen and increasing soil fertility. These bacteria accumulate atmospheric nitrogen in the soybean roots and convert it into a form easily absorbed by plants. Since Rhizobium-type nodule bacteria are generally absent in the soils of our republic, it is advisable to treat soybean seeds with preparations containing these bacteria before planting. Using bacterial fertilizers with highly active strains of nodule bacteria gives good results for soybean cultivation. When bacterial fertilizers are applied, the required rate of nitrogen fertilizers can also be reduced. Approximately 2–3 weeks after soybean germination, the roots can be examined and nodules formed as a result of bacterial activity can be observed. The inside of healthy nodules is usually pink in color. If the nodules are green or black, it indicates that the bacteria have died.

Histogram 1



Soil containing nodule bacteria (Bradyrhizobium japonicum) was taken from the 0–15 cm soil layer and applied at a rate of 1500 kg per hectare. In addition, before sowing, soybean seeds were treated with the new phosphorus-solubilizing bacterial biofertilizer FOSSTIM-3 at a rate of 1.0 kg/ha. According to the research results, the application of the phosphorus-solubilizing bacterial biofertilizer FOSSTIM-3 together with soil containing nitrogen-fixing nodule bacteria (Bradyrhizobium japonicum) proved to be effective for improving the growth and development of soybean plants. It was determined that when these methods were applied, the growth indicators of soybean plants, the formation of nodule bacteria in the root system, and grain yield increased. The phosphorus-solubilizing bacterial biofertilizer FOSSTIM-3 converts insoluble phosphorus in the soil into forms available for plant uptake, which stimulates the development of the root system. Nitrogen-fixing nodule bacteria (Bradyrhizobium japonicum) establish a symbiotic relationship with the soybean root system, converting atmospheric nitrogen into a form usable by plants. The combined use of these two components significantly improves the growth and development of soybean plants.

Furthermore, according to the research results, the application of soil containing nitrogen-fixing nodule bacteria (Bradyrhizobium japonicum) taken from the 0–15 cm soil layer at a rate of 1500 kg per hectare had a positive effect on the formation of nodules in the root system of soybean plants.

CONCLUSION

Based on the obtained results, it is recommended to treat soybean seeds with the phosphorus-solubilizing bacterial biofertilizer FOSSTIM-3 before sowing and to apply soil containing nitrogen-fixing nodule bacteria (Bradyrhizobium japonicum) in order to improve the growth and development of soybean plants.

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