ISSN: 2181-3337 SCIENCE AND INNOVATION
INTERNATIONAL SCIENTIFIC JOURNAL
2022
№ 3

ISOLATION OF NITROGEN-FIXING BACTERIA LIVING IN THE SOIL

Зайнобидинова Мохларойим Рустамбек қизи
"Biotechnology in fruit and vegetable production"
Master's degree student Andijan Institute of Agriculture

https://doi.org/ 10.5281/zenodo.6793525

Abstract. *Plants establish direct interactions with various microorganisms living in the soil during growth. As a result, we observe positive or negative effects on the growth and development of plants. During these experiments, we managed to isolate 9 strains of bacteria belonging to the genus Azotobacter by growing nitrogen-synthesizing microorganisms in the soil in an artificial nutrient medium that does not contain nitrogen. It was aimed to reduce the requirement of nitrogenous fertilizers during the growth and development of winter wheat and to supply this requirement to bacteria belonging to the genus Azotobacter with biosynthesized nitrogen.*

Keywords: *azotobacter, plant, artificial nutrient medium, microorganism, nitrogen-synthesizing microorganisms.*

ВЫДЕЛЕНИЕ АЗОТСИНТЕЗИРУЮЩИХ БАКТЕРИЙ ИЗ РИЗОСФЕРЫ

Аннотация. *Растения в процессе роста устанавливают прямые взаимодействия с различными микроорганизмами, обитающими в почве. В результате мы наблюдаем положительное или отрицательное влияние на рост и развитие растений. В ходе этих экспериментов нам удалось выделить 9 штаммов бактерий, относящихся к роду Azotobacter, путем выращивания азотсинтезирующих микроорганизмов в почве на искусственной питательной среде, не содержащей азот. Она была направлена на снижение потребности в азотных удобрениях в период роста и развития озимой пшеницы и обеспечение этой потребности бактерий рода Azotobacter за счет биосинтезируемого азота.*

Ключевые слова: *азотобактер, растение, искусственная питательная среда, микроорганизм, азотсинтезирующие микроорганизмы.*

INTRODUCTION

Nowadays in order to increase the productivity of agricultural crops, the use of various mineral fertilizers containing nitrogen is increasing, which means that feeding with mineral fertilizers during the growing season has a negative effect on the violation of norms, soil fertility, and the population of beneficial microorganisms present in the soil (3). Especially considering the chemical composition and structural conditions of the soils used in today's agriculture, as a result of the accumulation of some pesticide residues and hard-to-dissolve salts in the soil, it causes a decrease in the productivity of agricultural crops, as well as the fertility indicators of the soil (1). The amount of antagonistic microorganisms, diazotrophs and associative microorganisms in the soil of the areas where agricultural crops are grown is reduced precisely by chemicalization of agriculture and the use of excessive mineral substances (4). The presence of diazotrophic microorganisms and their populations in the plant rhizosphere increases the resistance of crops to disease damage. This is of particular importance in increasing the yield that can be obtained from crops in terms of quality and quantity (5).

MATERIALS AND METHODS

In addition, the role of molecular nitrogen-absorbing, phytohormones, and nitrogen-synthesizing bacteria living in the root rhizosphere of plants is very important in increasing the

productivity of soils with an increasing amount of salts in the layer where plants can grow, adapting to different conditions and increasing the growth, development and productivity of crops (1, 5). These bacteria, which can adapt to various unfavorable conditions during the cultivation of agricultural crops, create favorable conditions for the growth and development of plants (2,3).

Nitrogen-synthesizing bacteria live in the rhizosphere of the roots, live in the root system in association with plants, and form colonies in the roots depending on the type of plant (6). Nitrogen-synthesizing bacteria form populations in and around plant roots, and the main reason for this is their exudates from plant roots. Thanks to this relationship, nitrogen-synthesizing bacteria provide crops with biological nitrogen, physiologically active substances necessary for plants, and make a great contribution to their growth and development (7).

RESULTS

In the course of our research, we isolated bacteria belonging to the genus Azotobacter from the rhizosphere of wheat fields growing in the soil of Namangan and Andijan regions in different regions of our Republic (1,2,5,6). For the isolation and identification of bacteria belonging to the genus Azotobacter, 10 g samples of rhizosphere and root parts were mixed in 90 ml nitrogen-free liquid nutrient medium and bulk cultures were obtained. The bacteria from the obtained cultures were planted in different solid nutrient media without nitrogen.

Bacteria belonging to the genus Azotobacter were used in Ashby nutrient medium. To prepare the nutrient medium, we used the following reagents - (g/l): sucrose - 20; $MgSO_4 \cdot 7H_2O$ – 0.2; KH_2PO_4 – 0.2; NaCl – 0.2: $CaCO_3$ – 5; pH - 6.8-7.0; agar-agar – 15. Bacteria belonging to the genus Azotobacter being cultured, two types of morphologically different colonies were isolated in Ashby nutrient medium. After studying the morphological-physiological, biochemical (cell shape, capsule slime formation, staining according to Gramm's reaction) characteristics of the colonies, they were matched to bacteria of the genus Azotobacter.

DISCUSSION

We managed to isolate 9 strains of bacteria belonging to the genus Azotobacter from the rhizosphere of wheat fields growing in the sampled soils.

Through our research, we can come to the conclusion that the plant-microbe association with the help of bacteria of the genus Azotobacter isolated from the rhizosphere of wheat fields can be used to increase soil fertility and plant productivity.

Through biological farming, it is possible not only to obtain natural products from crops, but also to clean (bioremediation) and restore the areas used in agriculture using metabolites of other organisms to protect plants from diseases and insects (8).

CONCLUSIONS

Various diazotrophic and associative microorganisms are used for these purposes. The use of diazotrophic bacteria in organic farming is of particular importance, and the representatives of this generation differ from other microorganisms by synthesizing nitrogen and physiologically active substances, including auxins, gibberellin-like substances, in the amounts that the plants want, and ensure the transition of hard-to-assimilate phosphates in the soil to ionic forms. Synthesizes certain types of proteins and substances that have preventive properties in protecting plants from fungal diseases, helps to ensure the stability of organometallic complexes in the roots in a soluble state until they enter the plant, limits the development of phytopathogenic microflora.

List of used literature

1. Расулов Б.А., Хасанов Р.К., Паттаева М.А., Хохлачева В.Е., Бегматова Г.Н. Изучениесинтеза наночастиц серебра на основе экзополисахарида Azotobacter chroococcum 79(1) и AgNO3 // Сборник тезисов докладов Республиканской науч.-практич.конф. молодых ученых – Ташкент, 2015.– С.361-363.
3. Abdusattarovich P. A. Antifungal properties of diazotrophic bacteria //INTERNATIONAL JOURNAL OF DISCOURSE ON INNOVATION, INTEGRATION AND EDUCATION. – 2020. – Т. 1. – №. 5. – С. 331-334.
4. Pattaeva M.A, Pattaev A.A, & Rasulov B.A. (2021). STUDY OF THE PHYSICOCHEMICAL PROPERTIES OF EPS SYNTHESIZED BY THE RH.RADIOBACTER STRAIN AND THE BIOSORPTION ACTIVITY OF NACL SALT UNDER CONDITIONS OF DIFFERENT SALINITY. Innovative Technologica: Methodical Research Journal, 2(05), 32–35. https://doi.org/10.17605/OSF.IO/J8UVX
5. Паттаев А. А. ORGANIC CONTROL OF POTATOES //Экономика и социум. – 2021. – №. 8. – С. 185-188.
6. Abdusattorovich P. A. EFFECTS OF AZOTOBACTER GENERATION BACTERIA ON PLANT GROWTH AND DEVELOPMENT //Science and innovation. – 2022. – Т. 1. – №. D3. – С. 19-25.
7. Abdugafurovich R. B., Abdusattorovich P. A. IMPORTANCE OF EPSS SYNTHESIZED BY MICROORGANISMS IN SOIL SALINITY AND PRODUCTIVITY //ResearchJet Journal of Analysis and Inventions. – 2021. – Т. 2. – №. 04. – С. 306-310.
8. Abdusattorovich P. A. SYNTHESIS OF METABOLITES OF THE GENUS FUNGUS FUSARIUM OXYSPORUM f. sp. VASINFECTUM //SYNTHESIS. – 2021. – Т. 7. – №. 12.