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ENDOPHYTIC BACTERIA ASSOCIATED WITH MUNG BEAN (PHASEOLUS AUREUS ROXB. PIPER) AND THEIR EFFECTS OF PLANT NODULATION

Annotattion

This article briefly discusses the bacteria found in the nodule of mung bean, the role of microorganisms in agriculture and their effects on the growth and nodulation of mung bean (Phaseolus aureus Roxb. Piper) and information provided to finding endophytic bacteria that improve the plant's relationship with rhizobia and stimulate plant growth.

Key words: mung bean, nodulation, endophytic bacteria, inoculation, plant traits.

ЭНДОФИТНЫЕ БАКТЕРИИ, СВЯЗАННЫЕ С МАШЕМ (PHASEOLUS AUREUS ROXB. PIPER), И ИХ ВЛИЯНИЕ НА ОБРАЗОВАНИЕ КЛУБЕНЬКОВ НА РАСТЕНИЯХ

Аннотация

В этой статье кратко обсуждаются бактерии, обнаруженные в клубеньках маша, роль микроорганизмов в сельском хозяйстве и их влияние на рост и клубеньки маша (Phaseolus aureus Roxb. Piper), а также информация, предоставленная для поиска эндофитных бактерий, улучшающих состояние растения. связь с ризобиями и стимулировать рост растений.

Ключевые слова: маш, клубеньки, эндофитные бактерии, инокуляция, признаки растения.

MOSH (PHASEOLUS AUREUS ROXB. PIPER) O’SIMLIGI BILAN ASSOTSIATSIYADA YASHAYDIGAN ENDOFIT BAKTERIYALAR VA ULARNING O’SIMLIK TUGUNAK HOSIL QILISH JARAYONIGA TA’SIRI

Annotatsiya

Ushbu maqolada mosh tugunagida uchraydigan bakteriyalar, mikroorganizmlarning qishloq xo‘jaligidagi o‘rni va ularning mosh (*Phaseolus aureus Roxb. Piper*) o‘sishi va tugunak hosil qilishiga ta’siri qisqacha muhokama qilinadi, shuningdek mosh o‘simligidan ajratib olingan endofitik bakteriyalarni rizobiya bilan aloqasi va o‘simliklarning o‘sishini rag‘batlantirishi haqida ma’lumotlar keltirilgan.

Kalit so'zlar: mosh, tugunak hosil qilish, endofit bakteriyalar, inokulyatsiya, o'simlik belgilari

Introduction. Global production of mungbean is around 6.0 million tones which comes from a cultivated area of about 7.3 million hectares.India alone produces mungbean up to 41% of the global production which makes it the largest producer of mungbean followed by Myanmar, Bangladesh and Pakistan. Loam to sandy loam soils with good drainage are the best suited for mungbean cultivation. Because of its short life span, nitrogen-fixing ability, low water requirement, great biomass, and high yield mungbean is considered as one of the most important crops in agriculture [1].

Mung beans are rich in carbohydrates, proteins, fat, vitamins, fiber content, and essential minerals such as Sodium, Potassium, Iron, and Calcium. Based on the different V. radiata (L) varieties, the possible yield can be achieved between 800 kg and 1900 kg per hectare. The soil fertility has worsened due to land degradation, soil erosion, lack of nutritional supplements, agrochemical usage, and over usage of lands without crop rotation. Across the globe, soil fertility loss leads to 10–12% of agricultural land becoming incapable of crop cultivation, and around 52% of the land has partially or severely lost fertility. Loss of soil fertility in the agricultural field affects the ecosystem’s viability and causes food scarcity in the increasing population by a considerable crop yield slump [2].

Literature review. Plant growth promoting bacteria (PGPB) are a group of heterogeneous micro-organisms that directly or indirectly benefit plants by influencing nutrient behaviors and pathogen control. The association between the plants and PGPB is symbiotic, as the plant releases small molecular weight compounds as root exudates that are utilized by the residing microbes as a source of nutrition, and in turn, they promote plant growth by virtue of several PGPB traits. Biological nitrogen fixation, phosphate solubilization, growth hormone production like indole acetic acid (IAA), gibberellins, cytokinins, and siderophore production contribute directly to plant growth whereas ACC deaminase, antibiotics, cell wall degrading enzymes, competition, hydrogen cyanide, induced systemic resistance for protection against phytopathogens, quorum quenching and tolerance against several abiotic stress are indirect mechanisms [3].

Symbiotic effectiveness of rhizobial inoculants for a wide variety of legumes can be improved by coinoculation with suitable non-rhizobial plant growth promoting bacteria (PGPB). Coinoculation of PGPB with crop specific rhizobia improves root infection which results in better nodulation and grain yield e.g., Agrobacterium sp. helps Bradyrhizobium sp. in infecting root and ultimately developing nodule. Moreover, bacteria belonging to Burkholderia, Azotobacter, Azospirillum, Enterobacter and Kurthia have also been evaluated for their co-inoculation efficacy with rhizobia and were found to improve plant growth [4].

Endophytic bacteria are known to promote the plant growth by producing siderophores, auxins, phytohormones and enzymes, nitrogen fixation, solubilizing phosphate, releasing ammonia or by supplying essential vitamins to plants [5]. These microbes provide protection against phyto-pathogens mediated by volatile metabolites including hydrogen cyanide and ammonia, iron acquisition by siderophores production of antibiotic, exopolysaccharides, production of cell wall degrading enzymes and antioxidant enzymes like superoxide dismutase, catalase, peroxidase and phenols [6].

All the isolated bacteria were able to colonize mung bean root, whereas, bacterial isolates Bacillus cereus, Enterobacter ludwigii, Micrococcus yunnanensis, Bacillus proteolyticus, Bacillus proteolyticus, Agrobacterium tumefaciens, Enterobacter ludwigii, Bacillus thuringiensis, Enterobacter cloacae, Bacillus simplex, Bacillus toyonensis, Pseudomonas corrugata showed high biofilm formation ability on abiotic surface.

Research Methodology Seed bacterization: The Rhizobium strains were grown in nutrient broth by incubation for 120 rpm at 28±2°C for 72 h. Healthy seeds measured and before planting in each pot, the seeds were first kept in water for 1 hour, and then in bacterial suspension for 30 minutes. After treatment with bacteria, it was dried in the shadei. ensure bacterial population in the range of 10 to 10 CFU seed. After drying for one hour in shade, uninoculated seeds were sown first followed by inoculated seeds just to avoid contaminaten. Mung bean seeds were soaked in water for 1 hour before planting, then 9-10 cm holes were dug in the pots and planted. Each pot contains 1 kg of medium moisture soil. Pea seeds were grown for 5 weeks at normal humidity after sowing [7].

Figure 1. Mung bean is growing in pots greenhouse conditions

Analysis and results. After weeks, the plants were removed from the pots and their biometric parameters were determined: plant height, root length, number of nodules, wet mass. After obtaining the biometric indicators, the soil where the plants were grown was taken and the amount of nutrients in the soil was analyzed and compared with the results of the preliminary analysis.

Figure 2. Increase in root length mung bean seedlings

signs of isolates	plant wet mass (gr))			Number of nodules			P plant height (mm)			Root length (mm)		
Returns	1	2	3	1	2	3	1	2	3	1	2	3
Control	1.2	1.8	1.6	3	5	4	18	22	23	4	4,6	5,3
MY1	1.4	2.1	2.2	9	11	12	27	32	27	7	9	8
MY2	2.4	1,5	2.3	18	17	19	48	29	30	18	10	6
MY3	0.9	1.1	1.6	5	6	5	27	28	32	8	10	11
MY4	2.4	1.6	1,9	8	9	12	31	30	26	11	8	6
MYZ 2	1.6	1.5	1.7	6	8	5	34	28	27	8	4	3

Table 1. Mung bean biometric parametres

Conclusion. The results of the experiment show that Bacillus proteolyticus has the highest number of nodules up to 46, Agrobacterium tumefaciens has 43 nodules, Bacillus thuringiensis has 37 nodules, and Bacillus simplex has 36 nodules. According to our hypothesis, these bacteria can be effective in the development of fertilizers, which play an important role in the production of rhizobia in plants.

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