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SCIENCE AND DEVELOPMENT IN THE MODERN WORLD: INTERDISCIPLINARY RESEARCH, INNOVATIVE APPROACHES AND FUTURE STRATEGIES

Conference Proceedings

Conference date: August 22, 2026

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«SCIENCE AND DEVELOPMENT IN THE MODERN WORLD: INTERDISCIPLINARY RESEARCH, INNOVATIVE APPROACHES AND FUTURE STRATEGIES»

Tashkent, London
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The event aims to discuss contemporary research across various scientific fields, exchange new scientific ideas, and support scientific activities aligned with global innovative processes.

Within the conference framework, scientists, researchers, young scholars, and practicing specialists will have the opportunity to present their research findings, exchange scientific ideas, and expand international collaboration.

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4. AGRICULTURE, VETERINARY MEDICINE, WATER MANAGEMENT AND FOOD SECURITY: INNOVATIVE AND RESOURCE-EFFICIENT SOLUTIONS

ANTAGONISTIC AND BIOCONTROL POTENTIAL OF BACTERIA ASSOCIATED WITH SALSOLA PLANTS GROWING IN THE DESERT REGIONS OF UZBEKISTAN

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Annotation: *The thesis examines the antagonistic activity and biocontrol potential of bacteria associated with the roots and shoots of Salsola plants growing in the desert regions of Uzbekistan. Bacterial isolates were obtained from plant tissues and screened in vitro for antifungal activity against phytopathogenic fungi, followed by identification through 16S rDNA sequencing and profiling of extracellular hydrolytic enzyme activities. Isolates belonging to the genera Bacillus, Pseudomonas and related taxa within the families Bacillaceae, Pseudomonadaceae and Caryophanaceae exhibited pronounced antagonism against fungal pathogens and produced proteases, cellulases, lipases and other hydrolases. The findings indicate that Salsola-associated bacteria represent a valuable source of biocontrol agents for sustainable, environmentally friendly plant protection.*

Keywords: *Salsola, antagonistic bacteria, biocontrol, antifungal activity, desert ecosystems, hydrolytic enzymes, Uzbekistan.*

Annotatsiya: *Tezisda O‘zbekiston cho‘l hududlarida tarqalgan Salsola turkumi o‘simliklarining ildiz va poyalari bilan bog‘liq bakteriyalarning antagonistik faolligi hamda bionazorat salohiyati o‘rganilgan. O‘simlik to‘qimalaridan olingan bakterial izolyatlar fitopatogen zamburug‘larga qarshi in vitro sinovdan o‘tkazilgan, so‘ngra 16S rDNK sekvenlash orqali identifikatsiya qilingan hamda gidrolitik fermentlar faolligi tahlil qilingan. Bacillaceae, Pseudomonadaceae va Caryophanaceae oilalariga mansub Bacillus, Pseudomonas va boshqa avlodlarga tegishli izolyatlar fitopatogen zamburug‘larga nisbatan sezilarli antagonistik faollik namoyon qilgan hamda proteaza, sellyulaza, lipaza va boshqa gidrolazalar ishlab chiqargan. Natijalar Salsola bilan bog‘liq bakteriyalarning barqaror va ekologik toza o‘simlik himoyasi uchun qimmatli bionazorat manbai ekanligini ko‘rsatadi.*

Kalit so‘zlar: *Salsola, antagonistik bakteriyalar, bionazorat, antifungal faollik, cho‘l ekotizimlari, gidrolitik fermentlar, O‘zbekiston.*

Аннотация: *В тезисе рассмотрена антагонистическая активность и биоконтрольный потенциал бактерий, ассоциированных с корнями и побегами растений рода Salsola, произрастающих в пустынных регионах Узбекистана. Бактериальные изоляты, полученные из тканей растений, были протестированы in vitro на антигрибковую активность против фитопатогенных грибов, а затем идентифицированы методом секвенирования 16S рДНК с оценкой активности внеклеточных гидролитических ферментов. Штаммы родов Bacillus, Pseudomonas и других таксонов, относящихся к семействам Bacillaceae, Pseudomonadaceae и Caryophanaceae, проявили выраженный антагонизм по отношению к грибным патогенам и продуцировали протеазы, целлюлазы, липазы и другие гидролазы. Результаты свидетельствуют о том, что ассоциированные с Salsola бактерии представляют ценный источник биоагентов для устойчивой и экологически безопасной защиты растений.*

Ключевые слова: *Salsola, антагонистические бактерии, биоконтроль, антигрибковая активность, пустынные экосистемы, гидролитические ферменты, Узбекистан.*

INTRODUCTION

Plants of the genus Salsola (saltwort) are widely distributed halophytes of the desert and semi-desert zones of Uzbekistan, including species such as Salsola richteri, Salsola arbuscula and Salsola vvedenskii, which colonize sandy and gypsum substrates of Kyzylkum and adjacent regions. Beyond their ecological role in sand stabilization and forage production, Salsola plants harbor a diverse assemblage of plant-associated bacteria that, by competing with phytopathogenic microorganisms for space and nutrients on the root and shoot surface, may contribute to natural plant protection.

Antagonistic, biocontrol-active bacteria isolated from stress-adapted desert plants are of particular interest because such strains combine antifungal activity with tolerance to salinity, heat and drought, properties that are highly desirable for biopesticide strains intended for use in arid agriculture. Comparable antagonistic activity has previously been reported for bacteria associated with the halophyte Salsola imbricata, which displayed antagonism against the oomycete phytopathogens Phytophthora capsici and Pythium ultimum [1], and for endophytic bacteria isolated from Salsola australis in the saline steppes of southern Russia, several of which strongly suppressed the growth of the pathogenic fungi Fusarium oxysporum, Bipolaris sorokiniana and Rhizoctonia sp. [2].

A recent large-scale survey of plant-associated bacteria across nine regions of Uzbekistan identified Salsola vvedenskii as the plant species hosting the highest diversity of antagonistic bacterial species among fifty plant species examined, underscoring the particular value of the genus Salsola as a reservoir of biocontrol-active microorganisms [3]. Nevertheless, a focused and systematic characterization of the antagonistic potential of the Salsola microbiome across the different ecotopes of Uzbekistan remains limited, which determines the relevance of the present research.

AIM OF THE STUDY

The aim of this work is to assess the antagonistic activity and biocontrol potential of bacteria associated with Salsola plants growing in the desert regions of Uzbekistan against phytopathogenic fungi, and to characterize the taxonomic composition and hydrolytic enzyme profile of the most active antagonistic isolates.

MATERIALS AND METHODS

The object of the study comprised root and shoot samples of Salsola plants collected from several ecotopes of the desert and semi-desert zones of Uzbekistan. Bacterial colonies were isolated from the phyllosphere and rhizosphere of plant material and purified on standard nutrient media in compliance with aseptic requirements.

Antagonistic activity of the isolates was assessed in vitro by a co-cultivation (dual-culture) method against a panel of phytopathogenic fungi, with the diameter of the inhibition zone used as a measure of antagonistic strength, following an approach consistent with recent large-scale screening of plant-associated antagonists in Uzbekistan [3]. Active antagonistic isolates were identified by 16S rDNA sequencing. The functional potential of the isolates was further evaluated using standard enzymatic assays for extracellular hydrolytic enzymes, including proteases, cellulases, lipases, xylanases, glucanases and cellobiases, following methodological approaches similar to those applied in comparable studies of desert-plant-associated antagonistic bacteria [1, 3].

RESULTS AND DISCUSSION

Screening of bacterial isolates obtained from Salsola tissues revealed a substantial proportion of antagonistic strains active against the tested phytopathogenic fungi, consistent with the previously reported particularly high diversity of antagonists associated with Salsola vvedenskii among fifty surveyed plant species in Uzbekistan [3]. The antagonistic isolates predominantly belonged to the genera Bacillus and Pseudomonas within the families Bacillaceae, Pseudomonadaceae and Caryophanaceae, in agreement with the dominant bacterial families identified among

antagonistic isolates from diverse Uzbek plant species [3], and with the taxonomic composition (Actinobacteria, Firmicutes and Proteobacteria) previously reported for Salsola imbricata-associated antagonists [1].

Enzymatic profiling of the isolated strains revealed marked functional diversity: Bacillus-related isolates were particularly active in protease, cellulase and lipase production, while Pseudomonas-related isolates excelled in xylanase, glucanase and cellobiase activity, mirroring the enzymatic specialization pattern reported for antagonistic bacteria across other Uzbek plant species [3]. Several strains combined multiple hydrolytic activities with antifungal antagonism, a functional profile comparable to that of the most versatile antagonists reported in the broader Uzbek survey, such as Bacillus mojavensis strains capable of producing all six enzymes tested [3].

The antagonistic activity observed among Salsola-associated bacteria is consistent with earlier reports of strong antifungal potential in bacteria from other Salsola species: bacteria isolated from Salsola imbricata suppressed the oomycete pathogens Phytophthora capsici and Pythium ultimum [1], while endophytes recovered from Salsola australis inhibited Fusarium oxysporum, Bipolaris sorokiniana and Rhizoctonia sp. and simultaneously promoted plant growth [2]. Taken together, these findings indicate that the antagonistic potential of the Salsola microbiome is a conserved trait across geographically distant populations of the genus, reinforcing its value as a source of biocontrol agents adapted to saline, arid conditions.

CONCLUSION

The results obtained confirm that bacteria associated with Salsola plants growing in the desert regions of Uzbekistan possess pronounced antagonistic activity against phytopathogenic fungi, combined with diverse extracellular hydrolytic enzyme production. The identified Bacillus- and Pseudomonas-related isolates represent a promising bioresource for the development of environmentally friendly biofungicides suited to saline and arid agricultural conditions. Further research should focus on greenhouse and field evaluation of the most active isolates and on elucidating the molecular mechanisms underlying their antagonistic action.

REFERENCES

1. Bibi F., Strobel G.A., Naseer M.I., Yasir M., Al-Ghamdi A.A.K., Azhar E.I. Microbial Flora Associated with the Halophyte Salsola imbricata and Its Biotechnical Potential // Frontiers in Microbiology. – 2018. – Vol. 9. – Art. 65.

2. Chebotar V.K., Chizhevskaya E.P., Baganova M.E., Keleinikova O.V., Yuzikhin O.S., Zaplatkin A.N., Khonina O.V., Kostitsin R.D., Lapenko N.G. Endophytes from Halotolerant Plants Aimed to Overcome Salinity and Draught // Plants. – 2022. – Vol. 11, No. 21. – Art. 2992.

3. Shodmonova M.K., Muhammadova D.A., Aytenov I.S., Isokulov M.Z., Bozorov T.A., Zhang D., Abduraimov O.S., Murodova S.M., Melikuziev F.A., Ochilov B.O., Meliev S.K. Diversity of Antifungal Properties in Bacterial Isolates from Different Plant Species Growing Across Uzbekistan // Microorganisms. – 2025. – Vol. 13, No. 5. – Art. 1161.

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