

Dr. Tahir Naqqash

Assistant Professor

Institute of Molecular Biology and Biotechnology,

Bahauddin Zakariya University, Multan,

Pakistan.

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Email: tahirnaqqash@gmail.com; tahirnaqqash@bzu.edu.pkGoogle Scholar: <https://scholar.google.com.pk/citations?user=PEXqIDYAAAAJ&hl=en>**Education**

- **PhD Biotechnology** (2017) — NIBGE, Faisalabad, PIEAS, Islamabad.

Thesis Title: **Biodiversity of diazotrophs in the rhizosphere of potato (*Solanum tuberosum* L.).**

- **M.Sc. (Hons.) Agronomy** (2009) — University of Agriculture, Faisalabad.

Thesis Title: **Effect of weed crop competition periods and fertilizer levels on the growth and yield of black Seed (*Nigella sativa* L.).**

- **B.Sc. (Hons.) Agriculture** (2006) — Department of Agronomy, Bahauddin Zakariya University, Multan.

Research Skills

Microbiology: Isolation, Identification, Inoculation, Bio-fertilizer production.

Molecular Biology: DNA & RNA extraction, PCR, Gene cloning, Gene transformation, Gene sequencing, Molecular Markers, Denaturing Gradient Gel Electrophoresis, Real Time PCR, Next Generation sequencing, Molecular Identification and Genetic Analysis, Metagenomic.

Field experiment: Plant inoculation experiment, *in vitro* and *in vivo* experimentation and field data analysis.

Publications

1. **Tahir Naqqash**, Aeman Aziz, Muhammad Baber, Muhammad Shahid, Muhammad Sajid, Radicetti Emanuele, Abdel-Rhman Z. Gaafar, Mohamed S. Hodhod, and Ghulam Haider (2024). Metal-tolerant *Morganella morganii* isolates can potentially mediate nickel stress tolerance in Arabidopsis by upregulating

- antioxidative enzyme activities. *Plant Signaling & Behavior*, Vol. 19, No. 1, <https://doi.org/10.1080/15592324.2024.2318513>.
2. **Tahir Naqqash**, Kauser Abdullah Malik, Asma Imran, Sohail Hameed, Muhammad Shahid, Muhammad Kashif Hanif, Afshan Majeed, Muhammad Arshad, Jan Dirk van Elsas (2024). Isolation and characterization of *Rhizobium* from non-leguminous potato plants: New frontiers in *Rhizobium* research. *Biology and Fertility of Soils*. <https://doi.org/10.1007/s00374-024-01800-5>
 3. **Tahir Naqqash**, Aeman Aziza, Madiha Gohar, Jallat Khan, Shahbaz Ali, Emanuele Radicetti, Muhammad Babar, Manzer H. Siddiqui, and Ghulam Haider (2023). Heavy metal-resistant rhizobacteria fosters to alleviate the cadmium toxicity in Arabidopsis by upregulating the plant physiological responses. *International Journal of Phytoremediation*. <https://doi.org/10.1080/15226514.2023.2253923>.
 4. Shaista Javaid, Saira Mushtaq, Muhammad Zahid Mumtaz, Ghulam Rasool, **Tahir Naqqash**, Maha Afzal, Uzma Mushtaq, Hayssam M. Ali, Muhammad Fakhar-U-Zaman Akhtar, Ghulam Abbas, Lingling Li (2023). Mineral Solubilizing Rhizobacterial Strains Mediated Biostimulation of Rhodes Grass Seedlings. *Microorganisms*, 11, 2543. <https://doi.org/10.3390/microorganisms11102543>.
 5. Farwa Basit, Muhammad Shahid, Saghir Abbas, **Tahir Naqqash**, Muhammad Sohail Akram, Muhammad Tahir, Muhammad Azeem, Yibei Cai, Shuhan Jia1, Jin Hu, Xinqiang Liang, Yajing Guan (2023). Protective role of ZnO nanoparticles in soybean seedlings growth and stress management under Cr-enriched conditions. *Plant Growth Regulation*. <https://doi.org/10.1007/s10725-023-00965-7>.
 6. **Tahir Naqqash**, Kauser Abdullah Malik, Asma Imran, Sohail Hameed, Muhammad Shahid, Muhammad Kashif Hanif, Afshan Majeed, Muhammad Javed Iqbal, Muthur Mansoor Qaisrani, Jan Dirk van Elsas (2022). Inoculation with *Azospirillum* spp. Acts as the Liming Source for Improving Growth and Nitrogen Use Efficiency of Potato. *Frontiers in Plant Science*13, 929114. doi: 10.3389/fpls.2022.929114.
 7. **Tahir Naqqash**, Aeman Aziz, Muhammad Babar, Syed Bilal Hussain, Ghulam Haider, Muhammad Shahid, Muthur Mansoor Qaisrani, Muhammad Arshad, Muhammad Kashif Hanif,

- Roberto Mancinelli, Emanuele Radicetti (2022). Lead-Resistant *Morganella morganii* Rhizobacteria Reduced Lead Toxicity in *Arabidopsis thaliana* by Improving Growth, Physiology, and Antioxidant Activities. *Agriculture* 12, 1155. <https://doi.org/10.3390/agriculture12081155>.
8. Muhammad Arshad, **Tahir Naqqash**, Muhammad Tahir, Johan H. Leveau, Ahmad Zaheer, Syeda Anjum Tahira, Nasir Ahmad Saeed, Shaheen Asad, Muhammad Sajid (2022). Comparison of bacterial diversity, root exudates and soil enzymatic activities in the rhizosphere of AVP1-transgenic and nontransgenic wheat (*Triticum aestivum* L.). *J Appl Microbiol.* 133, 3094–3112.
 9. Farwa Basit, Muhammad Mudassir Nazir, Muhammad Shahid, Saghir Abbas, Muhammad Tariq Javed, **Tahir Naqqash**, Yihan Liu, Guan Yajing (2022). Application of zinc oxide nanoparticles immobilizes the chromium uptake in rice plants by regulating the physiological, biochemical and cellular attributes. *Physiol Mol Biol Plants* 28(6):1175–1190 <https://doi.org/10.1007/s12298-022-01207-2>.
 10. Shazia Rani, Muhammad Baber, **Tahir Naqqash**, Saeed Ahmad Malik (2022). Identification and Genetic Mapping of Potential QTLs Conferring Heat Tolerance in Cotton (*Gossypium hirsutum* L.) by Using Micro Satellite Marker's Approach. *Agronomy*, 12, 1381. <https://doi.org/10.3390/agronomy12061381>.
 11. Muhammad Tahir, Muhammad Shahid, Farrukh Nawaz, Iftikhar Ahmad, Muhammad Ijaz, Abu Bakr Umer Farooq, Muhammad Akram, Umaira Khalid, **Tahir Naqqash**, Shehzad Mehmood, Muhammad Mubeen, Muhammad Sarfaraz, Yasir Abbas (2022). Efficacy of organic-based carrier material for plant beneficial rhizobacteria application in okra under normal and salt-affected soil conditions. *J Appl Microbiol.* 2022; 00: 1–17.
 12. **Tahir Naqqash**, Mahreen Fatima, Saif-ur-Rehman, Sherien Bukhat, Muhammad Shahid, Ghulam Shabir, Muhammad Tahir, Muhammad Arshad, Muhammad Babar (2021). Plant Growth-Promoting Rhizobacteria Significantly Improves Growth Attributes and Photosynthetic Machinery in Wheat. *Journal of Plant Growth Regulation*. <https://doi.org/10.1007/s00344-021-10519-8>.
 13. Muhammad Babar, Saif ur Rehman, Sumaira Rasul, Kashif Aslam, Rameesha Abbas, Irfan Manzoor, Muhammad Kashif Hanif, **Tahir Naqqash** (2021). Mining of halo-tolerant plant

- growth promoting rhizobacteria and their impact on wheat (*Triticum aestivum* L.) under saline conditions. Journal of King Saud University – Science 33. 101372. <https://doi.org/10.1016/j.jksus.2021.101372>.
14. Sughra Hakim, **Tahir Naqqash**, Muhammad Shoib Nawaz, Iqra Laraib, Muhammad Jawad Siddique, Rabisa Zia, Muhammad Sajjad Mirza, Asma Imran (2021). Rhizosphere engineering with plant growth-promoting microorganisms for agriculture and ecological sustainability. Frontiers in Sustainable Food Systems, Volume 5, Article 617157. <https://doi.org/10.3389/fsufs.2021.617157>.
 15. **Tahir Naqqash**, Asma Imran, Sohail Hameed, Muhammad Shahid, Afshan Majeed, Javed Iqbal, Muhammad Kashif Hanif, Shaghef Ejaz, Kauser Abdullah Malik (2020). First Report of diazotrophic *Brevundimonas* spp. as growth enhancer and root colonizer of potato. Scientific Reports, 10:12893. <https://doi.org/10.1038/s41598-020-69782-6>.
 16. Muhammad Kashif Hanif, Kauser Abdullah Malik, Sohail Hameed, Muhammad Jawad Saddique, Ayesha, Kaneez Fatima, **Tahir Naqqash**, et al., (2020). Growth stimulatory effect of AHL producing *Serratia* spp. from potato on homologous and non-homologous host plants. Microbiological Research, 238: 126506. <https://doi.org/10.1016/j.micres.2020.126506>.
 17. Ali Abbas, Aqsa Mushtaq, Ayesha Iftikhar Cheema, Faisal Mahmood, Muhammad Asaf Khan, **Tahir Naqqash**, et al., (2020). Heterologous expression of azoreductase-encoding gene *azrS* of *Bacillus* sp. MR-1/2 for enhanced azo dye decolorization and wastewater treatment. Archives of Microbiology. <https://doi.org/10.1007/s00203-020-01940-w>.
 18. Sherien Bukhat, Asma Imran, Shaista Javaid, Muhammad Shahid, Afshan Majeed, **Tahir Naqqash** (2020). Communication of plants with microbial world: Exploring the regulatory networks for PGPR mediated defense signaling. Microbiological Research, 238: 126486. <https://doi.org/10.1016/j.micres.2020.126486>.
 19. Shaghef Ejaz, Saneya Batool, Muhammad A. Anjum, Safina Naz, Muhammad F. Qayyum, **Tahir Naqqash**, Kausar H Shah, Sajid Ali (2020). Effects of inoculation of root-associative *Azospirillum* and *Agrobacterium* strains on growth, yield and quality of pea (*Pisum sativum* L.) grown under different nitrogen and phosphorus regimes. Scientia Horticulturae, 270: 109401.

- <https://doi.org/10.1016/j.scienta.2020.109401>.
20. Muhammad Noman, Muhammad Shahida, Temoor Ahmed, Muhammad Tahir, **Tahir Naqqash**, et al., (2020). Green copper nanoparticles from a native *Klebsiella pneumoniae* strain alleviated oxidative stress impairment of wheat plants by reducing the chromium bioavailability and increasing the growth. *Ecotoxicology and Environmental Safety*, 192: 110303.
 21. Muhammad Shahid, Ali Abbas, Ayesha Iftikhar Cheema, Muhammad Noman, Muhammad Tariq Javed, **Tahir Naqqash**, Temoor Ahmed, Irfan Manzoor (2020). Plant-microbe interactions in wastewater-irrigated soils. In: *Plant ecophysiology and adaptation under climate change: mechanisms and perspectives II*. Springer: Singapore, 673-699.
 22. Muhammad Shahid, Asad Ali Shah, Farwa Basit, Muhammad Noman, Muhammad Zubair, Temoor Ahmed, **Tahir Naqqash**, Irfan Manzoor, Awais Maqsood (2019). *Achromobacter* sp. FB-14 harboring ACC deaminase activity augmented rice growth by upregulating the expression of stress-responsive CIPK genes under salinity stress. *Brazilian Journal of Microbiology*, 51, 719–728. <https://doi.org/10.1007/s42770-019-00199-8>.
 23. Muthar Mansoor Qaisrani, Ahmad Zaheer, Muhammad Sajjad Mirza, **Tahir Naqqash**, et al., (2019). A comparative study of bacterial diversity based on culturable and culture-independent techniques in the rhizosphere of maize (*Zea mays* L.). *Saudi Journal of Biological Sciences*, 7: 1344-1351. <https://doi.org/10.1016/j.sjbs.2019.03.010>.
 24. Rameesha Abbas, Sumaira Rasul, Kashif Aslam, Muhammad Baber, Muhammad Shahid, Fathia Mubeen, **Tahir Naqqash** (2019). Halotolerant PGPR: A hope for cultivation of saline soils. *Journal of King Saud University – Science*, 31: 1195-1201. <https://doi.org/10.1016/j.jksus.2019.02.019>.
 25. Afshan Majeed, M Kaleem Abbasi, Sohail Hameed, Sumera Yasmin, Muhammad Kashif Hanif, **Tahir Naqqash**, Asma Imran (2018). *Pseudomonas* sp. AF-54 containing multiple plant beneficial traits acts as growth enhancer of *Helianthus annuus* L. under reduced fertilizer input. *Microbiological Research*, 216: 56-69.
 26. Afshan Majeed, Muhammad Kaleem Abbasi, Sohail Hameed, Asma Imran, **Tahir Naqqash**, Muhammad Kashif Hanif (2018). Isolation and characterization of sunflower associated bacterial

**Conference
Posters/Presentations**

- strain with broad spectrum plant growth promoting traits. International Journal of Biosciences, 13: 110-123.
27. **Tahir Naqqash**, Sohail Hameed, Asma Imran, Muhammad Kashif Hanif, Afshan Majeed, Jan Dirk van Elsas (2016). Differential growth stimulation response of potato towards inoculation with taxonomically diverse plant growth promoting rhizobacteria. Frontiers in Plant Science, 7: 144.
 28. Kashif Hanif, Sohail Hameed, Asma Imran, **Tahir Naqqash**, Muhammad Shahid, Jan Dirk Van Elsas (2015). Isolation and characterization of a β -propeller gene containing phosphobacterium *Bacillus subtilis* strain KPS-11 for growth promotion of potato (*Solanum tuberosum* L.). Frontiers in Microbiology, 6: 583.
 29. Muhammad Ather Nadeem, A. Tanveer, **Tahir Naqqash**, A. J. Jhala, K. Mubeen (2013). Effect of weed crop competition periods and fertilizer levels on the growth and yield of black Seed (*Nigella sativa* L.). Journal of Animal and Plant Sciences 23: 216-222.
1. National Conference on Soil Degradation: An Alarming Threat to Food Security and Environment, March 3-4, 2022, Organized by Department of Soil Science, Faculty of Agricultural Sciences & Technology, Bahauddin Zakariya University, Multan, Pakistan (Poster Presentation)
 2. Isolation and characterization of potential plant growth promoting rhizobacteria (PGPR) from rhizosphere of *Cyprus rotundus* L. 1st International and 2nd National Conference on “Challenges and Opportunities to Boost Agriculture in Changing Climate.” March 26-28, 2018. College Of Agriculture, Bahauddin Zakariya University, Bahadur Sub-Campus, Layyah, Punjab, Pakistan.
 3. Isolation and characterization of salt tolerant plant growth promoting rhizobacteria. 1st International and 2nd National Conference on “Challenges and Opportunities to Boost Agriculture in Changing Climate.” March 26-28, 2018. College Of Agriculture, Bahauddin Zakariya University, Bahadur Sub-Campus, Layyah, Punjab, Pakistan.
 4. Analysis of the potato (*Solanum tuberosum* L.) rhizosphere

Training

associated bacteria for their plant growth promoting potentials. Proceeding of International Conference on Himalayan Biodiversity and climate change: challenges and opportunities (2014). University of AJK, Muzaffarabad, Pakistan.

5. Screening of potato (*Solanum tuberosum* L.) rhizosphere bacteria for phosphate solubilization and nitrogen fixation. Proceeding of International Conference on Biotechnology: Prospects and Challenges in Agriculture, Industry, Health and Environment (2013). National Institute for Biotechnology and Genetic Engineering (NIBGE), Faisalabad, Pakistan.

- Participated in one day hands-on-training on “Genome editing and Protein purification” May 11, 2024 organised by U.S. Pakistan Centre for Advanced Studies in Agriculture and Food Security (USP-CAS-AFS) and PCSIR, LLC.
- Participated in Five day “International hands-on-training on CRISPR/Cas mediated genome editing” May 6-10, 2024 organised by National Centre for Genome Editing (NCGE), U.S. Pakistan Centre for Advanced Studies in Agriculture and Food Security (USP-CAS-AFS) at University of Agriculture, Faisalabad, Pakistan.
- Participated in One day workshop on “Environmental crisis and role of Molecular Biology and Biotechnology” April 2024, at Institute of Molecular Biology and Biotechnology, Bahauddin Zakariya University Multan, Pakistan.
- Three Days Hands-on Training on “Biosafety and Biosecurity for Young Researchers” January 17-19, 2023 at Institute of Molecular Biology and Biotechnology, Bahauddin Zakariya University Multan, Pakistan.
- Participated in “Five-day BRM basic training” held on 17-21 October, 2022 organized by Institute of Molecular Biology and Biotechnology, Bahauddin Zakariya University, Multan, Pakistan in association with Biorisk Management (BRM) Pakistan

Supervision/Co-supervision (PhD/M.Phil.)**PhD**

- Seema Aslam – (2020-25) - Biochemical Characterization, Molecular Fingerprinting and Biocontrol Potential of PGPR

Isolated from Rhizospheric Soil of Cotton-Wheat Crop Rotational Area

- Mahwish Batool Kazmi (2021-26) - Microbial mediated phyllosphere engineering to mitigate air pollution.
- Barooj Fatima (2022-2027) – Exploring the remediation potential of native microbes to mitigate the deleterious effects of organic and inorganic pollutants of tannery industry.

MPhil

- Saif ur Rehman - (2017-19) - Study of Physiologically Diverse Plant Growth Promoting Rhizobacteria in the Alleviation of Salt Stress in Wheat (*Triticum aestivum* L.) – (Completed).
- Muhammad Asif – (2017-19) - Characterization of *Brassica napus* germplasm based on microsatellite markers. – (Completed).
- Muhammad Nasir Khan Babar – (2017-19) - Analysis of the genetic diversity and phylogenetic relationship of *Ctenopharyngodon idella* fish collected from rivers Indus and Chenab by using microsatellite DNA markers. – (Completed)
- Barooj Fatima – (2020-22) - Characterization of bioremediation potential of native microbes from tannery industry – (Completed)
- Rimsha Sattar – (2020-22) - Microbial diversity in drought tolerant plants using morphological, biochemical and molecular techniques. – (Completed)
- Kashfa Feroz Khan – (2020-22) - Isolation and characterization of pesticide tolerant bacterial isolates to remediate organophosphate – (Completed)
- Farhan Ali – (2021-23) Assessment of PGPR for the mitigation of drought stress using maize (*Zea mays* L.)
- Momnah Bakht-Awer – (2021-23) Evaluation of bio-control potential of plant growth promoting rhizobacteria in wheat
- Fizza Wajid (2021-23) – Isolation, characterization and diversity analysis of rhizospheric microbes of roadside greenbelts
- Sheikh Muhammad Immad Hassan – (2021-23) Screening of potential petroleum hydrocarbon degrading microbes
- Iqra Sabir – (2021-23) Assessment of organophosphate tolerant bacteria and their plant growth promoting potential in cotton
- Mahrukh – (2022-24) Molecular marker dissection of stem rust resistance genes Sr31 and Sr38 in wheat germplasm

Administration

- Mashal Zahra – (2022-24) In-Silico analysis and structural modelling of Phospholipase *ytpA* gene in different *Bacillus* strains
- Director Student affairs (DSA) at the Institute of Molecular Biology and Biotechnology (IMBB), Bahauddin Zakariya University, Multan
- Member Admission Committee
- Secretary Admission Committee
- Member Examination Committee
- Member Departmental Technical Purchase Committee
- Member/Secretary Zakariyan Federation of Biotechnologist
- Part of organizing committee of “14th National Training Course on Modern Techniques in Biotechnology” held at National Institute for Biotechnology and Genetic Engineering, Faisalabad (April 18-22, 2016).
- Part of organizing committee of “2nd National Student Conference on Biological Sciences” held at National Institute for Biotechnology and Genetic Engineering, Faisalabad (Oct. 12-14, 2015).
- Part of organizing committee of “NIBGE Sports Gala” held at National Institute for Biotechnology and Genetic Engineering, Faisalabad.
- Part of organizing committee of “11th National Training Course on Modern Techniques in Biotechnology” held at National Institute for Biotechnology and Genetic Engineering, Faisalabad (Feb. 11-15, 2013).
- Part of organizing committee of “2nd National Training Course on Bacterial Identification and Metagenomics” held at National Institute for Biotechnology and Genetic Engineering, Faisalabad (March 4-8, 2013).
- Part of organizing committee of “International Conference on Biotechnology: Prospects and Challenges in Agriculture, Industry, Health and Environment” held at National Institute for Biotechnology and Genetic Engineering, Faisalabad (April 22-26, 2013).
- Part of organizing committee of “10th National Training Course on Modern Techniques in Biotechnology” held at National Institute for Biotechnology and Genetic Engineering, Faisalabad (Feb. 13-

	17, 2012). • Part of organizing committee of “9th National Training Course on Modern Techniques in Biotechnology” held at National Institute for Biotechnology and Genetic Engineering, Faisalabad (March 07-11, 2011). • Part of organizing committee of “3rd National Training Workshop on Electron and Confocal Microscopy” held at National Institute for Biotechnology and Genetic Engineering, Faisalabad (Dec. 12-21, 2011). • Part of organizing committee of “8th National Training Course on Modern Techniques in Biotechnology” held at National Institute for Biotechnology and Genetic Engineering, Faisalabad (April 12-16, 2010). Part of organizing committee of “2nd National Training Workshop on Electron and Confocal Microscopy” held at National Institute for Biotechnology and Genetic Engineering, Faisalabad (Dec. 06-15, 2010).
Awards and Achievements	• HEC approved Supervisor • Performance Based Increment from BZ University, Multan Pakistan (2022) • HEC-5000 Indigenous Fellowships for PhD under HEC, Pakistan • 6-month Research Fellowship under IRSIP, HEC, Pakistan
Member Editorial/Review Board	• Frontiers in Plant Science https://www.frontiersin.org/journals/plant-science • Scientific Reports ISSN: 2045-2322; https://www.nature.com/srep/ • 3 Biotech ISSN: 2190-5738; https://www.springer.com/journal/13205/ • Heliyon ISSN: 2405-8440; https://www.cell.com/heliyon/home • PLOS One ISSN: 1932-6203; https://journals.plos.org/plosone/
Examiner/Expert/Member	• University of Okara, Okara, Pakistan • Government College University, Faisalabad, Pakistan • Women University, Multan, Pakistan
Research Grants	• 2022: Biochemical and molecular characterization of pesticide

NCBI Gene Bank Accessions

- degrading plant growth promoting rhizobacteria: a paradigm of sustainable disease management (BZU, Multan, Pakistan; Rs. 200, 000)
- 2017: Bioprospecting the rhizosphere of noxious weed for potent plant growth promoting rhizobacteria (HEC, Islamabad; Rs.4, 80,000)
- NCBI Gene Bank Release of *Morganella morganii* strain 16S ribosomal RNA gene partial sequence (Accession Number: ON316873), 2022. **Naqqash, T.**, Aziz, A. and Baber, M.
- NCBI Gene Bank Release of *Morganella morganii* strain 16S ribosomal RNA gene partial sequence (Accession Number: ON316874), 2022. **Naqqash, T.**, Aziz, A. and Baber, M.
- NCBI Gene Bank Release of Enterobacter strain 16S ribosomal RNA gene partial sequence (Accession Number: MT796341), 2020. **Naqqash, T.**, Fatima, M. and Baber, M.
- NCBI Gene Bank Release of Enterobacter strain 16S ribosomal RNA gene partial sequence (Accession Number: MT796342), 2020. **Naqqash, T.**, Fatima, M. and Baber, M.
- NCBI Gene Bank Release of *Mammaliicoccus sciuri* strain 16S ribosomal RNA gene partial sequence (Accession Number: MT796472), 2020. **Naqqash, T.**, Wazir, N. and Aslam, K.
- NCBI Gene Bank Release of *Alcaligenes faecalis* strain 16S ribosomal RNA gene partial sequence (Accession Number: MT765076), 2020. **Naqqash, T.**, Babar, M., Abbas, R. and Rasul, S.
- NCBI Gene Bank Release of *Alcaligenes faecalis* strain 16S ribosomal RNA gene partial sequence (Accession Number: MT765077), 2020. **Naqqash, T.**, Babar, M., Abbas, R. and Rasul, S.
- NCBI Gene Bank Release of *Azospirillum* sp. TN01 16S ribosomal RNA gene partial sequence (Accession Number: LN833441), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Azospirillum* sp. TN02 16S ribosomal RNA gene partial sequence (Accession Number: LN833442), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Azospirillum* sp. TN03 16S ribosomal RNA gene partial sequence (Accession Number: LN833443), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.

- NCBI Gene Bank Release of *Rhizobium* sp. TN04 16S ribosomal RNA gene partial sequence (Accession Number: LN833444), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Advenella* sp. TN05 16S ribosomal RNA gene partial sequence (Accession Number: LN833445), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Agrobacterium* sp. TN06 16S ribosomal RNA gene partial sequence (Accession Number: LN833446), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Azospirillum* sp. TN08 16S ribosomal RNA gene partial sequence (Accession Number: LN833447), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Azospirillum* sp. TN09 16S ribosomal RNA gene partial sequence (Accession Number: LN833448), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Azospirillum* sp. TN10 16S ribosomal RNA gene partial sequence (Accession Number: LN614537), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Sphingobacterium* sp. TN11 16S ribosomal RNA gene partial sequence (Accession Number: LN833449), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Azospirillum* sp. TN12 16S ribosomal RNA gene partial sequence (Accession Number: LN833450), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Azospirillum* sp. TN13 16S ribosomal RNA gene partial sequence (Accession Number: LN833451), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Agrobacterium* sp. TN14 16S ribosomal RNA gene partial sequence (Accession Number: LN614534), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Azospirillum* sp. TN15 16S ribosomal RNA gene partial sequence (Accession Number: LN833452), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Achromobacter* sp. TN16 16S ribosomal RNA gene partial sequence (Accession Number: LN833453), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Stenotrophomonas* sp. TN17 16S ribosomal RNA gene partial sequence (Accession Number: LN833454), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.

- NCBI Gene Bank Release of *Rhizobium* sp. TN18 16S ribosomal RNA gene partial sequence (Accession Number: LN833455), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Bacillus* sp. TN19 16S ribosomal RNA gene partial sequence (Accession Number: LN833456), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Stenotrophomonas* sp. TN21 16S ribosomal RNA gene partial sequence (Accession Number: LN833457), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Azospirillum* sp. TN22 16S ribosomal RNA gene partial sequence (Accession Number: LN833458), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Stenotrophomonas* sp. TN23 16S ribosomal RNA gene partial sequence (Accession Number: LN833459), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Shinella* sp. TN25 16S ribosomal RNA gene partial sequence (Accession Number: LN833460), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Agrobacterium* sp. TN26 16S ribosomal RNA gene partial sequence (Accession Number: LN833461), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Rhizobium* sp. TN27 16S ribosomal RNA gene partial sequence (Accession Number: LN833462), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Azospirillum* sp. TN29 16S ribosomal RNA gene partial sequence (Accession Number: LN833463), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Azospirillum* sp. TN30 16S ribosomal RNA gene partial sequence (Accession Number: LN833464), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Azospirillum* sp. TN31 16S ribosomal RNA gene partial sequence (Accession Number: LN8334465), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Bacillus* sp. TN32 16S ribosomal RNA gene partial sequence (Accession Number: LN833466), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Bacillus* sp. TN33 16S ribosomal RNA gene partial sequence (Accession Number: LN833467), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.

- NCBI Gene Bank Release of *Bacillus* sp. TN34 16S ribosomal RNA gene partial sequence (Accession Number: LN833468), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Achromobacter* sp. TN35 16S ribosomal RNA gene partial sequence (Accession Number: LN833469), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Pseudomonas* sp. TN36 16S ribosomal RNA gene partial sequence (Accession Number: LN614533), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Brevundimonas* sp. TN37 16S ribosomal RNA gene partial sequence (Accession Number: LN833470), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Enterobacter* sp. TN38 16S ribosomal RNA gene partial sequence (Accession Number: LN614535), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Brevundimonas* sp. TN39 16S ribosomal RNA gene partial sequence (Accession Number: LN833471), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Brevundimonas* sp. TN40 16S ribosomal RNA gene partial sequence (Accession Number: LN833472), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Agrobacterium* sp. TN41 16S ribosomal RNA gene partial sequence (Accession Number: LN833473), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Rhizobium* sp. TN42 16S ribosomal RNA gene partial sequence (Accession Number: LN614536), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Enterobacter* sp. TN43 16S ribosomal RNA gene partial sequence (Accession Number: LN833474), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Brevundimonas* sp. TN44 16S ribosomal RNA gene partial sequence (Accession Number: LN833475), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Azospirillum* sp. TN01 *nifH* gene partial sequence (Accession Number: LT596584), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Azospirillum* sp. TN02 *nifH* gene partial sequence (Accession Number: LT596585), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.

- NCBI Gene Bank Release of *Azospirillum* sp. TN03 *nifH* gene partial sequence (Accession Number: LT596586), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Rhizobium* sp. TN04 *nifH* gene partial sequence (Accession Number: LT596587), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Azospirillum* sp. TN09 *nifH* gene partial sequence (Accession Number: LT596588), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Azospirillum* sp. TN10 *nifH* gene partial sequence (Accession Number: LN681358), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Azospirillum* sp. TN12 *nifH* gene partial sequence (Accession Number: LT596589), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Azospirillum* sp. TN13 *nifH* gene partial sequence (Accession Number: LT596590), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Azospirillum* sp. TN15 *nifH* gene partial sequence (Accession Number: LT596591), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Stenotrophomonas* sp. TN21 *nifH* gene partial sequence (Accession Number: LT596592), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Azospirillum* sp. TN22 *nifH* gene partial sequence (Accession Number: LT596593), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Azospirillum* sp. TN30 *nifH* gene partial sequence (Accession Number: LT596594), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Azospirillum* sp. TN31 *nifH* gene partial sequence (Accession Number: LT596595), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Brevundimonas* sp. TN37 *nifH* gene partial sequence (Accession Number: LT596596), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.
- NCBI Gene Bank Release of *Brevundimonas* sp. TN40 *nifH* gene partial sequence (Accession Number: LT596597), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.

References

- NCBI Gene Bank Release of *Brevundimonas* sp. TN44 *nifH* gene partial sequence (Accession Number: LT596598), 2015. **Naqqash, T.**, Hameed, S. and Imran, A.

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