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EDITED BY
Vijay Singh Meena,
CIMMYT-Borlaug Institute for South Asia (BISA), India

REVIEWED BY
Sudhir K. Upadhyay,
Veer Bahadur Singh Purvanchal University, India
Shrivardhan Dheeman,
MVN University, India

*CORRESPONDENCE
Snehal Bagatharia
✉ drsnehal.bagatharia@gmail.com
Madhvi Joshi
✉ jd1-gbrc@gujarat.gov.in
Byong-Hun Jeon
✉ bhjeon@hanyang.ac.kr
Ashish Patel
✉ uni.ashish@gmail.com

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Bacillus subtilis ER-08, a multifunctional plant growth-promoting rhizobacterium, promotes the growth of fenugreek (*Trigonella foenum-graecum* L.) plants under salt and drought stress

Margi Patel[1], Shaikhul Islam[2], Fohad Mabood Husain[3], Virendra Kumar Yadav[1], Hyun-Kyung Park[4], Krishna Kumar Yadav[5,6], Snehal Bagatharia[7]*, Madhvi Joshi[8]*, Byong-Hun Jeon[9]* and Ashish Patel[1]*

[1]Department of Life Sciences, Hemchandracharya North Gujarat University, Patan, Gujarat, India, [2]Bangladesh Agricultural Research Council, Dhaka, Bangladesh, [3]Department of Food Science and Nutrition, College of Food and Agriculture Sciences, King Saud University, Riyadh, Saudi Arabia, [4]Department of Pediatrics, Hanyang University College of Medicine, Seoul, Republic of Korea, [5]Faculty of Science and Technology, Madhyanchal Professional University, Ratibad, Bhopal, India, [6]Environmental and Atmospheric Sciences Research Group, Scientific Research Center, Al-Ayen University, Thi-Qar, Nasiriyah, Iraq, [7]Gujarat State Biotechnology Mission (GSBTM), Gandhinagar, Gujarat, India, [8]Gujarat Biotechnology Research Centre (GBRC), Gandhinagar, Gujarat, India, [9]Department of Earth Resources and Environmental Engineering, Hanyang University, Seoul, Republic of Korea

Introduction: Sustainable agriculture and meeting the world's food needs face considerable obstacles from abiotic stresses such as soil salinity and drought. This critical issue was addressed by our current study, which sought to uncover multi-trait bioinoculants from hostile ecosystems that could help mitigate salinity and drought stresses at the same time.

Methods: The *Bacillus subtilis* ER-08 (BST) strain was isolated from the halotolerant plant Fagonia *cretica* which was collected from the Little Rann of Kachchh, India. Various biochemical and molecular approaches were applied for the detailed characterization of the BST isolate.

Results and discussion: The BST isolate demonstrated notable plant growth-promoting qualities. Fenugreek seed biopriming was performed using the BST isolate. The effect of BST seed treatment on fenugreek developmental indices as well as abiotic alleviation was examined under greenhouse conditions. The BST produced 83.7 g ml^{-1} gibberellins (GA_3) and 176.1 g ml^{-1} indole-3 acetic acid. Moreover, hydrogen cyanide, siderophore, exopolysaccharides (EPS), ammonia, cellulase, protease, pectinase, and chitinase were also produced by the BST strain. Interestingly, 52% of *Fusarium oxysporum* mycelial growth was suppressed by the BST isolate under *in vitro* conditions. Furthermore, BST isolates functioned well under several abiotic stress conditions, for instance, salinity (4 and 6 ds m^{-1}), pH (5, 7, and 9), drought (PEG6000 at 10%, 20%, and 30%), and temperature (25°C, 35°C, 37°C, and 55°C). This study indicates that the BST strain might serve as an effective bio-inoculant for minimizing the detrimental effects of abiotic stresses.

KEYWORDS

drought stress, fenugreek, multi-trait endophytic bacteria, rhizobacteria, plant growth augmentation, salt stress