International Journal of Agricultural Sciences ☞ DOI:10.15740/HAS/IJAS/19,RAAAHSTSE-2023/246-256
Volume 19 | RAAAHSTSE - 2023 | 246-256 ■ ISSN : 0973-130X Visit us : *www.researchjournal.co.in*

A REVIEW

Enhancing cowpea productivity in the Indian subcontinent: Physiological insights into rhizobial symbiosis and sustainable nitrogen fixation

Chavan Syamraj Naik* **and** M Vijay Kumar[1]
Department of Crop Physiology, Agriculture College (Acharya N.G. Ranga Agriculture University), Rajamahendravaram (A.P.) India (Email: chavan_syam@rediffmail.com)

Abstract : Cowpea (*Vigna unguiculata*) is a vital legume crop in India, valued for its drought resilience, nitrogen-fixing ability, and nutritional benefits. However, its productivity is constrained by abiotic stresses (drought, heat, salinity), poor soil fertility, and suboptimal farming practices. This review examines the physiological mechanisms of cowpea-rhizobia symbiosis, emphasizing strain-specific adaptations that enhance nitrogen fixation under stress. High-efficiency rhizobial strains like COC-10 (salinity-tolerant), TAL-1000 (low-phosphorus-adapted), and SB-12 (salt-tolerant) have increased yields by 15–40% in Indian agroecologies. Key physiological markers—leghaemoglobin content, xylem ureides, and nodule SDH activity—are identified for strain screening. Field trials in Karnataka, Andhra Pradesh, and Odisha demonstrate the success of integrated practices, including rhizobia-compost synergy and intercropping, which reduce fertilizer dependence by 40–50%. Challenges such as inoculant stability, farmer awareness gaps, and strain-soil mismatches are addressed through innovations like CRISPR-edited rhizobia and microbial consortia. Policy recommendations include subsidies for alginate-encapsulated inoculants and farmer training programs. By optimizing symbiotic efficiency and adopting context-specific strategies, cowpea cultivation can significantly contribute to sustainable agriculture and food security in India.

Key Words : Cowpea, Rhizobia, Nitrogen fixation, Abiotic stress, Sustainable agriculture, India

View Point Article : Naik, Chavan Syamraj and Vijay Kumar, M. (2023). Enhancing cowpea productivity in the Indian subcontinent: Physiological insights into rhizobial symbiosis and sustainable nitrogen fixation. *Internat. J. agric. Sci.*, **19** (RAAAHSTSE) : 246-256, **DOI:10.15740/HAS/IJAS/19, RAAAHSTSE-2023/246-256.**

Article History : Received : 13.03.2023; **Accepted :** 20.03.2023

INTRODUCTION

Cowpea (*Vigna unguiculata*) is a vital legume crop that holds significant agronomic and nutritional importance, particularly in the Indian context. As a warm-season crop, cowpea is well-suited to the climatic conditions prevalent in many parts of India, making it a staple in both agricultural practices and dietary habits. India is one of the largest producers of cowpea, with states like Uttar Pradesh, Karnataka, and Maharashtra being major contributors to its cultivation. The crop's

***Author for correspondence :**
[1]Department of Crop Physiology, Agricultural Research Station, Professor Jayashankar Telangana Agricultural University), Basanthpur, Sangareddy (Telangana) India (Email: vijay.pjtsau@gmail.com)