

RESEARCH ARTICLE :

Impact of seasonal variations on physiological traits and nutrient accumulation in guar (*Cyamopsis tetragonoloba* L.)

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SUMMARY : A field experiment was conducted to evaluate the impact of seasonal variations on physiological traits and nutrient accumulation patterns in 22 guar genotypes across three growing seasons (*Kharif*, *Rabi* and Summer) under semi-arid conditions of Andhra Pradesh, India. The study focused on crop growth rate (CGR), relative growth rate (RGR), net assimilation rate (NAR), leaf area index (LAI), and nitrogen, phosphorus, and potassium (NPK) accumulation in different plant parts. Results revealed significant seasonal variations in physiological parameters and nutrient uptake patterns. *Kharif* season recorded highest CGR ($22.79 \text{ g m}^{-2} \text{ day}^{-1}$) and RGR ($109 \text{ mg g}^{-1} \text{ day}^{-1}$) values, while summer season showed superior NAR ($191.46 \text{ mg cm}^{-2} \text{ day}^{-1}$) after flowering. LAI was maximum during *Kharif* (0.55) compared to summer (0.26) and *Rabi* (0.11). NPK accumulation peaked at 60 DAS across all seasons, with summer season showing better nutrient distribution to seeds. The study established that guar is a warm-loving crop with optimal performance during summer season, making it suitable as a third crop in the semi-arid cropping systems.

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BACKGROUND AND OBJECTIVES

Guar or cluster bean (*Cyamopsis tetragonoloba* L.) Taub is a drought-tolerant annual legume crop grown primarily for grain, fodder, vegetable, and green manure in arid and semi-arid regions of India, Pakistan, Sudan, parts of USA, and to some extent in Australia, South Africa, and Brazil (Chamola and Hasija, 1984). India is the chief guar-growing country, accounting for 80% of total global guar production, with an area of 33.47 lakh

hectares, production of 11.69 lakh tonnes, and productivity of 350 kg ha^{-1} (Indiastat, 2006-07). The crop has gained significant industrial importance due to its water-soluble natural polymer galactomannan gum, which finds extensive applications in textile, paper, food processing, cosmetics, mining, pharmaceutical, explosives, and petroleum industries. Guar seed is composed of hull (30-33%), endosperm (27-30%), and germ (43-47%), with the endosperm containing 19-43%

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