

## Crop physiological approaches to evaluate drought-resistant traits in clusterbean (*Cyamopsis tetragonoloba*)

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### ABSTRACT

An experiment was conducted during rainy (*kharif*) seasons of 2003 and 2004 to identify genotypes with both higher crop growth rate and dry-matter partitioning of pods and analyse the association of drought-resistance traits with yield components in clusterbean [*Cyamopsis tetragonoloba* (L.) Taub.] under rainfed condition. Genotypic variations for total dry matter, pod yield and seed yield were noticed. Strong relationship ( $r^2= 0.82$ ) between crop-growth rate determined by sequential growth analysis and crop growth rate derived on the basis of thermal time indicated that larger set of germplasm can be evaluated for higher crop and pod growth rates with ease on thermal time basis by recording phenology data, total dry matter and pod yield at maturity. Significant relationship of specific leaf area with both seed yield and relative water content suggested that low specific leaf area, a cost effective and easily measurable leaf trait, is a potential selection criterion for improving yield of clusterbean under rainfed conditions of arid zone.

**Key words:** Clusterbean, Crop growth rate, Specific leaf area, Specific root weight

Clusterbean [*Cyamopsis tetragonoloba* (L.) Taub.], commonly known as *guar* is an important rainfed crop of the arid and semiarid regions. The total national production is 0.68 million tonnes, of which 58% is produced in Rajasthan with very low productivity of 246 kg/ha (Henry and Mathur 2007). The discovery that endosperm of guar seed is a source of useful industrial gum have diversified uses brought world wide recognition of this little known legume. Despite multiple and diverse uses, very little research efforts have so far gone to improve this crop for drought tolerance. Being grown as rainfed crop in arid zone, long dry spells during cropping period often results in low and unstable yield in clusterbean. Water deficit stress has been reported to affects practically every aspect of plant growth and metabolism (Burman *et al.* 2004, Garg *et al.* 2006). Significant genotypic differences to water stress in clusterbean have been reported both at germination and latter growth stages (Garg 2004). These variations for morphological and physiological traits are

needed to be better understood for selection and development of drought-tolerant genotypes with higher yield potential under water-limited conditions. Identification and evaluation of the genetic variability in drought tolerance traits and their association with the yield needs to be established. This study is an attempt to investigate the potential of physiological approaches to select genotypes of clusterbean with higher crop growth rate and dry matter partitioning to pods and to identify the drought resistance traits in clusterbean and analysis of their association with yield components.

### MATERIALS AND METHODS

The experiments were conducted during rainy (*kharif*) seasons of 2003 and 2004 at the research farm of Regional Research Station, Bikaner. The rainfall during 2003 and 2004 growing seasons were 227.9 mm and 127.7 mm, which were 17.0 and 53.6 % less over the normal rainfall of 275 mm. During 2003, 41 genotypes of clusterbean were evaluated for yield components and drought-resistant traits, while during 2004 studies were conducted on 10 genotypes selected on the basis of their performance and leaf traits expressed during 2003. The crop were sown in randomized block design with 3 replications. Recommended package of practices were followed. Data on phenology (days to emergence, flowering, pod initiation, maturity) were recorded in both seasons.

### Growth rate

Growth rates were determined by two ways, one through

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