

## Genotypic Variations in Stomatal Regulation and Root Traits and their Association with Yield Parameters in Moth Bean (*Vigna aconitifolia* Jacq.) under Rainfed Conditions of Arid Zone

H.S. Talwar\*, M.L. Soni, R.K. Beniwal, N.D. Yadava, J.P. Singh, V.S. Rathore and Sunil Kumar

Central Arid Zone Research Institute, Regional Research Station, Bikaner 334 004, India

**Abstract:** The experiments were conducted during kharif 2003 and 2004 seasons to analyze the genotypic variations in stomatal regulation and root traits and their association with yield parameters in moth bean (*Vigna aconitifolia* Jacq.) under water scarcity conditions of arid zone. Wide range of variations in total dry matter (TDM), pod yield (PY) and seed yield (SY) were noticed among the 26 genotypes. Our results suggest that genotypes with thick leaves (low SLA) exhibit more drought tolerance by keeping their stomata open at lower relative water content (RWC) in leaves. Significant relationship of specific leaf area (SLA) with both seed yield ( $r^2 = 0.57$ ) and relative water content (RWC) ( $r^2 = 0.49$ ) suggested that low SLA could be an important leaf trait for selecting moth bean genotypes for higher yield under water-deficit conditions. The strong relationship of specific root weight (SRW, root weight per unit root length) with TDM ( $r^2 = 0.73$ ) and PY ( $r^2 = 0.56$ ) indicated that selection of genotypes with extensive root system would enhance the yield of moth bean under water scarcity conditions of arid zone. This study suggested that SLA, a cost-effective and easily measurable leaf trait, and/or SRW are the potential selection criteria to enhance the moth bean yield under rainfed conditions of the arid zone.

**Key words:** Arid zone, moth bean, pod yield, root length, root weight, seed yield, specific leaf area, specific root weight, total dry matter.

Moth bean, *Vigna aconitifolia* (Jacq.) Marechal), known as *Phaseolus aconitifolia* (Jacq.), is an important crop of the north-western arid zone of India. It is one of the most drought-tolerant legumes grown during kharif season on light sandy soil as a rainfed crop. The total area under this crop is approximately 1.33 million hectare with production of 0.20 million tonnes of seed. Besides being a pulse crop, its green pods are consumed as vegetable and the plant, being

highly palatable and rich in protein, forms an excellent fodder. On account of its mat-like growth habit, it is highly useful in retarding soil erosion, loss of soil moisture, crust formation and organic matter loss (Soni, 1992).

The cultivars of moth bean are inherently low-yielding and the productivity is only 250 kg ha<sup>-1</sup> (Kumar *et al.*, 1998). Studies undertaken on growth, yield and various physiological attributes with selective moth bean genotypes under drought and good rainfall conditions indicated that early flowering genotypes (30-31 DAS to 50%

\* National Research Center for Sorghum (NRCS), Rajendra Nagar, Hyderabad.