Productivity, quality and resource utilization by clusterbean (*Cyamopsis tetragonoloba*) as influenced by nutrient management

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ABSTRACT

A field experiment was conducted during rainy (*kharif*) season of 2004 and 2005 at Bikaner to study the effect of nutrient management on yield, quality, nutrient uptake, water-use efficiency and economics of rainfed clusterbean [*Cyamopsis tetragonoloba* (L.) Taub.] under hot arid, rainfed condition of western Rajasthan. Nutrient application showed significant influence on productivity, quality and resource utilization (nutrient and water) of clusterbean. Application of chemical fertilizer @ 100% RDF (20 kg N + 17.5 kg P/ha) recorded 50.9, 59.3 and 36.2% higher seed yield, gum yield and water-use efficiency respectively over the control. Among biofertilizers tested, dual inoculation (*Rhizobium* + phosphate-solubilizing bacteria) registered maximum improvement in yield, quality and nutrient uptake, followed by single inoculation of *Rhizobium* and PSB. Integration of chemical fertilizer @ 50% RDF with dual inoculation of biofertilizer registered 43.7 and 52.9% higher seed and gum yields respectively over the control. Dual inoculation of biofertilizer (*Rhizobium* + PSB) integrated with chemical fertilizer @ 50% RDF fetched maximum net returns (Rs 8,213/ha) and B : C ratio (1.6 : 1).

Key words: Biofertilizer, Chemical fertilizer, Clusterbean, Gum, Nutrient uptake, Water-use efficiency, Yield

Clusterbean is a short-duration legume, highly adapted to the harsh edapho-climatic conditions of hot arid zone of India. It is grown traditionally for feed and fodder and is an important component of cropping systems of the region. Clusterbean of late, has acquired the status of industrial crop because of high glactomanan content in the endosperm of its seed, which has multiple industrial uses and thus a main foreign-exchange earner for the area. Despite the maximum area of clusterbean in Rajasthan, the average productivity is only 0.25 t/ha compared with 0.37, 0.70 and 1.20 t/ha in Gujarat, Haryana and Punjab respectively (Henry, 2003). Poor soil fertility and lack of nutrient management are considered the major reasons of this dismally low productivity. Therefore, augmenting of the nutrient supply assumes prime significance to improve its productivity. Low and erratic rainfall, escalation in the price of chemical fertilizers along with poor socio-economic condition of the farmers make the extensive use of chemical fertilizer to augment crop productivity a risky preposition in this hot arid region. Therefore low-cost nutrient sources such as biofertilizers along with chemical fertilizer in the form of integrated plant nutrient-supply system may be a better option to supply nutrient requirement of the crops. Hence the present study was undertaken to assess the effect of chemical and biofertilizers on the yield, quality, nutrient and water use of rainfed clusterbean under hot arid conditions.

MATERIALS AND METHODS

The field experiment was conducted during rainy (*kharif*) season of 2004 and 2005 at Regional Research Station, CAZRI, Bikaner. The soil was sandy with pH 8.2, having 0.1% organic C, 89.7 kg/ha available N, 8.0 kg/ha available P and 234.1 kg/ha available K. The experiment was laid out in randomized block design having three replications with 10 nutrient-management treatments, viz. T_1, the control, T_2; 50% of recommended dose of fertilizer (RDF); T_3, 75% of RDF; T_4, 100% of RDF; T_5, *Rhizobium*; T_6, phosphate-solubilising bacteria (PSB); T_7; *Rhizobium* + PSB; T_8, 50% of RDF + *Rhizobium*; T_9, 50% of RDF+PSB; and T_{10}, 50% of RDF+*Rhizobium* + PSB. The clusterbean variety 'RGC 936' was sown with hand-plough in 40 cm rows on 2 August 2004 and 30 June 2005. The net plot size was 5.0 × 3.2 m. The RDF was 20 kg of N + 17.5 kg P/ha, applied basal through urea and single superphosphate as per treatment. Biofertilizer was applied as seed treatment just before sowing. Five random plants were selected from each plot, excluding the border row, for taking observations on growth and yield attributes. The representative dry

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