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Effect of nutrient management on growth, yield and yield attributes of cluster bean (*Cyamopsis tetragonoloba* (L.) Taub) grown under south Gujarat condition

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Abstract

A field experiment with object to study the effect of nutrient management on growth, yield, quality and economics of cluster bean (*Cyamopsis tetragonoloba* (L.) Taub) grown under south Gujarat condition was conducted at 'B' Block, College farm, Navsari Agricultural University, Navsari during summer season, 2018. Among the seven treatments, foliar application of enriched banana pseudo stem sap (1%) at 45, 75 and 105 DAS (T₄) give significantly higher plant height 60 and 90 DAS. In case of yield and yield attributes viz., number of pod per plant, pod yield per plant (g), pod yield (q ha⁻¹) was significantly affected by foliar application of 19-19-19 (1%) at 45, 75 and 105 DAS (T₁) with respective value of 12.00, 74.92, 327.38 and 207.63, respectively.

Keywords: Foliar application, growth, yield and cluster bean

Introduction

Cluster bean [*Cyamopsis tetragonoloba* (L.) Taub] is a legume crop belonging to the family Fabaceae, commonly known as the Guar. The pods of cluster bean are used as vegetable. Guar is bushy annual herb have a deep rooted system, is a resilient and drought resilient leguminous crop grown on sandy soils of arid and semi-arid regions. Green pods of cluster bean are rich source of nutritive values as pod contains protein- 3.2 g, minerals- 1.4 g, thiamine- 0.09 mg, riboflavin- 0.09 and vitamin A- 47 mg 100g⁻¹. The endosperm fraction of cluster bean seed is rich in galactomannan (16.80 to 30.90%), while the germ and hull portion termed as guar meal obtained after the extraction of gum is rich in protein (28.90-46.00%) and used as animal and poultry feed (Lee *et al.*, 2004 and Rodge, 2008) [1, 2]. In India, Rajasthan can be termed as the largest guar producing state in the world as it dominates the Indian production scenario contributing to around 420000 tons of this crop i.e. over 70% of the total production in India. Haryana and Gujarat place themselves at the second and third positions regarding the production in India with 12% and 11% respectively (DES, 2009). In Gujarat cluster bean is grown about 38,397 ha of land with the production of 391248.35 MT green pods during the year 2016-17 (Anonymous, 2017) [3]. The basic concept underlying the principle of nutrient management is to maintain or adjust plant nutrient supply to achieve a given level of crop production by optimizing the benefits from all possible sources of plant nutrients. Bulky organic manures may not be able to supply adequate amount of nutrients, nevertheless their role becomes important in meeting the above objectives (Rao and Reddy, 2008). Foliar fertilization (FF) of water soluble fertilizers has become an established procedure to increase growth, yield and quality of crops (Patel, 2011) [6]. Foliar application is credited with the advantage of quick and efficient utilization of nutrients, eliminating losses through leaching, and fixation and helps in regulating the uptake of nutrients by plants (Manomani and Srimathi, 2009) [7].

Materials and Methods

A field experiment was conducted at 'B' Block, College farm, Navsari Agricultural University, Navsari during summer season, 2018. The soil of the experimental plot was non-saline (EC – 0.42 dSm⁻¹) and slightly alkaline in reaction (pH- 7.40), medium in available N (266.56 kg ha⁻¹) and P₂O₅ (31.16 kg ha⁻¹) and high in available K₂O (519.18 kg ha⁻¹) and there

was no deficiency of micronutrients. An experiment was laid out in a Complete Randomized Block Design with four replications consisting of seven treatments viz., T₁:19-19-19 (1%) at 45, 75 and 105 DAS, T₂:Urea (1%) at 45, 75 and 105 DAS, T₃:19-19-19 (1% at 45 DAS) + 0-52-34 (1% at 75 DAS) + 13-0-45 (1% at 105 DAS), T₄:Enrich banana pseudo stem sap (1%) at 45, 75 and 105 DAS, T₅:Cow urine (1%) 45, 75 and 105 DAS, T₆:Farmer practices {19-19-19 – (0.5%) + 0-52-34 – (0.5%) at 45 DAS, 0-52-34 (0.5%) + 13-0-45 – (0.5%) at 75 DAS, 19-19-19 – (0.5%) + 13-0-45 – (0.5%) at 105 DAS} and T₇:Control- Water spray. Recommended dose of fertilizer 20-40-00 Kg N: P₂O₅: K₂O given at time of sowing to all plots. The seeds of Pusa Navbhar sown manually in previously opened and fertilized furrows using recommended seed rate of 10 kg per hectare with (45×15 cm) spacing. Observations were recorded on five tagged plants in each treatment for growth, yield and yield attributes. The collected data for various parameters

were statistically analyzed using Fisher's analysis of variance (ANOVA) technique and the treatments were compared at 5% level of significance.

Results

Effect of nutrient management on growth, yield and yield attributes

Plant height

The observed data revealed that, different nutrient management treatments were found to be non-significant at 30 DAS (Table 1). However, it was significantly influenced by different treatment at 60 and 90 DAS. Significantly higher plant height at 60 and 90 DAS was obtained under treatment receiving foliar application of enriched banana pseudostem sap (1%) at 45, 75 and 105 DAS with tune value of 74.50 and 144.38 cm, respectively, which was statistically remained at par with T₃ and T₇ in case of 60 DAS; T₁, T₂, T₃, T₅, and T₆ in case of 90 DAS.

Table 1: Effect of nutrient management on plant height of cluster bean

Treatments		Plant height (cm)		
		30 DAS	60 DAS	90 DAS
T ₁	19-19-19 (1%) at 45, 75 and 105 DAS	11.95	72.87	127.21
T ₂	Urea (1%) at 45, 75 and 105 DAS	10.53	62.41	134.04
T ₃	19-19-19 (1% at 45 DAS) + 0-52-34 (1% at 75 DAS) + 13-0-45 (1% at 105 DAS)	11.56	59.53	128.28
T ₄	Enrich banana pseudo stem sap (1%) at 45, 75 and 105 DAS	13.15	74.50	144.78
T ₅	Cow urine (1%) 45, 75 and 105 DAS	11.68	65.79	125.13
T ₆	Farmer practices {19-19-19 – (0.5%) + 0-52-34 – (0.5%) at 45 DAS, 0-52-34 (0.5%) + 13-0-45 – (0.5%) at 75 DAS, 19-19-19 – (0.5%) + 13-0-45 – (0.5%) at 105 DAS}	12.60	73.81	144.31
T ₇	Control: Water spray	10.88	59.33	101.49
S. Em. ±		0.67	4.11	7.63
CD at 5%		NS	12.22	22.67
CV%		11.37	12.30	11.80

Number of picking

Foliar spray of different organic and inorganic WSFs did not exert any significant effect on number of picking (Table 2). But, maximum number of pickings was noted under treatment receiving foliar application of T₁:19-19-19 (1%) at 45, 75 and 105 DAS and T₃:19-19-19 (1%) at 45 DAS + 0-52-34 (1%) at 75 DAS + 13-0-45 (1%) at 105 DAS with tune value of 12.00.

Number of pod per plant

The results revealed that significantly higher number of pods per plant was recorded with foliar application of 19-19-19 (1%) at 45, 75 and 105 DAS (T₁) with tune value of 74.92 and was being at par with farmer practices *i.e.*, foliar application of 19-19-19 (0.5%) + 0-52-34 (0.5%) at 45 DAS, 0-52-34 (0.5%) + 13-0-45 (0.5%) at 75 DAS, 19-19-19 (0.5%) + 13-0-45 (0.5%) at 105 DAS, (Table 2).

Pod yield per plant

The data pertaining to pod yield per plant (Table 2) showed that foliar application of 19-19-19 (1%) at 45, 75 and 105 DAS (T₁) recorded significantly higher pod yield per plant with a tune figure of 327.38 g which was statistically remained at par with 19-19-19 (1%) at 45 DAS + 0-52-34 (1%) at 75 DAS + 13-0-45 (1%) at 105 DAS (T₃) and 19-19-19 (0.5%) + 0-52-34 (0.5%) at 45 DAS, 0-52-34 (0.5%) + 13-0-45 (0.5%) at 75 DAS, 19-19-19 (0.5%) + 13-0-45 (0.5%) at 105 DAS (T₆) with a respective value of 306.95 and 293.30 g.

Pod yield

The foliar application of 19-19-19 (1%) at 45, 75 and 95 DAS (T₁) resulted in significantly highest pod yield with value 207.63 q ha⁻¹ over T₂, T₅, T₆ and T₇ with respective value of 160.80, 162.85, 158.23 and 148.40 q ha⁻¹. The results further showed that treatment T₁ was remained at par with T₃ and T₄ with increased in magnitude was 5.86 and 7.78 per cent over T₃ and T₄, respectively.

Table 4.2: Effect of nutrient management on yield attributes and yield of cluster bean

Treatments		Number of Picking	Number of pod per plant	Pod yield (g plant ⁻¹)	Pod yield (q ha ⁻¹)
T ₁	19-19-19 (1%) at 45, 75 and 105 DAS	12.00	74.92	327.38	207.63
T ₂	Urea (1%) at 45, 75 and 105 DAS	11.00	64.09	276.86	160.80
T ₃	19-19-19 (1% at 45 DAS) + 0-52-34 (1% at 75 DAS) + 13-0-45 (1% at 105 DAS)	12.00	64.00	306.95	196.13
T ₄	Enrich banana pseudo stem sap (1%) at 45, 75 and 105 DAS	11.00	63.49	262.24	192.65
T ₅	Cow urine (1%) 45, 75 and 105 DAS	10.00	61.84	253.21	162.85
T ₆	Farmer practices {19-19-19 – (0.5%) + 0-52-34 – (0.5%) at 45 DAS, 0-52-34 (0.5%) + 13-0-45 – (0.5%) at 75 DAS, 19-19-19 – (0.5%) + 13-0-45 – (0.5%) at 105 DAS}	11.00	73.59	293.30	158.23
T ₇	Control: Water spray	9.00	58.72	242.69	148.40

S. Em. \pm	0.73	2.86	16.54	10.04
CD at 5%	NS	8.51	49.15	29.82
CV%	13.45	8.70	11.80	11.45

Discussion

Significant increase in growth and yield parameters was mainly due to increase in nutrient uptake. The supply of nutrients through foliar application increased the nutrient availability for uptake and better utilization by the crop which intern produced more photosynthesis resulting in better partitioning of dry matter from source to sink. Kumar *et al.* (2008) ^[8] and Patil *et al.* (1994) reported significantly higher plant height under foliar spray of inorganic over organic WSFs. The pronounced effect of water soluble fertilizers on plant height have also been reported by Chaurasia *et al.* (2005) ^[10] in tomato, Singhal *et al.* (2015) ^[11] in vegetable cow pea, Senthil and Kumaresan (2006a & b) ^[13] in tomato and chilli.

Conclusion

From the results, it can be concluded that for getting higher growth, yield and yield attributes of *summer* cluster bean should be fertilized with recommended dose of fertilizers (20-40-00 NPK kg ha⁻¹) followed by foliar spray of water soluble fertilizer 19-19-19 (1%) at 45, 75 and 105 DAS under south Gujarat condition.

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