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## Effect of fertility levels and Panchagavya on growth, flowering and economics of clusterbean (*Cyamopsis tetragonoloba* L.)

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### Abstract

An experiment was carried out entitled “Effect of fertility levels and Panchagavya on growth, yield and quality of clusterbean (*Cyamopsis tetragonoloba* L.)” at College Farm, College of Horticulture, S. D. Agricultural University, Jagudan, Gujarat, India during Summer 2022. The experiment was laid out in Randomized Block Design with three replications. Total thirteen treatments were evaluated in the study viz., 100% RDF (N:P:K @ 25:40:00 kg/ha and FYM 15 t/ha) (T<sub>1</sub>); 80% RDF + Foliar spray of Panchagavya @ 4% at 20 DAS (T<sub>2</sub>); 80% RDF + Foliar spray of Panchagavya @ 4% at 40 DAS (T<sub>3</sub>); 80% RDF + Foliar spray of Panchagavya @ 4% at 20 and 40 DAS (T<sub>4</sub>); 80% RDF + Foliar spray of Panchagavya @ 6% at 20 DAS (T<sub>5</sub>); 80% RDF + Foliar spray of Panchagavya @ 6% at 40 DAS (T<sub>6</sub>); 80% RDF + Foliar spray of Panchagavya @ 6% at 20 and 40 DAS (T<sub>7</sub>); 60% RDF + Foliar spray of Panchagavya @ 4% at 20 DAS (T<sub>8</sub>); 60% RDF + Foliar spray of Panchagavya @ 4% at 40 DAS (T<sub>9</sub>); 60% RDF + Foliar spray of Panchagavya @ 4% at 20 and 40 DAS (T<sub>10</sub>); 60% RDF + Foliar spray of Panchagavya @ 6% at 20 DAS (T<sub>11</sub>); 60% RDF + Foliar spray of Panchagavya @ 6% at 40 DAS (T<sub>12</sub>) and 60% RDF + Foliar spray of Panchagavya @ 6% at 20 and 40 DAS (T<sub>13</sub>). The results revealed that the treatment T<sub>7</sub> (80% RDF + Foliar spray of Panchagavya @ 6% at 20 and 40 DAS) was found to be superior in the terms of plant height at 60 DAS and 90 DAS (73.52 cm and 116.83 cm, respectively) as compared to the other treatments. However, days taken for initiation of flowering, days taken for first picking after sowing and number of pickings were found non significant. With reference to the economics, among all the treatments maximum benefit cost ratio (2.77) was obtained with the treatment T<sub>7</sub> i.e. 80% RDF + Foliar spray of Panchagavya @ 6% at 20 and 40 DAS.

**Keywords:** Panchagavya, growth, fertility levels, flowering, foliar spray, organic

### Introduction

Clusterbean or guar (*Cyamopsis tetragonoloba* L.) belongs to the leguminosae family. It is also known as *gavar*, *gawar* or *guvar* bean. The word “guar” represents its derivation from Sanskrit word *Gauaahar* which means cow fodder or otherwise fodder of the livestock. The tender green pods are used as a vegetable. They are good source of protein, vitamin A and vitamin C. Clusterbean contains (per 100 g of edible portion) 81 g moisture, 10.8 g carbohydrate, 3.2 g protein, 0.4 g fat, 1.4 g minerals, 316 I.U. vitamin A, 47 I.U. Vitamin C, 0.03 mg riboflavin, 0.09 mg thiamine and dry seed contain 33.3% protein (Aykroyd, 1963) [2]. The cultivated area of *guar* in Gujarat is 44.58 thousand ha with the production of 441.37 thousand metric tonnes having 9.67 MT/ha productivity. Clusterbean is mainly cultivated in each district of Gujarat state (Anonymous, 2022) [1].

In Sanskrit, Panchagavya refers to the blend of five products obtained from cow namely dung, urine, milk, curd and ghee. The presence of naturally occurring, beneficial, effective microorganisms (EMOs) in Panchagavya predominantly lactic acid bacteria, yeast, *Actinomycetes*, photosynthetic bacteria and certain fungi besides beneficial and proven fertilizers such as *Acetobacter*, *Azospirillum* and *Phosphobacterium* were detected which have the beneficial effect especially in improving soil quality, growth and yield of crops (Xu and Xu., 2000) [9]. Panchagavya, an organic product is a potential source to play great role for promoting growth and providing immunity to the plant system. Bio-chemical properties of Panchagavya revealed that it possesses almost all the major nutrients like N, P, K and micro nutrients essential for plant and growth hormones like IAA and GA required for crop growth (Selvaraj *et al.*, 2007) [7].

## Materials and Methods

A field experiment on clusterbean var. Pusa Navbahar was conducted at College Farm, College of Horticulture, S. D. Agricultural University, Jagudan, Gujarat, India during Summer 2022. The experiment was laid out in Randomized Block Design with total thirteen treatments. The treatments contain 100% RDF (N: P: K 25:40:00 kg/ha and FYM 15 t/ha) (T<sub>1</sub>), 80% RDF + Foliar spray of Panchagavya @ 4% at 20 DAS (T<sub>2</sub>), 80% RDF + Foliar spray of Panchagavya @ 4% at 40 DAS (T<sub>3</sub>), 80% RDF + Foliar spray of Panchagavya @ 4% at 20 and 40 DAS (T<sub>4</sub>), 80% RDF + Foliar spray of Panchagavya @ 6% at 20 DAS (T<sub>5</sub>), 80% RDF + Foliar spray of Panchagavya @ 6% at 40 DAS (T<sub>6</sub>), 80% RDF + Foliar spray of Panchagavya @ 6% at 20 and 40 DAS (T<sub>7</sub>), 60% RDF + Foliar spray of Panchagavya @ 4% at 20 DAS (T<sub>8</sub>), 60% RDF + Foliar spray of Panchagavya @ 4% at 40 DAS (T<sub>9</sub>), 60% RDF + Foliar spray of Panchagavya @ 4% at 20 and 40 DAS (T<sub>10</sub>), 60% RDF + Foliar spray of Panchagavya @ 6% at 20 DAS (T<sub>11</sub>), 60% RDF + Foliar spray of Panchagavya @ 6% at 40 DAS (T<sub>12</sub>), 60% RDF + Foliar spray of Panchagavya @ 6% at 20 and 40 DAS (T<sub>13</sub>) replicated three times.

The experimental soil was loamy sand, with good drainage condition. The recommended dose of Farm Yard Manure (FYM) 15 t/ha and fertilizer 25:40:00 kg/ha was applied at the time of field preparation as per the treatment. Urea and Single Super Phosphate (SSP) were used as the source of nitrogen and phosphorus, respectively. Where, half dose of nitrogen along with full dose of phosphorus were given as per the treatments in the field and remaining half dose of nitrogen was applied at thirty days after sowing as top dressing. The experimental field was irrigated fully after applying fertilizers and sowing. The various foliar applications of Panchagavya as per the treatments were given at 20 and 40 days after

sowing during the morning hours with plastic hand sprayer. The Panchagavya moistened both; the surface of leaves and apical meristems. The planting operation was carried out at the spacing of 45 cm x 30 cm with plot size of 2.25 m x 1.80 m. The observations were recorded on growth attributing character *viz.*, plant height at 60 DAS and 90 DAS (with the help of wooden measuring scale) and number of pickings (counted at each and after all harvestings); Flowering parameters *viz.*, days taken to initiation of flowering (calendar days counting method) and days taken to first picking after sowing (calendar days counting method) and economics.

## Results and Discussion

### Growth parameters

The data on growth attributing character such as plant height at 60 DAS and 90 DAS depicted in Table

#### 1. Plant height at 60 and 90 DAS (cm)

The data presented in table 1 and figure 1 shows the effect of fertility levels and Panchagavya on plant height at 60 and 90 DAS was statistically significant. The maximum plant height (73.52 cm and 116.83 cm) at 60 DAS and 90 DAS, respectively was observed with the application of 80% RDF + Foliar spray of Panchagavya @ 6% at 20 and 40 DAS (treatment T<sub>7</sub>) over other treatments. This could be due to the reason that Panchagavya contains macronutrients like N, P and K as well as micronutrients needed for production of various vitamins, amino acids and growth regulators like auxins and gibberellins, which are necessary for proper plant growth and development. Kumar and Neeraj (2015)<sup>[5]</sup> found similar result for onion, Mishra *et al.* (2015)<sup>[6]</sup> for capsicum and Singh *et al.* (2022)<sup>[8]</sup> for green gram

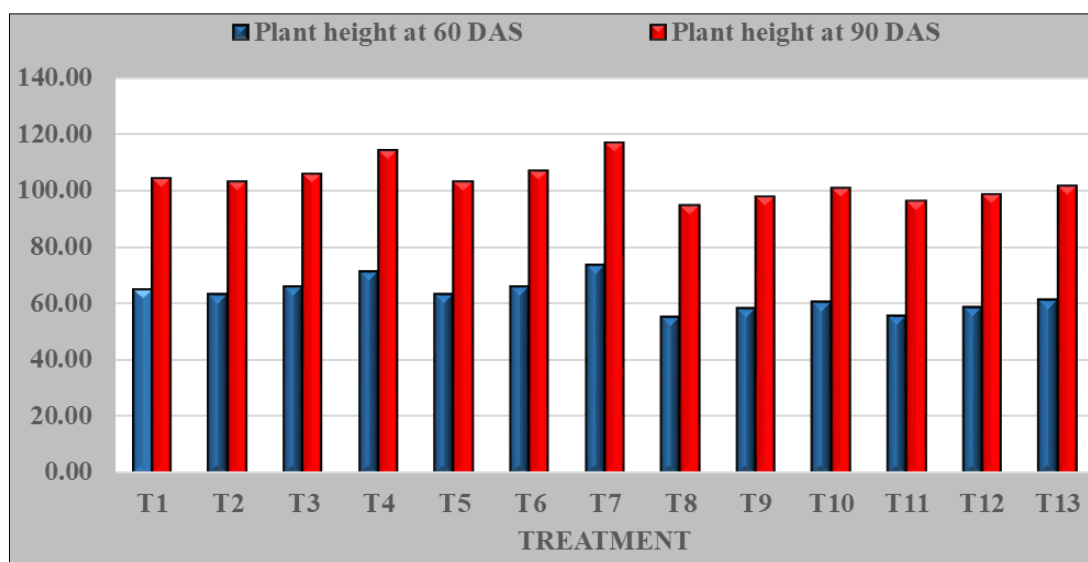


Fig 1: Effect of fertility levels and Panchagavya on plant height (cm) at 60 and 90 DAS of clusterbean (*Cyamopsis tetragonoloba* L.)

#### 2. Number of pickings

The data depicted in table 1 shows non-significant effect of fertility levels and Panchagavya on number of pickings. However, T<sub>7</sub> (80% RDF + Foliar spray of Panchagavya @ 6% at 20 and 40 DAS) reported the maximum pickings (11).

### Flowering Parameters

The data on flowering parameters *i.e.* days taken for initiation of flowering and days taken for first picking after sowing are

depicted in Table 2.

#### 1. Days taken to initiation of flowering

The data presented in table 2 shows that the effect of fertility levels and Panchagavya on days taken to initiation of flowering was non significant. However, minimum days for flower initiation (37.67) were recorded with the treatment T<sub>7</sub> (80% RDF + Foliar spray of Panchagavya @ 6% at 20 and 40 DAS).

## 2. Days taken to first picking

The data presented in table 2 reveals that the effect of fertility levels and Panchagavya on days taken to first picking after

sowing was found statistically non-significant. Though, minimum days taken for first picking (49.25) were noticed with the treatment T<sub>7</sub> (80% RDF + Foliar spray of Panchagavya @ 6% at 20 and 40 DAS).

**Table 1:** Effect of fertility levels and Panchagavya on growth parameters

Tr. No.	Treatment details	Plant height at 60 DAS (cm)	Plant height at 90 DAS (cm)	Number of pickings
T <sub>1</sub>	100% RDF	64.84	104.12	10.33
T <sub>2</sub>	80% RDF + Panchagavya @ 4% at 20 DAS	62.93	103.00	10.00
T <sub>3</sub>	80% RDF + Panchagavya @ 4% at 40 DAS	65.61	105.68	10.67
T <sub>4</sub>	80% RDF + Panchagavya @ 4% at 20 and 40 DAS	71.15	113.84	10.67
T <sub>5</sub>	80% RDF + Panchagavya @ 6% at 20 DAS	63.27	103.07	10.33
T <sub>6</sub>	80% RDF + Panchagavya @ 6% at 40 DAS	65.68	106.75	10.67
T <sub>7</sub>	80% RDF + Panchagavya @ 6% at 20 and 40 DAS	73.52	116.83	11.00
T <sub>8</sub>	60% RDF + Panchagavya @ 4% at 20 DAS	55.18	94.58	8.67
T <sub>9</sub>	60% RDF + Panchagavya @ 4% at 40 DAS	58.22	97.53	9.33
T <sub>10</sub>	60% RDF + Panchagavya @ 4% at 20 and 40 DAS	60.46	100.73	9.67
T <sub>11</sub>	60% RDF + Panchagavya @ 6% at 20 DAS	55.67	96.03	9.33
T <sub>12</sub>	60% RDF + Panchagavya @ 6% at 40 DAS	58.67	98.33	9.33
T <sub>13</sub>	60% RDF + Panchagavya @ 6% at 20 and 40 DAS	61.06	101.36	10.00
	S.Em. ±	2.96	4.26	0.47
	C.D. (P = 0.05)	8.64	12.44	NS
	C.V.%	8.17	7.15	8.18

**Table 2:** Effect of fertility levels and Panchagavya on flowering parameters

Tr. No.	Treatment details	Days taken for initiation of flowering	Days taken for first picking after sowing
T <sub>1</sub>	100% RDF	39.33	50.93
T <sub>2</sub>	80% RDF + Panchagavya @ 4% at 20 DAS	39.67	51.42
T <sub>3</sub>	80% RDF + Panchagavya @ 4% at 40 DAS	39.00	50.53
T <sub>4</sub>	80% RDF + Panchagavya @ 4% at 20 and 40 DAS	38.33	49.68
T <sub>5</sub>	80% RDF + Panchagavya @ 6% at 20 DAS	39.67	51.07
T <sub>6</sub>	80% RDF + Panchagavya @ 6% at 40 DAS	38.67	50.03
T <sub>7</sub>	80% RDF + Panchagavya @ 6% at 20 and 40 DAS	37.67	49.25
T <sub>8</sub>	60% RDF + Panchagavya @ 4% at 20 DAS	41.33	53.20
T <sub>9</sub>	60% RDF + Panchagavya @ 4% at 40 DAS	40.67	52.67
T <sub>10</sub>	60% RDF + Panchagavya @ 4% at 20 and 40 DAS	40.33	51.80
T <sub>11</sub>	60% RDF + Panchagavya @ 6% at 20 DAS	41.00	53.00
T <sub>12</sub>	60% RDF + Panchagavya @ 6% at 40 DAS	40.67	52.67
T <sub>13</sub>	60% RDF + Panchagavya @ 6% at 20 and 40 DAS	40.00	51.47
	S.Em. ±	0.92	1.28
	C.D. (P = 0.05)	NS	NS
	C.V.%	4.01	4.31

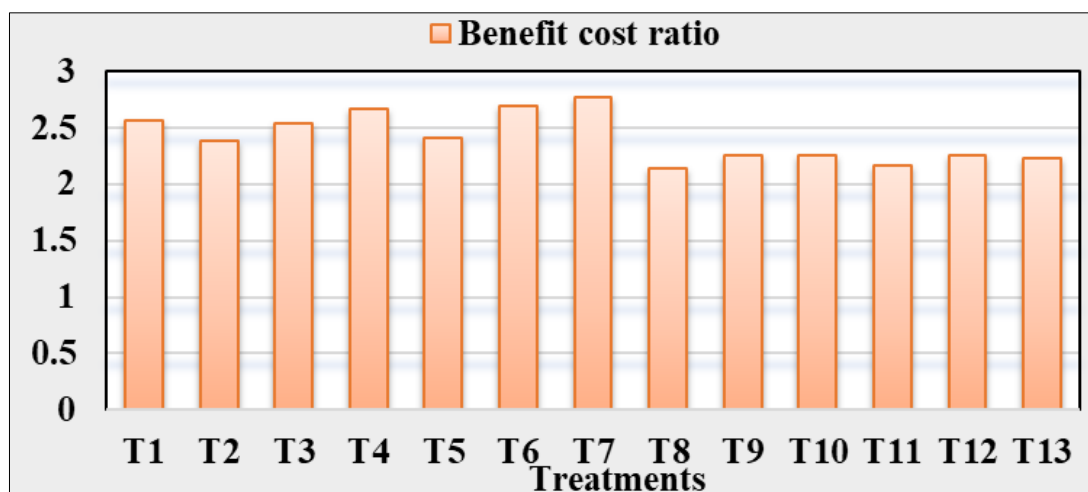
## Economics

The details of economics *i.e.*, cost of cultivation, gross returns, net returns and Benefit Cost Ratio (BCR) on data basis for different treatments have been calculated and presented in Table 3. From the economics point of view, highest yield (109.46 q/ha), gross return (328380 ₹/ha), net

return (209853 ₹/ha) and Benefit Cost Ratio (2.77) were recorded with the application of 80% RDF + Foliar Spray of Panchagavya @ 6% at 20 and 40 DAS *i.e.* (T<sub>7</sub>) as compared to the other treatments. The figure 2 also shows the highest BCR (2.77) with the treatment T<sub>7</sub> (80% RDF + Foliar Spray of Panchagavya @ 6% at 20 and 40 DAS)

**Table 3:** Effect of fertility levels and Panchagavya on economics of clusterbean (*Cyamopsis tetragonoloba* L.)

Tr. No.	Yield/hectare (q)	Total cost (₹/ha)	Gross returns (₹/ha)	Net returns (₹/ha)	BCR
T <sub>1</sub>	92.59	107876	277770	169894	2.57
T <sub>2</sub>	88.89	111462	266670	155208	2.39
T <sub>3</sub>	94.44	111462	283320	171858	2.54
T <sub>4</sub>	102.88	115527	308640	193113	2.67
T <sub>5</sub>	90.74	112962	272220	159258	2.41
T <sub>6</sub>	101.85	112962	305550	192588	2.70
T <sub>7</sub>	109.46	118527	328380	209853	2.77
T <sub>8</sub>	79.01	110983	237030	126047	2.14
T <sub>9</sub>	83.54	110983	250620	139637	2.26
T <sub>10</sub>	86.42	115048	259260	144212	2.25
T <sub>11</sub>	80.86	112483	242580	130097	2.16
T <sub>12</sub>	84.57	112483	253710	141227	2.26
T <sub>13</sub>	87.65	118048	262950	144902	2.23



**Fig 2:** Effect of fertility levels and Panchagavya on Benefit Cost Ratio (BCR) of clusterbean (*Cyamopsis tetragonoloba* L.)

### Conclusion

The results obtained from the investigation, it can be concluded that the application of 80% RDF along with the foliar spray of Panchagavya @ 6% at 20 and 40 DAS in summer clusterbean is beneficial for obtaining maximum growth and high economic returns.

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