

# COMPARATIVE ECONOMICS OF CLUSTER BEAN CULTIVATION IN SOUTHERN HARYANA

## ABSTRACT

The present study was carried out with the objectives to work out costs and returns in cultivation of cluster bean in Southern Haryana during 2020-21. The study was based on primary data. Bhiwani and Mahendargarh districts were consciously selected based on the highest area under cluster bean from Southern Haryana. From both districts, four blocks (two blocks from each district) were selected purposively *i.e.*, Bahal and Kairu block from Bhiwani district and Kanina and Satnali block from Mahendargarh district. From each selected block, two villages (10 farmers from each village) were selected randomly. Finally, a total of 80 farmers were interviewed to gather all the desired information. The per hectare cost of cluster bean cultivation was found to be Rs. 40241 and Rs. 44553 in Bhiwani and Mahendargarh district, respectively. On an average, the per hectare yield, gross returns and net returns obtained from the cultivation of cluster bean in Bhiwani district were 10.82 quintals, Rs.49002 and Rs.8758, respectively. The corresponding figures for Mahendargarh district were worked out to be 11.02quintals, Rs.52732 and Rs.8178, respectively. The B:C ratio and B:C ratio over variable cost was worked out to be 1.21 and 2.34, for Bhiwani & 1.18 and 2.32 for Mahendargarh district, which was comparatively lower in Mahendargarh district, high cost of labour was the major reason for this.

**Keywords:** Cost, Returns, Cultivation, B-C Ratio, B-C Ratio over variable cost

## 1. INTRODUCTION

Cluster bean, (*Cyamopsis tetragonoloba* (L.) Taub) is popularly known as Guar in India, which has been evolved from its most common use in the country as cattle feed “Gow ahaar (Gow means cow and Ahaar means feed)”. It has been cultivated for grain as well as for green vegetable purpose since ancient times in India (Singh, 2014). On an average, cluster bean can fix around 30 kg nitrogen/ha and used as a soil fertility restorer.

Guar crop has experienced a remarkable journey from a traditional crop grown on marginal lands mainly for food, animal feed and fodder to a crop with various industrial usages ranging from food, cosmetics, printing, textile, paper, cosmetics, mining (petroleum, natural gas, well drilling and oil industries) and pharmaceutical industry. Green pods are nutritionally rich and are routinely consumed as vegetable especially in northern and western parts of India. Cluster bean seed (endosperm) is a source of a natural hydrocolloid (galactomannan/guar gum). The unique binding, thickening and emulsifying property of guar gum powder obtained from guar seed has made it a much sought, after product in the international market. The United States of America is the largest importer of guar and its derivatives from India (Singh, 2015, Bhatt *et al.*, 2016). The potential countries in present time for its production are India, Africa, Peru, Brazil, Java, Australia, Pakistan and the United States. Among these countries, India produces over 6 lakh tons of cluster bean annually and is the largest producer of cluster bean in the world with a contribution of nearly 75 to 80 per cent of the world's total production of cluster bean.

In India, cluster bean crop is cultivated mainly during Kharif season. It occupied an area of 31.40 lakh hectare with a total production of 15.19 lakh tons of guar seed during 2019-20 in the country (Directorate of Economics and Statistics, DAC&FW). The country exports over 1.17 lakh tons of guar and its derivatives annually, which is comprised by 0.33 lakh tons of refined split guar gum and 0.84 lakh tons of treated and pulverized guar gum. The net worth of the Indian

exports is estimated over Rs 500 crores. India is the major exporter of guar gum to the world; it exports various forms of Guar products to a large number of countries. The country has exported 234,872 MT of guar gum to the world for the worth of Rs. 1949 Crores during the year 2020-21. USA, Norway, Germany, Russia, China were the major guar gum export destinations of the country during 2020-21 with a total contribution of 61 per cent to total guar gum export of the country with export quantity of 142978 MT of guar gum (APEDA, Indian stock market).

Cluster bean is native to the India and has been cultivated in the country for ages and is mainly grown in the dry habitats of Rajasthan, Haryana, Gujarat, Punjab and to limited extent in the states of Uttar Pradesh and Madhya Pradesh. Throughout world, Rajasthan is the largest state in terms of guar production as it is on the top in the Indian production scenario of cluster bean with a contribution of nearly 4.2 lakh tons which is more than 70 per cent of the total cluster bean production in India. Haryana and Gujarat are placed at the second and third positions regarding the production of cluster bean in India with a contribution of around 12% and 11% respectively. (CRNINDIA, Indian stock market).

In Haryana it occupied an area of 84.40 thousand hectare with a total production of 511.88 thousand tons in 2017-18 (Department of Economics and Statistical Analysis, Haryana and Director, Land Records, Haryana). Owing to its demand in the international market, it has been introduced in the non-traditional growing areas like Andhra Pradesh, Tamil Nadu, Karnataka, Maharashtra and Chhattisgarh. It is also being grown under irrigated conditions during the summer. Green pods are nutritionally rich and are commonly consumed as vegetable especially in northern and western parts of India.

Guar gum shows cholesterol and glucose lowering effects because of its gel forming properties. It also helps in weight loss and obesity prevention. Due to gel forming capacity of guar gum soluble fiber, an increased satiation is achieved because of slow gastric emptying. Diet supplemented with guar gum decreased the appetite, hunger and desire for eating (Butt *et al.*, 2007). Adequate intake of guar gum as dietary fiber helps in the maintenance of bowel regularity, significant reductions in cholesterol, control of diabetes, enhancement of mineral absorption and prevention of digestive problems like constipation (Yoon *et al.*, 2008).

## **2. MATERIALS AND METHODS**

The present study was conducted in Haryana state to achieve well-defined objectives for cluster bean crop. In state, District Bhiwani (23,040 ha) and Mahendargarh (20225 ha) were selected from southern Haryana purposively based on highest area under cluster bean cultivation.

Further, from each district, two blocks and from each block two villages (10 farmers from each village) were selected randomly. Thus, a total of 80 farmers were interviewed from both the districts.

The study was conducted using primary data collected directly from the farmers. The data was related to the agricultural year 2021-22 and was obtained through personal interviews using a carefully crafted and pre-tested questionnaire designed specifically for this study. Tabular analysis was followed to analyze the collected data.

### **2.1 Selection of study area**

The present study was conducted in Haryana state to achieve well-defined objectives for cluster bean crop. Cluster bean alone occupies an area of 84.40 thousand hectare with a total production of 511.88 thousand tons in 2017-18 in the state (Department of Economics and Statistical Analysis, Haryana and Director, Land Records, Haryana). District Bhiwani (23,040 ha) and Mahendargarh (20225 ha) were selected from southern Haryana purposively based on highest area under cluster bean cultivation.

## Analytical Framework

The various statistical tools like Average, Percentage, costs, returns, Benefit-Cost ratio (B:C ratio) etc. were employed to draw valid inferences from the study.

### Cost and returns in production of cluster bean

Following tools or formulae were employed to work out the cost and returns in the cultivation of cluster bean:

- Gross return = Main product value + By product value
- Return over variable cost = Gross return – Total variable cost
- Return over total cost (Net return) = Gross return – Total cost
- Benefit-cost ratio = 
$$\frac{\text{Gross return}}{\text{Total cost}}$$
- Cost of production per quintal without by-product = 
$$\frac{\text{Total cost}}{\text{Main product quantity in quintals}}$$
- Cost of production per quintal with by-product = 
$$\frac{\text{Reduced Total cost}}{\text{Main product quantity in quintals}}$$
  
(Reduced Total Cost = Total Cost – Value of by-product).
- Working capital / variable cost = Total preparatory tillage cost + pre sowing irrigation charges + sowing value + FYM value + total fertilizer cost + irrigation value + pesticide cost + herbicide cost + manual weeding charges + Harvesting value + Threshing value + Miscellaneous charges.
- Management charges (10%) = Total variable cost \*0.1
- Risk factor (10%) = Total variable cost \*0.1
- Total fixed cost = Transportation charges +Rental value of land+ Management charges+Risk factor.

## 3. RESULTS AND DISCUSSION

**Table 1. Resource use pattern in cluster bean on different land size holdings in Bhiwani and Mahendargarh district, during 2021-22.**

|       |                                 | (per hectare)    |       |       |       |                  |       |       |       |
|-------|---------------------------------|------------------|-------|-------|-------|------------------|-------|-------|-------|
| S. N. | Input                           | Bhiwani          |       |       |       | Mahendargarh     |       |       |       |
|       |                                 | Size of holdings |       |       |       | Size of holdings |       |       |       |
|       |                                 | S                | M     | L     | O     | S                | M     | L     | O     |
| 1.    | Preparatory tillage (No.)       | 2.86             | 2.92  | 3.16  | 2.97  | 2.43             | 2.53  | 2.72  | 2.55  |
| 2.    | Seed (kg)                       | 12.84            | 12.92 | 12.97 | 12.89 | 12.65            | 12.52 | 12.35 | 12.55 |
| 3.    | Hoeing & Weeding                |                  |       |       |       |                  |       |       |       |
|       | (a) Manual (No.)                | 0.73             | 0.53  | 0.67  | 0.65  | 1.37             | 1.07  | 1.36  | 1.28  |
| 4.    | Fertilizer                      |                  |       |       |       |                  |       |       |       |
|       | (a) Nitrogen (kg)               | 8.89             | 8.55  | 12.05 | 9.71  | 11.12            | 11.95 | 20.21 | 13.91 |
|       | (b) Phosphates (kg)             | 22.72            | 21.84 | 30.78 | 24.85 | 28.41            | 30.58 | 51.62 | 35.52 |
| 5.    | FYM (qt)                        | 49.65            | 51.13 | 55.58 | 51.87 | 0.00             | 0.00  | 0.00  | 0.00  |
| 6.    | Plant Protection (No. of spray) | 0.66             | 0.69  | 0.67  | 0.67  | 0.56             | 0.76  | 0.63  | 0.65  |
| 7.    | Irrigation (No.)                | 0.26             | 0.38  | 0.25  | 0.30  | 1.8              | 1.99  | 2.17  | 1.98  |

### 3.1 Resource Use Pattern

The use of inputs and adoption of various cultural practices in the cultivation of cluster bean crop in Bhiwani and Mahendargarh district has been given in the table 1.

The field preparation for cluster bean sowing in Southern Haryana starts in May month. On an average, 2.97 preparatory tillage operations in Bhiwani district and 2.55 in Mahendargarh district were done to prepare the fields. Fields were prepared with the help of tractors. The per hectare seed rate used was 12.84 kg, 12.92 kg and 12.97 kg on small, medium and large farms in Bhiwani district the corresponding figures for Mahendargarh district were 12.65 kg, 12.52 kg and 12.35 kg respectively. On an average the seed used by the sample farms were 12.89 kg in Bhiwani and 12.55 kg per hectare in Mahendargarh district. The quantity of FYM applied to the field in Bhiwani district was 49.65, 51.13 and 55.58 quintal per hectare on small, medium and large farms, respectively, no FYM was used in Mahendargarh district. Quantity of Nitrogen fertilizer used in Bhiwani district was 8.89, 8.55 and 12.05 kg per hectare on small, medium and large farms, the corresponding figures for Mahendargarh district were 11.12 kg, 11.95 kg and 20.21 kg respectively. Quantity of Phosphate fertilizer used in Bhiwani district was 22.72, 21.84 and 30.78 kg per hectare on small, medium and large farms, the corresponding figures for Mahendargarh district were 28.41 kg, 30.58 kg and 51.62 kg respectively. The average number of plant protection sprays applied to the crop was 0.67 per hectare for Bhiwani district and 0.65 for Mahendargarh district. The average number of weeding done manually was 0.65 in Bhiwani district during growing season and 1.28 in Mahendargarh district. On an average, 0.30 irrigations were given to the cluster bean crop in Bhiwani district and 1.98 irrigations were given in Mahendargarh district by sample farmers.

### **3.2 Cost of Cultivation of Cluster bean in the Study Area**

The various expenses incurred in the cultivation of cluster bean in Bhiwani and Mahendargarh districts from Southern Haryana are represented in Table 2. In Bhiwani district, the variable cost was found to be around ₹20957 ha<sup>1</sup> and fixed cost was ₹19284 ha<sup>-1</sup>. Whereas, in Mahendargarh district the corresponding figures were ₹22731 ha<sup>1</sup> and ₹21823 ha<sup>-1</sup>. Thus, the total cost of cluster bean cultivation in overall both the districts was ₹42397.5 ha<sup>-1</sup> and the total variable cost was ₹21844 ha<sup>-1</sup> which accounted for 51.52 per cent of the total cost in overall. In the variable cost for Bhiwani district, cost incurred on the Harvesting was highest accounted for 13.41 per cent of the total cost followed by preparatory tillage 10.08 per cent, similar trend was observed for Mahendargarh district with corresponding figures of 11.98 and 8.04 per cent. Similarly, in the fixed cost in both the districts, rental value of owned land was found to be highest 34.38 per cent and 36.92 per cent, followed by management charges and risk factor.

**Table 2. Comparative Economics of cluster bean cultivation in Bhiwani and Mahendargarh District during 2021-22** (₹/ha)

| S. N.                      | Particulars                                       | Bhiwani |              |            | Mahendargarh |              |            | Overall (Haryana) |                |            |
|----------------------------|---|---------|--------------|------------|--------------|--------------|------------|-------------------|----------------|------------|
|                            |   | Qty.    | Value (Rs.)  | % of TC    | Qty.         | Value (Rs.)  | % of TC    | Qty.              | Value (Rs.)    | % of TC    |
| <b>I. Operational cost</b> |   |         |              |            |              |              |            |                   |                |            |
| 1.                         | Preparatory tillage                               | 2.97    | 4057         | 10.08      | 2.55         | 3585         | 8.04       | 2.76              | 3821           | 9.01       |
| 2.                         | Sowing  |         | 1297         | 3.22       |              | 1408         | 3.16       |                   | 1352.5         | 3.19       |
| 3.                         | Operational charges for weedicides and pesticides |         | 1075         | 2.67       |              | 803          | 1.80       |                   | 939            | 2.21       |
| 4.                         | Hoeing & Weeding                                  |         |              |            |              |              |            |                   |                |            |
| II                         | Manual  | 0.65    | 834          | 2.07       | 1.28         | 1720         | 3.85       | 0.97              | 1277           | 3.01       |
| 5.                         | Harvesting  |         | 5397         | 13.41      |              | 5341         | 11.98      |                   | 5369           | 12.66      |
| 6.                         | Threshing   |         | 3365         | 8.36       |              | 2921         | 6.55       |                   | 3143           | 7.41       |
| 7.                         | Miscellaneous                                     |         | 334          | 0.82       |              | 290          | 0.65       |                   | 312            | 0.73       |
|                            | <b>Sub Total</b>                                  |         | 16357        | 40.64      |              | 16067        | 36.06      |                   | 16212          | 38.24      |
| <b>II. Material Cost</b>   |   |         |              |            |              |              |            |                   |                |            |
| 1.                         | Seed (kg)   | 12.89   | 901          | 2.23       | 12.55        | 941          | 2.11       | 12.72             | 921            | 2.17       |
| 2.                         | Fertilizer (kg)                                   |         |              |            |              |              |            |                   |                |            |
| (a)                        | Nitrogen  | 9.71    | 237          | 0.58       | 13.91        | 343          | 0.76       | 11.81             | 290            | 0.68       |
| (b)                        | Phosphates  | 24.85   | 604          | 1.50       | 35.52        | 876          | 1.96       | 30.18             | 740            | 1.75       |
| (c)                        | Potash  |         |              |            |              |              |            |                   |                |            |
| 3.                         | FYM   | 51.87   | 865          | 2.14       |              |              |            | 25.94             | 432.5          | 1.02       |
| 4.                         | Plant Protection (No. of spray)                   | 0.67    | 914          | 2.27       | 0.65         | 1019         | 2.28       | 0.66              | 966.5          | 2.28       |
| 5.                         | Irrigation  | 0.3     | 371          | 0.92       | 1.98         | 2717         | 6.10       | 1.14              | 1544           | 3.64       |
| 6.                         | Interest @ 7% for crop period                     |         | 709          | 1.76       |              | 769          | 1.72       |                   | 739            | 1.74       |
|                            | Sub Total   |         | 4600         | 11.43      |              | 6664         | 14.96      |                   | 5632           | 13.28      |
|                            | Total Working Cost (I+II)                         |         | 20957        | 52.07      |              | 22731        | 51.01      |                   |                | 51.52      |
| <b>III. Fixed Cost</b>     |   |         |              |            |              |              |            |                   |                |            |
| 1.                         | Risk factor                                       |         | 2095         | 5.20       |              | 2272         | 5.10       |                   | 2183.5         | 5.15       |
| 2.                         | Management charges                                |         | 2095         | 5.20       |              | 2272         | 5.10       |                   | 2183.5         | 5.15       |
| 3.                         | Transportation charges                            |         | 1257         | 3.12       |              | 828          | 1.85       |                   | 1042.5         | 2.46       |
| 4.                         | Rental value of land                              |         | 13838        | 34.38      |              | 16450        | 36.92      |                   | 15144          | 35.72      |
|                            | Sub Total   |         | 19284        | 47.92      |              | 21823        | 48.98      |                   | 20553.5        | 48.48      |
|                            | <b>Total cost (Rs.) (I+II+III)</b>                |         | <b>40241</b> | <b>100</b> |              | <b>44554</b> | <b>100</b> |                   | <b>42397.5</b> | <b>100</b> |
|                            | Production  |         |              |            |              |              |            |                   |                |            |
| (a)                        | Main (qt)   | 10.82   | 46291        |            | 11.02        | 49551        |            | 10.92             | 47921          |            |
| (b)                        | By Product  |         | 2711         |            |              | 3186         |            |                   | 2948.5         |            |
|                            | <b>Gross returns (Rs.)</b>                        |         | <b>49002</b> |            |              | <b>52731</b> |            |                   | <b>50866.5</b> |            |
|                            | Return over variable cost (Rs.)                   |         | 28044        |            |              | 30000        |            |                   | 29022          |            |
|                            | Net returns (Rs.)                                 |         | 8761         |            |              | 8177         |            |                   | 8469           |            |
|                            | Cost of Production (Rs/qt) without by-product     |         | 3719         |            |              | 4043         |            |                   | 3881           |            |
|                            | Cost of Production (Rs/qt) with by-product        |         | 3469         |            |              | 3754         |            |                   | 3611.5         |            |
|                            | <b>Benefit Cost Ratio</b>                         |         | <b>1.22</b>  |            |              | <b>1.18</b>  |            | <b>1.20</b>       |                |            |
|                            | <b>Benefit Cost Ratio over variable cost</b>      |         | <b>2.33</b>  |            |              | <b>2.31</b>  |            | <b>2.32</b>       |                |            |

**Note:** Interest on working capital and interest on fixed capital are calculated for one cropping season.

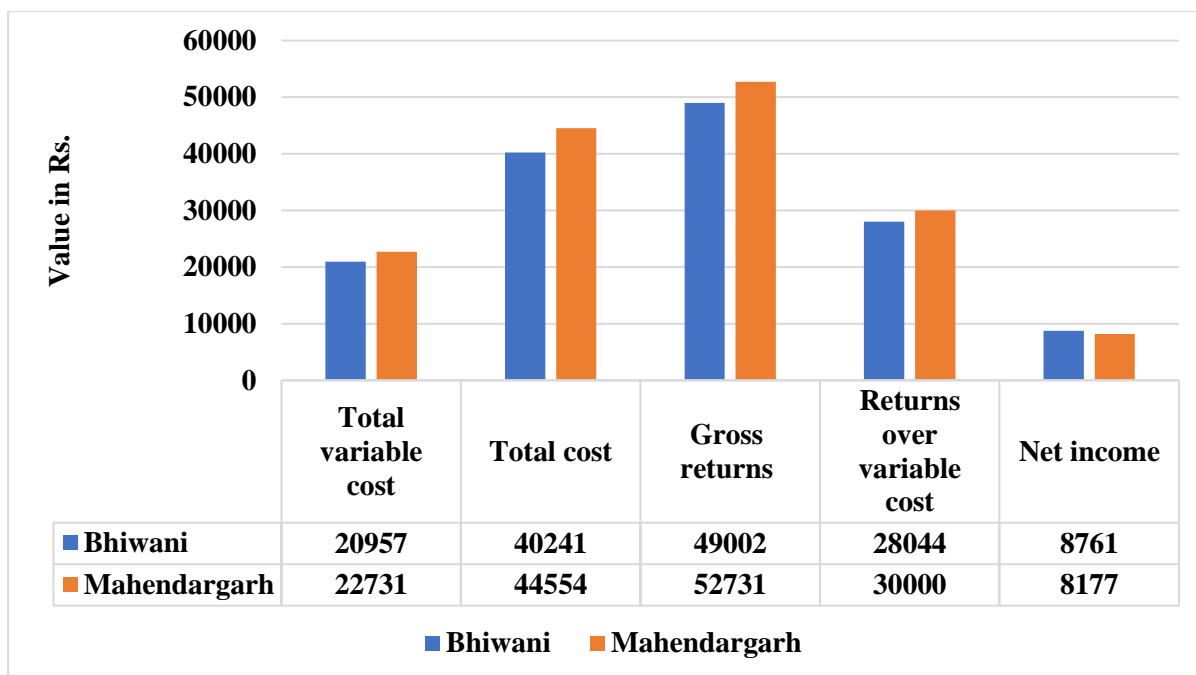
The figure in the parenthesis indicates per cent to total cost.

Table 3. and fig.1 provides a comparison of various factors related to cluster bean cultivation in selected districts of Haryana. In Bhiwani district, the variable cost was around ₹20957, while Mahendargarh district has a slightly higher cost of ₹22731 and overall from both the districts of Haryana was ₹21844. In Bhiwani district, the average yield was observed to be around 10.82 qtl, while Mahendargarh district produces 11.02 qtl on an average basis and in overall the region achieves a production of 10.92 qtl. The gross return was found to be ₹49002 in Bhiwani, ₹52731 in Mahendargarh and ₹50866.5 in both the districts as a whole.

Bhiwani district farmers achieved a net income of ₹8761 whereas, the farmers of Mahendargarh earned ₹8177 from cultivation of cluster bean and the overall net income in both the districts from Haryana was ₹8469. The B:C Ratio considering all costs was computed to be 1:22 in Bhiwani, 1:18 in Mahendargarh and 1.20 in overall from both the districts of Haryana. The cost of production per quintal was ₹3719 in Bhiwani district and ₹4043 in Mahendargarh district. Cost of labour, frequency of irrigations and the rental value of land were higher in Mahendargarh district compared to Bhiwani district which contributed to higher cost of cultivation in Mahendargarh district than in Bhiwani district. Due to high cost of cluster bean cultivation in Mahendargarh district and lower cost in Bhiwani district, the cost of production per quintal was also high and low in the concerned districts, which contributed to higher net returns for Bhiwani district and lower net returns for Mahendargarh district.

**Table 3. Returns from cluster bean cultivation in Bhiwani and Mahendargarh (₹/ha)**

| Sr. No. | Particulars                    | Bhiwani | Mahendargarh | Overall (Haryana) |
|---------|--------------------------------|---------|--------------|-------------------|
| 1.      | Variable cost                  | 20957   | 22731        | 21844             |
| 2.      | Total cost                     | 40241   | 44554        | 42397.5           |
| 3.      | <b>Returns from Production</b> |         |              |                   |
|         | Main product                   | 46291   | 49551        | 47921             |
|         | By product                     | 2711    | 3186         | 2948.5            |
| 4.      | Gross return                   | 49002   | 52731        | 50866.5           |
| 5.      | Returns over variable cost     | 28044   | 30000        | 29022             |
| 6.      | Net returns                    | 8761    | 8177         | 8469              |
| 7.      | B:C Ratio (VC)                 | 2.33    | 2.31         | 2.32              |
| 8.      | B:C Ratio                      | 1.22    | 1.18         | 1.20              |



**Fig.1 Cost and returns from watermelon cultivation from Bhiwani and Mahendargarh District**

## CONCLUSIONS

From the findings of the study, it was observed that, the cost and returns of cluster bean cultivation in overall chosen districts from Haryana showed that, average yield was 10.92 qtl ha<sup>-1</sup>. The returns over variable cost were ₹29022 ha<sup>-1</sup>. Farmers obtaining a net return of ₹8469 ha<sup>-1</sup> with a benefit-cost ratio of 1:20. So, it is concluded from the study that cultivation of cluster bean is highly beneficial in both the districts of the state.

## References

- Anonymous (2018). Department of Economics and Statistical Analysis, Haryana and Director, Land Records, Haryana.
- Anonymous (2020). Directorate of Economics and Statistics, DAC and FW.
- Anonymous (2021). APEDA (Ministry of Commerce and Industry, Govt. of India), Indian stock market.
- Bhatt, R. K., Jukanti, A. K. and Roy, M. M. (2017). "Cluster bean [*Cyamopsis tetragonoloba* (L.) Taub.], an important industrial arid legume: A review". *Legume Research: An International Journal*, **40**(2).
- Butt M. S., Shahzadi N, Sharif M. K. and Nasir M. (2007). Guar gum: a miracle therapy for hypercholesterolemia, hyperglycemia and obesity. *Critical Reviews in Food Science and Nutrition*.; 47:389–396. doi: 10.1080/10408390600846267.
- Singh, D. (2015). Marketing of cluster bean (Guar) (*Cyamopsis tetragonoloba*) in Churu District of Rajasthan. *Small*, 5, 3-87.
- Yoon S. J., Chu D. C. and Juneja L. R. (2008). Chemical and physical properties. Safety and application of partially hydrolyzed guar gum as dietary fiber. *Journal of Clinical Biochemistry and Nutrition*. 42:1–7.

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