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## Effect of farming system and varieties on seed quality of fenugreek in Northern dry zone of Karnataka

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### Abstract

The field experiment was conducted at College of Horticulture, Bagalkot, Karnataka in *rabi* season 2024-25. The effect of farming system and varieties on seed quality revealed that package of practices farming system module (M4) recorded significantly higher protein yield (184.59 kg/ha) compare to the other farming system modules. Highest germination percentage (97.83%), seedling length (23.00 cm), seedling dry weight (105.13 mg), Seed vigour index-I (2,250.85), Seed vigour index-II (10,290.50) recorded with natural farming system module. Highest protein yield recorded in M4V4 (package of practices farming system module with AFg-5) with protein yield (190.13 kg/ha) followed by M4V2 package of practices farming system module with AFg-3) (187.99 kg/ha) and maximum seedling length (23.83 cm) was recorded with M4V4 and M1V2 while the interaction M3V1 recorded minimum seedling length (18.33 cm). In general natural farming system module recorded better seed quality parameters than other farming system modules.

**Keywords:** Field experiment, College of Horticulture, Bagalkot, Farming system

### Introduction

Fenugreek (*Trigonella foenum-graecum* L.) is one of the major seed spice crop belongs to Papilionaceae, a sub family of Fabaceae widely cultivated during the *rabi* season across northern and western India. The nutritional significance of fenugreek is well recognized worldwide as a vital source of essential minerals, vitamins and dietary fibres. Seeds are rich in protein, minerals especially iron, calcium, vitamins (A, B<sub>2</sub>, C), and and certain substances such as volatile oil, fixed oil, cellulose, starch, sugars, alkaloids and enzymes. The volatile oil content of seed is (0.02%) but extremely odoriferous due to the compound called 3 hydroxy 4, 5-dimethyl-oxolone-2-furanone. The fixed oil content averages 7.6% and has a very bitter taste. The bitter taste in seeds as well as in leaves is due to the presence of alkaloids such as trigonelline and choline (Srinivasan, 2014) <sup>[5]</sup>. Diosgenin has been identified as the major steroid sapogenin in the leaves and seeds of fenugreek, along with smaller amount of tigogenin and gitogenin. Seeds used as spice being odoriferous, seed powder used as condiment (Jabeen *et al.*, 2018) <sup>[1]</sup>. Presently agriculture is mainly dependent on fertilizer and chemicals, the increasing population pressure has forced many countries to use inorganic fertilizers to increase the crop productivity for fulfilling their ever-increasing food requirements. The prolonged indiscriminate usages of chemicals are resulted in soil and human health hazards along with environmental pollution. The productivity and quality of the produce is decreasing with increased cost of production, this has made farming much more difficult. Hence, the present study was carried out to evaluate the fenugreek varieties for their seed quality under different farming system modules.

### Materials and Methods

The field experiment was conducted during the *rabi* season of 2024-25 at the College of Horticulture, UHS, Bagalkot. The site is located at 16°18'N latitude, 75°69' Longitude, and 542 m above MSL, representing the Northern dryzone (ZoneIII) of Karnataka. The soil was light black loam. The experiment was laid out in a split-plot design with four farming system modules as main plots - natural (M<sub>1</sub>), organic (M<sub>2</sub>), integrated (M<sub>3</sub>), recommended package of practices

(M<sub>4</sub>). The four fenugreek varieties - Krishna Prabha Devimenthe1 (V<sub>1</sub>), AFg-3 (V<sub>2</sub>), AFg-4 (V<sub>3</sub>) and AFg-5 (V<sub>4</sub>) as sub plots, replicated thrice. Seeds were sown at 30 × 10 cm spacing using healthy, disease-free seeds. For natural (M<sub>1</sub>) seed treatment with beejamrutha (5%) and jeevamrutha, mulching practices were practiced, organic (M<sub>2</sub>) seed treatment with *Rhizobium* and PSB (@500g each/ha) + *Trichoderma viride* @ 10 g/kg of seeds, vermicompost applied on nitrogen equivalent base, integrated (M<sub>3</sub>) seed treatment with 50% RPP + vermicompost @ 2 t/ ha + FYM 5 t/ha and recommended package of practices (M<sub>4</sub>) seed treatment with fungicide (carbendazim @ 2.5 g/kg seed) at the time of sowing. NPK @ 50: 25: 40 kg/ha + FYM 10 t/ha were followed as per farming system practices. Nutrient and crop management practices were followed as per respective modules. The seed quality parameters viz protein content (%), protein yield (kg/ha), seed germination (%), seedling length (cm), seedling dry weight (mg), seed vigour index-I (length) and seed vigour index-II (mass) were recorded.

## Result and Discussion

### 1. Protein content and protein yield

Observations on protein content (%) and protein yield in seeds of fenugreek varieties as influenced by different farming system modules are presented in table 1.

The highest protein yield (184.59 kg/ha) was noticed with M<sub>4</sub> (package of practice farming system module) due to the presence of the highest protein content (20.87 %) was noticed with M<sub>4</sub>. Significantly the lowest protein yield (135.99 kg/ha) was obtained with the M<sub>2</sub> (organic farming system module). Although significantly the lowest protein content (19.37 %) was recorded with the M<sub>1</sub> (natural farming system module), but it has recorded on par protein yield (160.91 kg/ha) with M<sub>4</sub>. The protein content and protein yield was not significantly impacted by varieties, where all four varieties recorded meager variation with range of protein content from 20.10 to 20.60 per cent. The interaction effect of different varieties and farming system modules was non-significant with respect to protein yield. Numerically, highest protein yield recorded in M<sub>4</sub>V<sub>4</sub> (Package of practices farming system module with AFg-5) with protein yield

(190.13 kg/ha) followed by M<sub>4</sub>V<sub>2</sub> (187.99 kg/ha). The interaction M<sub>2</sub>V<sub>3</sub> (Organic farming system module with AFg-4) recorded numerically less protein yield of 127.13 kg/ha.

Higher nitrogen content in seed was observed with the package of practice farming system module owing to improved photosynthetic and metabolic activity which results in better partitioning of photosynthates to sinks, which reflected in quality enhancement in term of protein content. The results are in conformity with those reported by Gopinath *et al.* (2008), Mere *et al.* (2012), Jat *et al.* (2013)<sup>[3]</sup> and Jadhao *et al.* (2019)<sup>[25]</sup>.

### 2. Other seed quality parameters

Other seed quality parameters were represented in table 2 and 3.

The germination percentage found non-significant due to influence of different farming system modules and varieties. But there was a significant variation found with seedling length (23.0 cm), seedling dry weight (105.13), seed vigour index-I (2250.85) and seed vigour index-II (10290.50) noticed with natural farming system module (M<sub>1</sub>) which was out-performed in all the seed quality parameters and package of practices farming system module (M<sub>4</sub>) recorded on par result with M<sub>1</sub>.

Among the varieties non significant difference was noticed for seed germination per centage. The AFg-5 variety recorded significantly highest seedling length (22.52 cm), seedling dry weight (102.83 mg), seed vigour index-I (2201.67) and AFg-3 variety recorded highest (10076.10) seed vigour index-II compared to varieties.

Interaction effect was found significant with respect to seedling length where maximum seedling length (23.83 cm) were recorded with M<sub>4</sub>V<sub>4</sub> (Fig. 1) and M<sub>1</sub>V<sub>2</sub> while the interaction M<sub>3</sub>V<sub>1</sub> recorded minimum seedling length (18.33 cm). The interaction effect for all the other seed quality parameters were found non significant.

In the present experiment, adequate source of nutrients supply under the package of practice farming system module, followed by the organic and natural farming increased quality of seeds might be due to increased timely availability of nutrients which in turn accelerated crop growth and there by enhanced the quality.

**Table 1:** Protein content and protein yield in seeds of fenugreek (*Trigonella foenum-graecum*L.) varieties as influenced by different farming system modules

| Treatments                                    | Protein content (%)    |       |          |       |       | Protein yield (kg/ha) |        |          |        |        |
|-----------------------------------------------|------------------------|-------|----------|-------|-------|-----------------------|--------|----------|--------|--------|
|                                               | Fenugreek varieties(V) |       |          |       |       |                       |        |          |        |        |
|                                               | V1                     | V2    | V3       | V4    | Mean  | V1                    | V2     | V3       | V4     | Mean   |
| Farming system modules (M)                    | KPD-1                  | AFg-3 | AFg-4    | AFg-5 | Mean  | KPD-1                 | AFg-3  | AFg-4    | AFg-5  | Mean   |
| M1:Natural farming system module              | 19.24                  | 19.66 | 19.40    | 19.18 | 19.37 | 154.81                | 164.92 | 160.51   | 163.42 | 160.91 |
| M2:Organic farming system module              | 20.36                  | 20.44 | 20.45    | 20.48 | 20.43 | 130.04                | 145.93 | 127.13   | 140.86 | 135.99 |
| M3:Integrated farming system module           | 20.23                  | 21.06 | 21.30    | 20.70 | 20.82 | 160.68                | 156.71 | 165.45   | 148.26 | 157.77 |
| M4:Package of practices farming system module | 20.74                  | 20.90 | 21.00    | 20.83 | 20.87 | 179.42                | 187.99 | 180.83   | 190.13 | 184.59 |
| Mean                                          | 20.14                  | 20.52 | 20.53    | 20.29 | 20.37 | 156.23                | 163.89 | 158.48   | 160.67 | 159.81 |
|                                               | S. Em±                 |       | CD at 5% |       |       | S. Em±                |        | CD at 5% |        |        |
| MainPlot(M)                                   | 0.305                  |       | 1.07     |       |       | 8.19                  |        | 28.34    |        |        |
| Subplot(V)                                    | 0.308                  |       | NS       |       |       | 5.55                  |        | NS       |        |        |
| Interaction(M× V)atsame level                 | 0.617                  |       | NS       |       |       | 11.10                 |        | NS       |        |        |
| Interaction(M×V)atsame or different level     | 0.614                  |       | NS       |       |       | 13.10                 |        | 44.39    |        |        |

**Note:** KPD -Krishna Prabha Devimenthe1, AFg -Ajmer fenugreek

**Table 2:** The germination percentage, seedling length and seedling dry weight in fenugreek (*Trigonella foenum-graecum* L.) varieties as influenced by different farming system modules

| Treatments                                     | Germination percentage (%) |       |          |       |       | Seedling length(cm) |       |          |       |       | Seedling dry weight(mg) |        |          |        |        |
|------------------------------------------------|----------------------------|-------|----------|-------|-------|---------------------|-------|----------|-------|-------|-------------------------|--------|----------|--------|--------|
| Farming system modules (M)                     | Fenugreek varieties (V)    |       |          |       |       |                     |       |          |       |       |                         |        |          |        |        |
|                                                | V1                         | V2    | V3       | V4    |       | V1                  | V2    | V3       | V4    |       | V1                      | V2     | V3       | V4     |        |
|                                                | KPD-1                      | AFg-3 | AFg-4    | AFg-5 | Mean  | KPD-1               | AFg-3 | AFg-4    | AFg-5 | Mean  | KPD-1                   | AFg-3  | AFg-4    | AFg-5  | Mean   |
| M1:Natural farming system module               | 97.33                      | 98.33 | 98.00    | 97.67 | 97.83 | 21.67               | 23.83 | 23.00    | 23.50 | 23.00 | 99.66                   | 109.00 | 102.00   | 110.00 | 105.13 |
| M2:Organic farming system module               | 97.33                      | 97.00 | 97.33    | 98.00 | 97.47 | 21.33               | 21.17 | 21.67    | 21.00 | 21.22 | 98.33                   | 99.67  | 101.00   | 101.33 | 100.06 |
| M3:Integrated farming system module            | 97.67                      | 98.33 | 97.00    | 96.67 | 97.47 | 18.33               | 20.67 | 21.00    | 21.83 | 20.48 | 97.00                   | 98.33  | 95.00    | 97.66  | 97.00  |
| M4: Package of practices farming system module | 97.33                      | 97.67 | 98.00    | 98.33 | 97.83 | 21.67               | 23.00 | 21.83    | 23.83 | 22.53 | 100.33                  | 105.00 | 102.00   | 102.33 | 102.17 |
| Mean                                           | 97.47                      | 97.83 | 97.53    | 97.67 | 97.65 | 20.70               | 22.17 | 21.85    | 22.52 | 21.80 | 98.83                   | 103.00 | 100.00   | 102.83 |        |
|                                                | S. Em±                     |       | CD at 5% |       |       | S. Em±              |       | CD at 5% |       |       | S. Em±                  |        | CD at 5% |        |        |
| Main Plot (M)                                  | 0.22                       |       | NS       |       |       | 0.26                |       | 0.91     |       |       | 1.427                   |        | 5.036    |        |        |
| Sub plot (V)                                   | 0.35                       |       | NS       |       |       | 0.23                |       | 0.69     |       |       | 1.08                    |        | 3.17     |        |        |
| Interaction (M×V) at same level                | 0.44                       |       | NS       |       |       | 0.52                |       | 1.46     |       |       | 2.85                    |        | NS       |        |        |
| Interaction(M×V) at same or different level    | 0.65                       |       | NS       |       |       | 0.48                |       | 1.50     |       |       | 2.35                    |        | NS       |        |        |

**Note:** KPD -Krishna Prabha Devimenthe1, AFg –Ajmer fenugreek

**Table 3:** The seed vigour index-I and seed vigour index-II in fenugreek (*Trigonella foenum-graecum* L.) varieties as influenced by different farming system modules

| Treatments                                    | Seed vigour index-I (Length) |          |           |          |          | Seed vigour index-II (Mass) |           |           |           |           |
|-----------------------------------------------|------------------------------|----------|-----------|----------|----------|-----------------------------|-----------|-----------|-----------|-----------|
| Farming system modules (M)                    | Fenugreek varieties (V)      |          |           |          |          |                             |           |           |           |           |
|                                               | V1                           | V2       | V3        | V4       | Mean     | V1                          | V2        | V3        | V4        | Mean      |
|                                               | KPD-1                        | AFg-3    | AFg-4     | AFg-5    |          | KPD-1                       | AFg-3     | AFg-4     | AFg-5     |           |
| M1:Natural farming system module              | 2,109.67                     | 2,344.00 | 2,254.33  | 2,295.50 | 2,250.85 | 9,711.67                    | 10,721.00 | 9,987.33  | 10,742.00 | 10,290.50 |
| M2:Organic farming system module              | 2,076.00                     | 2,053.17 | 2,108.00  | 2,059.00 | 2,074.03 | 9,564.67                    | 9,667.67  | 9,822.00  | 9,951.00  | 9,751.33  |
| M3:Integrated farming system module           | 1,790.33                     | 2,031.67 | 2,037.00  | 2,109.00 | 1,992.00 | 9,470.67                    | 9,665.00  | 9,215.00  | 9,424.67  | 9,443.83  |
| M4:Package of practices farming system module | 2,110.33                     | 2,246.00 | 2,139.50  | 2,343.17 | 2,209.75 | 9,779.67                    | 10,251.00 | 9,994.33  | 10,056.30 | 10,020.33 |
| Mean                                          | 2,021.53                     | 2,168.70 | 2,134.70  | 2,201.67 |          | 9,631.67                    | 10,076.10 | 9,754.67  | 10,043.50 |           |
|                                               | S.Em±                        |          | CD at 5 % |          |          | S.Em±                       |           | CD at 5 % |           |           |
| Main Plot (M)                                 | 23.00                        |          | 81.17     |          |          | 141.93                      |           | 500.69    |           |           |
| Sub plot (V)                                  | 25.01                        |          | 73.41     |          |          | 102.64                      |           | 301.37    |           |           |
| Interaction (M×V) at same level               | 46.01                        |          | NS        |          |          | 283.86                      |           | NS        |           |           |
| Interaction (M×V) at same or different level  | 49.05                        |          | NS        |          |          | 227.48                      |           | NS        |           |           |

**Note:** KPD-KrishnaPrabhaDevimenthe1, AFg–Ajmerfenugreek

## Conclusion

The highest protein content recorded in M3V3 (integrated farming system module × AFg-4) with protein content (21.30 %) followed by M3V2 but highest protein yield recorded in M4V4 (package of practices farming system module with AFg-5) with

protein yield (190.13 kg/ha). The protein content and protein yield was not significantly impacted by varieties AFg-3. In general natural farming system module recorded better seed quality parameters than other farming system modules.



**Plate 1:** M4 V4 showing higher and significant value on seedling length (cm).

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