

Response of Fenugreek and Mustard as Influenced by Intercropping and Fertility Levels

S. S. TOMAR, NIVEDITA SINGH*, PRIYANKA CHAND AND PRIYANKA TIWARI¹

Department of Agronomy, School of Agriculture, Institute of Technology and Management University, Gwalior-474 001 (M. P.), India

**(e-mail : niveditasinghrana@gmail.com; Mobile : 84456 76912)*

(Received : January 24, 2022; Accepted : February 16, 2022)

ABSTRACT

An experiment was conducted during winter seasons of 2016-17 and 2017-18 at Crop Research Center of Career Point University, Kota with five intercrops viz., fenugreek (F : sole crop), mustard (M : sole crop), F + M (3 : 1), F+M (4 : 2) and F+M (5 : 2) row ratio and at four levels of 125, 100, 75 and 50% fertility (N+P). The intercropping with 3 : 1 row ratio produced higher dry matter, test weight and yield (grain and straw) in fenugreek, whereas under mustard crop the 4 : 2 row ratio the dry matter, seed and straw yield was higher than 3 : 1 row ratio. Under fertility levels (N+P), dry matter, test weight grain and straw were higher than other levels in both the crops. The quality parameters were higher at 3 : 1 and 125% fertility levels.

Key words : Intercropping, fertility, fenugreek, mustard, yield, quality, economics

INTRODUCTION

Fenugreek is a spice since utilized in elective medication. It is a local to Mediterranean area, southern Europe and western Asia. It is used in Indian dishes and regularly taken as an enhancement. Today, fenugreek is advanced as a dietary enhancement for diabetes, feminine spasms and cholesterol level.

In intercropping due to differential rooting system of main and component crops, the moisture and nutrients from various depths of soil layers are being utilized fully and efficiently. In Rajasthan, fenugreek is mainly cultivated in the districts of Bikaner, Churu, Kota and Thalwar and very useful to human health as spices and green vegetable. The legume component fixes atmospheric nitrogen and thus increases the supply of this utmost important nutrient in the soil biosphere which reduces competition for nitrogen for the component crop of the system, hence, increases the quality of component crops. Use of phosphorus improves plant metabolism and photosynthetic movement for better development and advancement of plants and eventually the yield (Fahimeh and Balouch, 2015; Patel and Amin, 2017; Wani and Kumar, 2018; Abate and Getachew, 2018). Keeping in

view the above facts, an experiment was laid out to know the effect on yield and quality aspects of fenugreek and mustard in intercropping system.

MATERIALS AND METHODS

The fenugreek variety Hissar Sonali and mustard variety Pusa Agrani (SEJ-21) were used as test crops. A field experiment was carried out during winter season (**rabi**) of 2016-17 and 2017-18 at Career Point University Research farm (CRC), Kota. The soil was vertisol with low available nitrogen and phosphorus and high in exchangeable potassium. The experiment was laid out in randomized block design (RBD) with three replications consisting 20 treatment combinations of five intercropping systems viz., sole fenugreek, sole mustard, 3 : 1, 4 : 2 and 5 : 2 row ratios of fenugreek and mustard with four fertility levels viz., 125, 100, 75 and 50% of recommended dose of N and P to main crop (fenugreek). Both fenugreek and mustard were sown on 16th October during both the years and harvested on 20th and 25th Feb., respectively. Samples of grain were collected from each main and intercrop for test weight and protein content. The crude protein was

¹Department of Civil Engineering, National Institute of Technology, Kurukshetra-136 119 (Haryana), India.

calculated by multiplying the per cent nitrogen content in seed with a factor of 6.25. The per cent oil content in mustard was estimated with the help of “NMR” Spectrometer.

RESULTS AND DISCUSSION

Among different intercropping systems, the highest dry matter production at harvest, test weight and yield (grain and straw) were recorded in (F+M) 3 : 1 row ratio under fenugreek which was significantly superior over all other combinations except, sole crop (Table 1). Under main crop, (fenugreek) nutrient (N+P) application 125% was significantly higher in dry matter production, test weight and yield (grain and straw) over other levels of nutrient application. The results are in the close conformity with the findings of Thenua *et al.* (2017). The reduction in test weight of fenugreek in intercropping system with 4 : 2 row ratio might be due competition between the component crop for space, nutrient, light and water which might have adversely affected the growth of fenugreek. The similar results were noted with dry matter production of fenugreek, consequently the yield (grain and straw) was also observed in the same direction by Boori *et al.* (2017).

The highest and significant dry matter, grain and straw yield were observed under the row ratio of 4 : 2, whereas test weight was higher in 3 : 1 row ratio under component (mustard) crop of intercropping (Table 1), though the

highest yield and yield contributing characters were recorded in sole crop of mustard. Under intercropping system, the mustard yield was encouraging under 4 : 2 row ratio due to proper availability of space, nutrient and moisture. The per cent increase under this row ratio (4 : 2) was 22.56 and 13.46 over 3 : 1 and 5 : 2 row ratio applied for intercropping system for mustard crop.

Under fertilizer application, the mustard dry matter production, test weight and yield (grain and straw) were observed highest in 125% application of N and P which increased grain yield of mustard over 100, 75 and 50% dose of N and P application by 5.78, 12.06 and 21.80%, respectively.

The fenugreek equivalent yield (FEY in q/ha) was affected significantly by the intercropping. Maximum FEY was under 4 : 2 row ratio which was significantly superior over 3 : 1 and 5 : 2 row ratio (Table 2). In fertility levels, it varied from 8.51 to 6.08 q/ha. The highest FEY was with 125% RDF which was significantly at par with 100% and superior over 75 and 50% application of fertilizer. Geetha and Shanmugapriya (2022) also reported that yield equivalent of main crop had the significance in intercropping during **rabi** season.

In quality parameters, protein content was estimated in both the crops (fenugreek and mustard), whereas oil content was estimated only in mustard crop (Table 2). Protein content of fenugreek varied from 20.36 to 18.32 under intercropping system. The intercrop with 3 : 1 row ratio produced higher and significant

Table 1. Effect of intercropping and fertility levels on dry matter production, test weight, seed and straw yield of main and component crops (Pooled data of two years)

Treatments Intercropping system	Fenugreek				Mustard			
	Dry matter at harvest (q/ha)	Test weight (g)	Seed yield (q/ha)	Straw yield (q/ha)	Dry matter at harvest (q/ha)	Test weight (g)	Seed yield (q/ha)	Straw yield (q/ha)
Fenugreek (sole)	64.78	12.49	23.76	40.96	-	-	-	-
Mustard (sole)	-	-	-	-	67.30	5.21	21.12	45.71
F+M (3 : 1)	58.12	10.83	19.38	38.21	26.92	6.53	8.60	18.32
F+M (4 : 2)	48.92	9.93	16.27	32.61	32.40	5.99	10.54	21.86
F+M (5 : 2)	55.21	10.31	18.92	36.25	30.24	6.12	9.29	20.92
C. D. (P=0.05)	1.21	0.69	0.78	0.92	0.92	0.52	0.64	0.86
Fertility levels (N and P)								
F (125%)	61.35	11.39	22.00	34.86	6.25	11.34	23.46	39.31
F (100%)	58.87	10.40	20.69	32.15	5.98	10.72	21.33	38.14
F (75%)	55.76	9.23	19.21	31.06	5.63	10.12	20.86	36.51
F (50%)	50.49	8.92	17.63	27.46	5.37	9.31	18.12	32.82
C. D. (P=0.05)	1.21	0.69	0.78	0.92	0.52	0.64	0.86	0.92

Recommended fertility levels of main (fenugreek) crop (100%) = 20 kg N + 40 kg P₂O₅/ha.

Table 2. Effect of intercropping and fertility levels on quality parameters and economics of fenugreek (main) and mustard (component) (Pooled data of two years)

Treatment-Intercropping system	Protein content of fenugreek (%)	Protein content of mustard (%)	Oil content of mustard (%)	Net returns (Rs./ha)	Fenugreek equivalent yield (q/ha)
Fenugreek (sole)	20.36	-	-	137020	23.76
Mustard (sole)		18.62	39.32	81580	15.84
F+M (3 : 1)	19.21	22.97	40.69	15850	6.45
F+M (4 : 2)	18.32	19.12	38.82	26070	7.91
F+M (5 : 2)	18.86	20.37	40.08	19420	6.96
C. D. (P=0.05)	0.51	0.81	0.60	-	0.82
Fertility levels (N and P)					
F (125%)	22.62	22.87	40.75	30270	8.51
F (100%)	21.12	21.18	39.10	27260	8.04
F (75%)	20.39	19.72	38.15	23200	7.50
F (50%)	19.65	17.36	37.05	19560	6.98
C. D. (P=0.05)	0.51	0.81	0.60	-	0.76

Market price : (a) Fenugreek=Rs. 6000/q, (b) Mustard=Rs. 4500/q, (c) Straw of fenugreek=Rs. 1000/t, (d) Straw of mustard=Rs. 1000/t and (e) Cost of cultivation of fenugreek=Rs. 29300/ha.

protein content over other row ratio which was 4.86 and 1.86% higher over row ratio of 4 : 2 and 5 : 2, respectively.

The protein content of fenugreek varied from 22.61 to 19.65 under fertility levels (N+P) and it was maximum with 125% which recorded significantly higher protein over other fertility treatments. 125% level of fertility produced protein content higher by 7.10, 10.94 and 15.11% over 100, 75 and 50% fertility levels, respectively. The intercropping increased the efficiency of resources, greater availability of nutrient, thus increased the protein content as reported by Kubala (2019).

In mustard crop, the protein and oil content of mustard was highest with 3 : 1 row ratio of intercropping which had 22.97% protein and 40.69% oil. Among fertility levels, 125% (N+P) was significantly superior over 100, 75 and 50%, when compared on protein and oil content. The protein per cent ranged from 22.87 to 17.36, whereas oil content varied between 40.75 to 37.05% (Table 2).

Net returns (Rs./ha) were computed with the help of market price and cost of cultivation of both the crops (Table 2). The maximum net returns were found under the row ratio of 4 : 2 which were superior to 3 : 1 and 5 : 2 row ratios of intercropping though, sole crops had the maximum net returns (Rs. 137020 for fenugreek and Rs. 81580 for mustard). It might be due to yield and market price of both the commercial crops. Under the fertility levels, the maximum net returns were observed with 125% application of nutrient which was (Rs. 30270) 11.04, 30.47 and 54.75% higher by 100,

75 and 50% RDF (N+P), respectively. Gendy *et al.* (2018) reported very encouraging results on economics of intercropping, although they worked on wheat and mustard intercropping and observed that intercropping gave the higher monetary benefits than the other systems of cropping.

CONCLUSION

The intercropping of fenugreek with mustard had great significance with the row ratios of both the tested crops. If the farmers want to go for intercropping with these commercial crops then they should try the row ratio of 3 : 1 (3 rows of fenugreek+1 row of mustard). In the case of fertility levels (N+P) 125% of RDF was found superior over other levels (100, 75 and 50%). The enhancement in yield attributes, yield (grain and straw), quality parameters and economics led due to higher availability of nutrient and better utilization of resources.

REFERENCES

- Abate, M. and Getachew, A. (2018). Biological benefits of intercropping maize (*Zea mays* L.) with fenugreek, field pea and haricot bean under irrigation in Fogera Plain, South Gonder Zone, Ethiopia. *Agric. For. Fisheries* **7** : 19-35.
- Boori, P. K., Shivran, A. C., Giana, G. K., Jat, M. L., Yadav, G. and Meena, S. (2017). Growth and production potential of fenugreek as influenced by intercropping system and sulphur levels. *J. Pharm. Photochem.* **6** : 1945-1949.

- Fahimeh, M. and Balouch, H. (2015). Effect of intercropping on the yield and some quantitative and qualitative traits of fenugreek and anise. *J. Agric. Sci. Sustain. Prod.* **25** : 1-16.
- Geetha, S. and Shanmugapriya (2022). Effect of organic fertilizer on seed germination and seedling vigour of fenugreek. <https://www.researchgate.net/publication/357993309>.
- Gendy, A. S. H., Abdelkader, M. A., El-Naggar, N. and Elakkad, H. A. (2018). Effect of intercropping systems and NPK foliar application on productivity and competition indices of black cumin and fenugreek. *Curr. Sci. Int.* **7** : 387-401.
- Kubala, J. (2019). Can fenugreek boost your testosterone level? *Healthline.com/nutrition/fenugreek*.
- Patel, S. M. and Amin, A. U. (2017). Feasibility of ajwain as intercropping in cumin (*Cuminum cyminum* L.). *Int. J. Seed Spices* **7** : 77-81.
- Thenua, O. V. S., Kumar, S., Raj, V. and Singh, S. P. (2017). Productivity and economics of fenugreek (*Trigonella foenum-graceum*) and maize (*Zea mays*) as influenced by nutrient management practices in winter maize-based cropping system. *Ind. J. Agron.* **62** : 206-210.
- Wani, S. A. and Kumar, P. (2018). Fenugreek : A review on its nutraceutical properties and utilization in various food products. *J. Saudi Soc. Agril. Sci.* **17** : 97-106.