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Economic feasibility of intercropping of Fenugreek (*Trigonella graecum* L.) with different short duration vegetable crops

A. Verma*, K. Aravindakshan[1], R.K. Sharma[2], K. Pushpa[3] and D. Gautam[4]

Department of Vegetable science, Swami Keshwanand Rajasthan Agricultural University, Beechwal, Bikaner 334 006, Rajasthan, India

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ABSTRACT

A field experiment entitled "Economic feasibility of intercropping of Fenugreek (*Trigonella graecum* L.) with different short duration vegetable crops" was conducted at the vegetable farm, Department of Vegetable Science, College of Horticulture and Forestry, Jhalrapatan, Jhalawar during *Rabi* season 2019-20. The experiment comprised of four sole crops (fenugreek, carrot, cabbage and radish) and fenugreek intercropped with carrot, cabbage and radish with three ratios 1:1, 1:2 and 2:2 with a total of thirteen treatments each replicated thrice and laid out in randomized block design. The result shows that the sole crops *viz.,* carrot, cabbage and radish had significant effect on growth, yield and quality over different intercropping system with fenugreek. The result revealed that intercropping of fenugreek with different short duration vegetable crops (carrot, cabbage and radish) had significant effect on equivalent yield, Land equivalent ratio and system productivity as compared to sole cropping system. The treatment T_5 (fenugreek + carrot 1:1) was found most effective in increasing the fenugreek equivalent yield (54.72 q/ha), LER (1.44) and the maximum net return of 219717 with B: C ratio of (4.08) as compared to T_1 (sole fenugreek) cropping system. However, the treatments T_6 (fenugreek + carrot 1:2) was found at par with treatment T_5 for equivalent yield and LER over sole cropping of fenugreek *i.e.* treatment T_1).

Key words : *Benefit Cost ratio, Equivalent yield, Intercropping, Land Equivalent Ratio.*

Introduction

Intercropping is a ways to enhance diversity in an agricultural ecosystem. Intercropping as an example of sustainable agricultural systems following objectives such as: ecological balance, more utilization of resources, increasing the quantity and quality and reduce yield damage to pests, diseases and weeds. Success of intercrops in comparison with a pure cropping can be determined by a series of agronomic operations that interactions between the species will be affected by them. These operations are including ultimate density, planting date, resources availability and intercropping models (Mazaheri *et al.,* 2006; Gliessman, 1997; Hatfield and Karlen, 1993). Owing to the importance of intercropping of vegetables and doubling the farmers income as it is an urgent need for today's demand and fenugreek being the major crop of Rajasthan, a study on fenugreek based intercropping with vegetables is necessary to be taken up. Intercropping with legumes makes effective use of land and other resources and results in reduced cost of production. Increased agricultural production through intercrop-

*Ph.D. Research Scholar

ping with minimal cost is need of time to feed increasing population.

Therefore, the present study entitled "Study on intercropping of fenugreek (*Trigonella foenum graecum* L.) with different short duration vegetable crops" was carried out with an object to estimate the economic feasibility of the intercropping system.

Materials and Methods

The field experiment on growth, yield and quality of fenugreek as influenced by different intercropping ratios was conducted at the vegetable farm, Department of Vegetable Science, College of Horticulture and Forestry, Jhalrapatan, Jhalawar during *Rabi* season 2019-20. The experiment comprising of thirteen treatments *viz.,* sole fenugreek, carrot, cabbage and radish, fenugreek + carrot (1:1), fenugreek + carrot (1:2), fenugreek + carrot (2:2), fenugreek + cabbage(1:1), fenugreek + cabbage (1:2), fenugreek + cabbage (2:2), fenugreek + radish (1:1), fenugreek + radish (1:2) and fenugreek + radish (2:2) was laid in randomized block design with three replications. Ajmer Fenugreek-3 was sown using 25 kg seeds at row to row spacing of 30 cm. The carrot (Pusa Yamdagini), cabbage (Pusa Mukta) and radish (Japanese White) were sown at row spacing of 30 cm. A uniform recommended doses of 30 Kg N and 20 kg P_2O_5 ha^{-1} and 20 kg K_2O for sole fenugreek, 90 kg N, 50 kg P_2O_5 and 40 kg K_2O for sole carrot, 100 kg N, 125 kg P_2O_5 and 25 kg K_2O for sole cabbage and 50 kg N, 100 kg P_2O_5 and 50 kg K_2O for sole radish was applied. In intercropping 100 % and 50 % of recommended RDF of intercrops were applied along with RDF of base crop. $^1/_3$ N and full dose of P and K was applied as basal dose at the time of sowing and remaining $^2/_3$ N was applied in two equal split doses at 30 and 60 DAS. The standard agronomic practices were followed for raising healthy crop of fenugreek as well as carrot, cabbage and radish. Irrigation was applied as per requirement of fenugreek, which met the demand of intercrops also. The observation on growth, yield and quality parameters was recorded. Harvesting of fenugreek and intercrops was done in stages keeping in view the maturity of crop.

The data on quantity observations recorded during the course of investigation for various characters were subjected to statistical analysis by adopting randomized block design (RBD) with three replications as per the technique suggested by Fisher (1950). Significance of difference in the treatment effect was tested through 'F' test at 5 percent level of significance.

Results and Discussion

Fenugreek equivalent yield and LER

The result of present investigation showed that intercropping of fenugreek with different short duration vegetables *viz.* carrot, cabbage and radish significantly influenced the fenugreek equivalent yield (q/ha) and land equivalent ratio. The maximum fenugreek equivalent yield (54.72 q/ha) and land equivalent ratio (1.44) were found in treatment T_5

Table 1. Effect of intercropping system on fenugreek equivalent yield (q/ha) and land equivalent ratio

Treatment notation	Treatments	FEY (q/ha)	LER
T_1	Fenugreek	34.55	1.00
T_2	Carrot	44.72	1.00
T_3	Cabbage	45.39	1.00
T_4	Radish	27.99	1.00
T_5	Fenugreek + Carrot (1:1)	54.72	1.44
T_6	Fenugreek + Carrot (1:2)	53.33	1.41
T_7	Fenugreek + Carrot (2:2)	48.78	1.29
T_8	Fenugreek + Cabbage (1:1)	53.28	1.39
T_9	Fenugreek + Cabbage (1:2)	53.61	1.37
T_{10}	Fenugreek + Cabbage (2:2)	47.64	1.25
T_{11}	Fenugreek + Radish (1:1)	49.66	1.40
T_{12}	Fenugreek + Radish (1:2)	48.82	1.37
T_{13}	Fenugreek + Radish (2:2)	45.67	1.29
S.Em±	-	0.85	0.01
CD 5%	**-**	**2.51**	**0.03**

(Fenugreek + carrot 1:1) and minimum fenugreek equivalent yield (27.99 q/ha) was found in treatment T_4 and minimum LER was found in respective sole crops *i.e.* fenugreek, carrot, cabbage and radish. However, the treatments T_6 (fenugreek + carrot 1:2) was found at par for fenugreek equivalent yield and LER with treatment T_5. The higher fenugreek equivalent yield in intercropping system was on account of additional yield of components crop without not much reduction in yield of base crop resulting in higher fenugreek equivalent yield. The highest fenugreek equivalent yield in T_5 followed by T_7, T_6, T_8 and T_9 was due to proportionately less reduction in yield of fenugreek as compared with sole with resulting better yield of component crop leading to higher FEY. The higher LER with all intercropping system is on account of better spatial and temporal resource utilization resulting in higher combined economical yield of base and intercrops (Mehta *et al.*, 2015). These results are in conformity with the findings of Gawade *et al.,* (2002) in cabbage intercropping system, Tripathi *et al.* (2005) in chickpea intercropping system, Kumar *et al.* (2006) in potato + fenugreek intercropping system, Hussain *et al.* (2008) in intercropping of tomato with summer vegetables, Seran *et al.* (2009) in radish intercropping with different vegetables, Wsaya *et al.* (2013) in wheat and fenugreek intercropping system, and Parsoya *et al.* (2019) in intercropping of ajwain intercropping.

System productivity and Economics

The data regarding to net return and B: C ratio is presented in Table 2 & figure 1 and showed thattreatment T_5 (fenugreek + carrot 1:1) was found most effective in increasing the fenugreek net return (Rs. 219717) with B:C ratio of (4.08), followed by Rs. 217328 with B:C (3.99) under treatment T_6 (fenugreek + carrot 1:2) as compared to T_1 (sole fenugreek) cropping system.

Conclusion

From the study it was concluded that intercropping of fenugreek with carrot (1:1) significantly increased fenugreek equivalent yield and Land equivalent ratio as well as profitability (net return and B: C ratio) in fenugreek cultivation.

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Conflict of interest statement

The author declares that there is no conflict of interest.

Table 2. Economics of different intercropping systems.

Treatment notation	Treatment combination	Seed yield of fenugreek ha^{-1}(q)	Yield of intercrops ha-1	Cost of cultivation including the cost of treatment	Gross return ha^{-1}	Net returns ($Rsha^{-1}$)	B:C ratio
T1	Fenugreeksole	34.55	-	50136	172750	122614	2.44
T2	Carrotsole	-	223.27	54429	223270	168841	3.10
T3	Cabbage sole	-	378.33	55865	226998	171133	3.06
T4	Radish sole	-	466.66	57290	186664	129374	2.25
T5	Fenugreek +Carrot(1:1)	32.83	109.44	53873	273590	219717	4.08
T6	Fenugreek +Carrot(1:2)	29.5	124.17	54342	271670	217328	3.99
T7	Fenugreek +Carrot(2:2)	31.56	86.11	53873	243910	190037	3.52
T8	Fenugreek +Cabbage(1:1)	30.92	186.33	54741	247765	193024	3.53
T9	Fenugreek +Cabbage(1:2)	27.15	220.55	54885	246025	191140	3.48
T10	Fenugreek +Cabbage(2:2)	29.78	148.88	54741	223340	168599	3.08
T11	Fenugreek +Radish(1:1)	31.22	230.55	55281	248320	193039	3.49
T12	Fenugreek +Radish(1:2)	27.9	270.83	55807	247832	192025	3.44
T13	Fenugreek +Radish(2:2)	30.83	183.33	55281	227482	172201	3.11

*Selling price of fenugreek 50/kg, Carrot 10/kg, Cabbage 5/kg and Radish 4/kg

References

Gawade, M.H., Patil, J.D. and Kakade, D.S. 2002. Studies on effect of intercrops on yield and monetary returns of cabbage. *Agricultural Science Digest*. 22(1): 63-64.

Gliessman, S.R. 1997. Agroecology: ecological processes in sustainable agriculture. Publisher: CRC Press.

Hatfield, J.L. and Karlen, D.L. 1993. *Sustainable Agriculture Systems*. Publisher: CRC Press.

Hussain, S.A., Ali, N., Rab, A. and Shah, M. 2008.Yield and economic dynamics of intercopping in summer vegetables. *Sarhad Journal of Agriculture*. 24(1): 31.

Kumar, A., Singh, R. and Chhillar, R.K. 2006. Nitrogen requirement of fennel (*Foeniculum vulgare*)-based cropping systems. *Indian Journal of Agricultural Sciences*. 76(10) : 599-602.

Mazaheri, D., Madani, A. and Oveysi, M. 2006. Assessing the land equivalent ratio (LER) of two corn (*Zea mays* L.) varieties intercropping at various nitrogen levels in Karaj, Iran. *Journal of Central European Agriculture*. 7(2) : 359-364.

Mehta, R.S., Singh, B., Meena, S.S., Lal, G., Singh, R. and Aishwath, O.P. 2015. Fennel (*Foeniculum vulgare* Mill.) based intercropping for higher system productivity. *International Journal Seed Spices*. 5(1): 56-62.

Parsoya, M., Mehta, R.S., Ameta, R.H., Kumar, V. and Kumar, P. 2019. Effect of different intercropping systems on nutrient uptake, yield and profitability in ajwain (*Trachysper mumammi* Sprague) production. *Journal of Pharmacognosy and Phytochemistry*. 8(2): 10-12.

Seran, T. H. and Brintha, I. 2009. Biological and economic efficiency of radish (*Raphanus sativus* L.) intercropped with vegetable amaranthus (*Amaranthus tricolor* L.). *The Open Horticulture Journal*. 2:17-21.

Tripathi, H.N., Chand, S. and Tripathi, A.K. 2005. Biological and economical feasibility of chickpea (*Cicer arietinum*) + Indian mustard (*Brassica juncea*) cropping systems under varying levels of phosphorus. *Indian Journal of Agronomy*. 50(1) : 31- 34.

Wasaya, A., Ahmad, R., Hassan, F.U., Ansar, M., Manaf, A. and Sher, A. 2013. Enhancing crop productivity through wheat (*Triticum aestivum* L.) and fenugreek intercropping system. *Journal Animal Plant Science*. 23(1) : 210-215.