



Performance of Coriander, Fenugreek and Soya as Intercrop under Gladiolus based Intercropping system

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ABSTRACT

The field experiment was planned and conducted during *rabi* season 2011-2012 to 2012-2013 at research farm of Sam Higginbottom Institute of Agriculture Technology and Science, Allahabad, Uttar Pradesh India, with three intercropping crop on growth and herbage yield. Experiment consisted 8 treatments each replicated thrice and laid in RBD. The result obtained from the experiment show that three crop significantly affected the growth parameters of coriander, fenugreek and soya such as seed germination, plant height, number of leaves per plant and number of branches per plant were found to be higher under coriander sole, fenugreek sole and as well as soya sole cropping. Sole cropping of coriander, fenugreek and soya not only gave best seed germination but also produced taller plant, more leaves and branches per plant, leading to higher herbage yield. Gladiolus yield attributes and yield were improved under intercropping as compare to sole cropping system.

Keywords: Coriander, Gladiolus, Fenugreek, Soya, Intercropping, Herbage Production

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Coriander (*Coriandrum sativum* L.) is an annual spice herb that belongs to the family Umbelliferae/Apiaceae (Hedburg and Hedburg, 2003). Coriander is a diploid cross pollinated crop. The plant is indigenous to Southern Europe and the Mediterranean region, is one of oldest consumed spices in India. It is also cited that the name coriander derives from French coriander through Latin "*coriandrum*". Fenugreek is the third largest seed spice in India after coriander and cumin. It is one of the principal odoriferous constituents of curry powder. The dried seeds, the leaves and tender shoots are all consumed and are valued as food, flavoring agent and medicine (Pedapati *et al.*, 2014). The seeds are good for the elimination of bad breath and body odour. The seeds are used in colic flatulence, dysentery, diarrhoea, dyspepsia with loss of appetite, chronic cough, dropsy and diabetes. It has chemo-preventive and chemo-therapeutic activities and is also reported to have low toxicity in pre-clinical studies (Vigushin *et al.*, 1998).

Myristicin is a naturally occurring insecticide and an important compound of the essential oil (Duke, 2001; Dhalwal *et al.*, 2008). Anethole is a terpenoid that is present in minor quantity in *Anethum*, but is also found in the essential oils of anise and fennel (Newberne *et al.*, 1999). It is used as a flavoring substance. *p-anisaldehyde* has a strong aroma and is an important component in pharmaceuticals and perfumery. Intercropping with flowering herbaceous plants increases parasitoid survivor-ship, fecundity and retention, and pest suppression in agro-ecosystems. Dill is a potentially suitable host for the parasitoids *Edovum puttleri* Grissell, *Cotesia glom-erata* and *Pediobius foveolatus* Crawford (Patt *et al.*, 1997 and Wanner *et al.*, 2006). Gladiolus is flowering plants; where as other three crop chosen for this study were categorized as spices. Intercropping is an excellent system of cropping which ensure better utilization of resources and inputs if the selection of crops were made appropriately (Singh *et al.*, 2014). Efficient intercropping not only improves the productivity but also sustain soil fertility stats (Singh *et al.*, 2013b). There seeds as well as

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herbage is also used for spices and condiment purpose (Pedapati *et al.*, 2014). This study was undertaken to understand the effects of one intercrops on another and to evolve suitable agro-technology (Singh *et al.*, 2014) for improving production of the crops under study.

This experiment was conducted in Floriculture Unit, Department of Horticulture, Allahabad School of Agriculture, Sam Higginbottom Institute of Agriculture, Technology and Sciences Allahabad, India. The experimental site is situated at a latitude of 20° and 15° North and longitude of 60° 3" East and at an altitude of 98 meters above mean sea level (MSL). The maximum temperature of the location reaches up to 46°C-48°C and seldom falls as low as 4°C-5°C. The relative humidity ranged between 20 to 94 per cent. The average rainfalls in this area is around 1013.4 mm annually. Soil of the experimental plot was sandy loamy, uniform in texture and well drained. The experiment was conducted in Randomized Block Design (RBD) with three replications. Foliar application of 20:20:20 NPK/m²/month @ 2g/l once in 2 days during first 3 months of planting and 15:8:35 NPK/m²/month @ 2g/l from 4th month onwards when flowering starts in 2 splits at 15 days intervals was given for good growth and flower production. The crop was supplied with 25 tons of FYM. A fertilizer dose of 120:90:60 kg of NPK per ha as basal dose and 60 kg N as top dressing at 30 days after transplanting was applied as recommended by Indian Institute of Horticultural Research, Bangalore. The sources of nitrogen, phosphorus and potash were urea (46%), single super phosphate (16% P₂O₅) and muriate of potash (60% K₂O) respectively. In total eight treatments gladiolus alone, coriander alone, fenugreek alone, soya alone, gladiolus alone + coriander, gladiolus alone + fenugreek, gladiolus alone + soya and gladiolus alone + coriander + fenugreek + soya were adopted. All the recorded observations were subjected to the statistical analysis. The data on growth and herbage yield components were subjected to Fisher's method of analysis of variance (ANOVA).

Significant variation was observed among the intercropped coriander, fenugreek and soya with gladiolus under different. Maximum seed germination (97.50%) was recorded when coriander was grown alone, followed by gladiolus + coriander (89.17) and the minimum seed germination (85.83%) was recorded when all three crop were taken under intercropping i.e. gladiolus + coriander + fenugreek + soya (Table 1). Whereas in case of fenugreek the maximum (95.0%) seed germination was observed in the plots of fenugreek sole followed by gladiolus + fenugreek (86.67%) and the minimum seed germination (84.17%) was recorded in

(gladiolus + coriander + fenugreek + soya). Where as in case of soya, maximum seed germination (92.50%) was recorded under soya sole followed by gladiolus + soya (85.83%) and corresponding minimum seed germination (82.50%) was recorded in (gladiolus + coriander + fenugreek + soya). It was observed that germination of individual crop were maximum when they were taken alone. As the number of crop increase under intercropping the germination of all crops reduced and it was reduced drastically when all crop accommodated in same piece of land. This might be due the intercrop completion or some allelopathic effects of one crop on associated crops (Singh *et al.*, 2012). Likewise in case of plant height, coriander attained maximum (34.93 cm) when it was sown sole, followed by intercropping with gladiolus (30.07), minimum plant height (25.03 cm) was noticed with treatment in case when all four crop were taken in to one plot i.e. gladiolus + coriander + fenugreek + soya. Soya attains e maximum plant height (28.00cm) under soya sole followed by gladiolus + soya (23.40) while the minimum plant height (18.53cm) was noticed with treatment gladiolus + coriander + fenugreek +soya intercropping. Similar findings were also reported by Singh *et al.* (2013a) while working with tobacco based intercropping system at Pusa Bihar. The maximum number of leaves per plant (60.13) was noticed by coriander sole followed by gladiolus +coriander and minimum (53.70) with gladiolus + coriander + fenugreek + soya. The maximum number of leaves per plant (51.83) was noticed under treatments soya sole followed by gladiolus +soya and minimum (45.77) with gladiolus + coriander + fenugreek + soya intercropping. The maximum number of branches per plant (11.93) by soya was noticed under treatments soya sole followed by gladiolus +soya intercropping and minimum (7.23) with intercropping of gladiolus + coriander + fenugreek + soya. The maximum number of branches per plant (15.87) was noticed under treatments coriander sole followed by (14.07), gladiolus + coriander, and minimum (10.83) with gladiolus + coriander + fenugreek + soya. The maximum coriander herbage yield (806.83g per plot) was observed in the plots in which coriander sole was taken, followed by gladiolus + coriander (519.50g). The minimum herbage yield (386.33g) was observed with gladiolus + coriander + fenugreek + soya. The maximum coriander herbage yield per plot (8.07/ha) was observed in the coriander when it was sown sole followed by gladiolus + coriander (5.61t/ ha). However the minimum herbage yield (3.52t /ha) was recorded the plots of gladiolus + coriander + fenugreek + soya. Gomez-Rodriguez *et al.* (2003) Observed that growth parameters, yield attributes and seed yield of coriander recorded was

Table 1: Intercropping in coriander, fenugreek and soya with gladiolus on growth and herbage yield.

Treatments	Seed germination			Plant height			Number of leaves			Number of branches / shoots			Herbage yield (g/ plot)			Herbage yield (t/ha)			
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
Gladiolus sole	-	-	-	89.33	-	-	-	-	-	18.83	-	-	-	-	-	-	-	-	-
Coriander sole	97.50	-	-	34.93	-	-	60.13	-	-	15.87	-	-	806.83	-	-	8.07	-	-	-
Fenugreek sole	-	95.00	-	28.03	-	-	62.13	-	-	18.57	-	-	909.67	-	-	-	9.10	-	-
Soya sole	-	-	92.50	-	-	28.00	-	51.83	-	-	-	-	-	-	768.67	-	-	-	7.69
Gladiolus + Coriander	89.17	-	-	30.07	-	-	57.67	-	-	14.07	-	-	519.50	-	-	5.61	-	-	-
Gladiolus + Fenugreek	-	86.67	-	26.12	-	-	55.47	-	-	-	16.57	-	689.33	-	-	-	6.89	-	-
Gladiolus + Soya	-	-	85.83	-	-	23.40	-	48.17	-	-	-	10.23	-	-	495.33	-	-	-	4.95
Gladiolus + Coriander + Fenugreek + Soya	85.83	84.17	82.50	25.03	23.93	18.53	53.70	48.27	45.77	10.83	15.03	7.23	386.33	435.50	367.83	3.52	4.36	3.68	-
F- test	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
S. Ed. (±)	0.83	1.44	1.29	2.22	0.86	2.09	1.14	3.07	0.88	0.80	0.71	0.72	57.62	97.22	54.82	0.41	0.97	0.55	-
C. D. (P = 0.05)	1.79	3.10	2.77	4.77	1.84	4.48	2.45	6.59	1.89	1.72	1.52	1.54	123.60	208.53	117.59	0.89	2.09	1.18	-

1= Coriander, 2= Fenugreek, 3= Soya

higher with coriander intercrops in 1:1 ratio. The association of carrot with coriander at all ratios proved superior over onion and garlic. The maximum plant height (28.3cm) was recorded for fenugreek when it was taken sole followed by (26.12cm) under intercropping with gladiolus while the minimum plant height (23.93cm) was attained under gladiolus + coriander + fenugreek +soya .In case of leaf, maximum number of leaves per plant (62.13) was noticed under treatments fenugreek sole followed by gladiolus +fenugreek and minimum (48.27) with gladiolus + coriander + fenugreek + soya .The maximum number of branches per plant (18.57) was noticed under treatments fenugreek sole followed by gladiolus + fenugreek and minimum (15.03) intercropping of gladiolus + coriander + fenugreek + soya (Table 1). The maximum herbage yield (909.67g) was noticed under fenugreek sole followed by with gladiolus + fenugreek. The minimum herbage yield per plot (435.50 g) was observed in gladiolus + coriander + fenugreek + soya. Similarly maximum herbage yield per (768.67g) was recorded with soya sole followed by under gladiolus + Soya intercropping. The minimum Herbage yield per plot (367.83g) was observed in gladiolus + coriander + fenugreek + soya (Table 1). In case of soya, maximum herbage yield (7.69 / ha) was obtained when it was grown alone followed by under gladiolus + Soya intercropping. The minimum herbage yield (3.68t/ ha) was observed under gladiolus + coriander + fenugreek + soya intercropping. However, maximum herbage yield (9.10t/ ha) was noticed with fenugreek sole followed by gladiolus + fenugreek. The minimum herbage yield (4.36t/ ha) was observed in gladiolus + coriander + fenugreek + soya (Table 1). [Nikam et al. \(1988\)](#) also noticed that in all intercrop treatments, the land-equivalent ratio and grain-equivalent ratio were similar (1.25) when coriander was grown with safflower in a 2:1 ratio (67% : 33%). Different ratios and population levels of the base crop to the intercrop did not show any significant influence on total returns from the system. According to [Singh et al. \(2013a\)](#) ratio between base and intercrop may influence system productivity significantly, however the quantum may be depend upon the nature of produce and market demand. [Gill et al. \(2008\)](#) revealed that an increase in the age of poplar decreased the yield of crops. During 2004-05 the reduction in yield was more in crops like *Mentha arvensis*, *M. spicata*, coriander and *Tagetes minuta*,

Table 2: Intercropping in coriander, fenugreek and soya with gladiolus on plant growth and yield parameters of Gladiolus.

Treatments	Plant height (cm)	Number of shoots per corn of Gladiolus	Number of leaves per plant of Gladiolus	Days to spike initiation	Days to opening of first floret	First floret durability (days)	Spike length (cm)	Rachis length (cm)	Number of florets per spike	Number of opened florets per spike	Number of partially opened florets per spike	Floret size (cm)	Durability of spike (days)	Number of spikes per hectare (lakh)	Number of corns per planted corn	Number of corns per hectare (lakh)	Number of cornlets per plant	Number of cornlets per hectare (lakh)	
Gladiolus sole	89.33	1.57	18.83	68.13	80.17	9.53	78.03	49.27	15.77	13.63	2.13	8.77	1-	1.41	2.10	1.89	20.63	18.57	
Coriander sole	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fenugreek sole	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Soya sole	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gladiolus + Coriander	93.67	1.83	19.30	66.27	77.83	9.87	78.93	50.70	16.43	14.27	2.17	8.97	10.77	1.10	2.20	1.32	22.33	13.40	
Gladiolus + Fenugreek	98.90	2.20	21.45	63.20	73.93	10.97	82.90	54.27	19.17	16.67	2.50	9.93	12.53	1.32	2.47	1.48	24.60	14.76	
Gladiolus + Soya	95.67	2.00	20.07	65.43	76.03	10.35	80.67	52.57	17.53	15.23	2.30	9.43	11.57	1.20	2.27	1.36	23.37	14.02	
Gladiolus + Coriander + Fenugreek + Soya	86.00	1.50	18.37	69.37	81.70	9.10	76.97	48.17	14.60	12.60	2.00	8.50	9.13	0.45	2.07	0.62	20.50	6.15	
F- test	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
S.Ed. (\pm)	1.49	0.08	0.21	0.54	0.83	0.20	0.47	0.66	0.50	0.44	0.13	0.13	0.36	0.03	0.04	0.03	0.44	0.28	
CD (P = 0.05)	3.19	0.17	0.46	1.16	1.78	0.42	1.01	1.42	1.08	0.94	0.28	0.27	0.78	0.07	0.08	0.06	0.95	0.59	

but was less in lemongrass, turmeric, fennel (6.8%), dillseed, fenugreek, *sarson* and wheat. Seed yield of fenugreek was significantly decreased by intercropping, and was lowest in the 2:2 row arrangements in both harvest years. Yield was not significantly affected by safflower cultivar, although the cultivar x intercropping pattern interaction was significant. Growth and yield component data are tabulated.

Perusal of data presented in table 2 revealed that Gladiolus sole crop attend height of 89.33 cm, however it was notice that contrary to intercrops it attains more height than sole and it was maximum (98.90cm) when with fenugreek followed by (95.67cm) under soya intercropping. Number of shoots per corm of Gladiolus was maximum (2.2) under gladiolus + fenugreek intercropping. Similarly number of leaves per plant of gladiolus also recorded higher under intercropping as compare to sole cropping. Other parameters understudies were also influenced significantly by the intercrops (Table 2). Number of spikes (Lakh/ha) were recorded highest (1.41) under sole cropping whereas under intercropping it was maximum (1.32) with fenugreek, corresponding lowest (0.45) spike was recorded when gladiolus was taken with all intercrop components *i.e.* coriander, fenugreek and soya.

It is concluded that sole cropping of coriander, fenugreek and soya not only gave best seed germination but also produced taller plant, more leaves and branches per plant, leading to higher herbage yield as compare to intercropping. Contrary to test intercrop *i.e.* coriander, fenugreek and soya, main crop *i.e.* gladiolus performances were improved under intercropping as compare to sole cropping.

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