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Effect of different planting patterns and fertilizer levels on production potential of maize [*Zea mays* L.] and green gram (V*igna radiata* L.)

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Sweet corn *(Zea mays L*) is one of the most important cereals, which ranks fifth in India for production. Maize is grown in 6.5 million ha in India and 45 per cent of the total production is consumed as food. It is used as food, feed and forage as well as in industry. India is the homeland of grain legumes including pulses which play vital role in cereal based Indian diet. Green gram (*Vigna radiata* L.) locally known as '*Moong*' in India covering an area of 3.1 million hectares with a total production of 1.1 million tonnes with the average of 425 ha^{-1} (Anon., 2004). Intercropping has been recognised as a beneficial system of crop production and is one of the potent means of better utilization of resources and higher crop production per unit time and area, which can provide substantial yield advantages compared to sole cropping. These advantages may be specially important because they are achieved not by means of costly inputs, but by the simple expedient of growing crop together (Willey, 1979). In new system, the modification of planting geometry may helps in accommodating the companion crop. By adopting the appropriate planting pattern the total productivity can be enhanced.

The field experiment was conducted during summer season of 2007 at the College of Agriculture, Navsari, Gujarat. The soil of the experimental field was clayey in texture, low in nitrogen (201 ha^{-1}), medium in available phosphorus (30.52 ha^{-1}) and fairly rich in available potassium (352 ha^{-1}) with pH (7.8). Nine treatment combinations consisting of three planting pattern and various nitrogen levels T_1: Sole sweet corn uniform row of 60 cm (control), T_2: Sole green gram uniform row of 30 cm (control), T_3: Paired row normal planting (control), T_4: Sweet corn + green gram (1:1) uniform in row of 60 cm (75 % RFD of N in sweet corn), T_5: Sweet corn + green gram (1:1) uniform in row of 60 cm (100 % RFD of N in sweet corn), T_6: Sweet corn + green gram (1:1) uniform in row of 60 cm (125 % RFD of N in sweet corn), T_7: Sweet corn + green gram (2:2) in paired row of 45/90 cm (75 % RFD of N in sweet corn), T_8: Sweet corn + green gram (2:2) in paired row of 45/90 cm (100 % RFD of N in sweet corn) T_9: Sweet corn + green gram (2:2) in paired row of 45/90 cm (125 % RFD of N in sweet corn) were evaluated in randomized block design with four replications. The varieties *Madhuri* and GM-4 respectively for sweet corn and green gram were sown on last week of Feb, 2007. The seed rate under sole cropping was maintained at 20 and 12 ha^{-1} respectively for maize and green gram.

Table 1: Cob/ grain and fodder yields and harvest index in sweet corn and green gram as influenced by planting pattern and fertility levels

Treatments	Yield (q.ha^{-1})		HI (%)	Yield (q.ha^{-1})		HI (%)
	Cob	Fodder		Grain	Fodder	
T_1	68.48	133.56	33.89	-	-	-
T_2	-	-	-	9.68	23.91	28.82
T_3	51.48	103.30	33.26	3.31	8.74	27.47
T_4	62.89	121.77	34.05	3.90	9.21	29.76
T_5	65.15	129.74	33.43	4.38	10.01	30.44
T_6	63.37	126.27	33.42	4.07	9.86	29.23
T_7	62.38	126.55	33.01	3.97	9.81	28.81
T_8	68.92	132.24	34.26	4.46	10.06	30.69
T_9	66.37	129.34	33.91	4.08	9.89	29.19
S.Em.(+)	**0.59**	**0.74**	**0.26**	**0.11**	**0.18**	**0.65**
LSD(0.05)	**1.74**	**2.19**	**0.77**	**0.33**	**0.53**	**NS**
C.V.%	**1.87**	**1.19**	**1.56**	**4.76**	**3.21**	**4.49**

HI: Harvest Index

Treatments of planting pattern and fertility levels significantly influenced the yield of maize and green gram (Table 1). The treatment T_8 (maize + green gram (2:2) in paired row of 45/90 cm (100 % RFD of N in sweet corn) recorded significantly the highest cob yield (68.92 q ha^{-1}) however, it was statistically at par with T_1. Treatment T_3 (row normal planting) (control) recorded significantly the lowest cob yield (51.48 q ha^{-1}) of sweet corn. The treatment T_8 and T_1 increased the cob yield by 33.87 and 33.02 per cent respectively, over T_3. Similar results were also reported by Sharma (1995), Akhtar and Silva (1999) and Shivran and Rana (2003).

The highest fodder yield (133.56 q ha^{-1}) was obtained under treatment T_1 (sweet corn uniform row of 60 cm) (control) but found at par with T_8. Significantly the lowest fodder yield (103.30 q ha^{-1}) was recorded with T_3 (paired row normal planting) (control). The treatment T_1 and T_8

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increased the fodder yield by 29.29 and 28.01 per cent, respectively, over T_3. Similar results were also reported by Arya and Saini (1989) and Sharma (1995).

The treatment T_8 (corn + green gram (2:2) in paired row of 45/90 cm) (100 % RFD of N in sweet corn) recorded maximum harvest index, however, it was found *at par* with T_4, T_9 and T_1. The lowest value was observed under treatment T_7 (corn + green gram (2:2) in paired row of 45/90 cm) (75 % RFD of N in sweet corn) being *at par* with T_3, T_6 and T_5. Similar results were also reported by Padhi and Panigrahi (2006), The results are contradictory with findings of Dhingra *et al*. (1991).

The treatment T_2 (green gram uniform row of 30 cm) (control) recorded significantly the higher grain yield (9.68 q ha^{-1}) compared to other treatments. Treatment of paired row normal planting (control) (T_3), recorded significantly the lowest grain yield (3.31 q ha^{-1}) of green gram indicating yield reduction due to normal planting pattern.

Table 2: Economics of different intercropping systems

Treat-ments	Gross return (₹. ha^{-1})	Cost of cultivation (₹. ha^{-1})	Net return (₹. ha^{-1})	BCR
T_1	68140	12679	55461	5.37
T_2	21751	9155	12596	2.37
T_3	59008	12299	46709	4.79
T_4	71210	13693	57517	5.20
T_5	74855	14126	60729	5.29
T_6	72449	14459	57990	5.01
T_7	71480	13558	57922	5.27
T_8	78286	13891	64395	5.63
T_9	75171	14224	60947	5.28

Treatment receiving T_2 (green gram uniform row of 30 cm) (control) produced the highest fodder yield (23.91 q ha^{-1}). Treatment T_3 (row normal planting) (control) recorded the lowest fodder yield (8.74 q ha^{-1}) of green gram being at par with T_4, indicating yield reduction due to normal planting pattern. These results confirmed the findings of Singh and Kaushik (1987), Padhi *et al*. (2001) with respect to grain and fodder yields.

The data showed that the differences in harvest index of green gram due to planting pattern and fertility levels were non-significant.

The data on economics of different planting pattern and fertility levels of sweet corn and green gram clearly indicated that T_8 (Sweet corn + green gram (2:2) in paired row of 45/90 cm) (100 % RFD of N in sweet corn) secured maximum net realization of Rs. 64395 ha^{-1} with BCR of 5.63, followed by Rs. 60947 ha^{-1} with BCR of 5.28 in T_9 (Sweet corn + green gram (2:2) in paired row of 45/90 cm) (125 % RFD of N in sweet corn). These results are in conformity with those reported by Padhi (2001) and Ghosh and Singh (1996).

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