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Studies on residual effect of maize-lucerne intercropping on succeeding Bengalgram

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ABSTRACT

Significantly higher grain and stover yield of succeeding Bengalgram crop were recorded after maize (90 cm × 20 cm) + lucerne (green manuring) at 1:2 row proportion (12.51 and 14.76 q/ha, respectively) compared to rest of the treatments except Lucerne green manuring treatments with which it was at par. Higher amount of available soil nitrogen (249.17 kg/ha) was found after harvest of Bengalgram in preceding treatment of maize + lucerne (green manuring) at 1:2 row proportion over initial status of soil. Whereas, marked depletion with regard to available soil phosphorus and potassium after harvest of Bengalgram were noticed over initial status of soil due to intercropping system. Significantly higher net returns (Rs. 21133/ha) and benefit:cost ratio (4.29) of Bengalgram were realized after maize (90 cm × 20 cm) + lucerne (green manuring) at 1:2 row proportion compared to rest of the treatments except lucerne green manuring treatment.

Key words : Intercropping, Green manure, Row proportion, Bengalgram, Miaze-lucerne

INTRODUCTION

Legumes intercropping are known to improve soil fertility and supply part of nutrient requirement of associated intercrops or sequences crops. Leguminous plants produce large quantity of biomass which after *in situ* incorporation slowly release the nutrients depending on the C:N ratio of incorporated green manure. Hence, crops grown in sequence are going to be benefited due to rice based cropping system but are very meager in other arable or field crops and cropping systems. Hence, present field study was conducted to know the residual effect of maize + lucerne intercropping on succeeding Bengalgram.

MATERIALS AND METHODS

A field experiment was conducted during *Kharif* and *Rabi* seasons of 2006-07 to study the residual effect of maize-lucerne intercropping on succeeding Bengalgram at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad under rainfed condition. The soil of the experimental site was medium deep vertisol having pH of 7.6. Soil before initiation of experiment was found to contain 228, 34.20 and 339.30 kg per ha of available N, P_2O_5 and K_2O, respectively. The rainfall during the year of experimentation (2006-07) was 870.2 mm, which was 14.58 per cent more than the average of the past 56 years.

The *Kharif* treatments included eight treatment combinations consisting two plant geometries of maize (90 cm × 20 cm and 90 cm/30 cm × 30 cm) and two maize-lucerne row proportions (1:1 and 1:2) with lucerne either for green manuring or for forage. In addition, there were three sole maize treatments with different plant geometries. The experiment was laid out in Randomized Complete Block Design with three replications and a plot size of 7.2 m × 3.6 m. In same experimental site after harvest of *Kharif* maize, the Bengalgram variety Annigeri-1 was sown during *Rabi* season without application of any fertilizers to know the residual effect of maize-lucerne intercropping on succeeding Bengalgram.

RESULTS AND DISCUSSION

The experimental data (Table 1) indicate that significantly higher total dry matter (21.96 g/plant), number of pods (53/plant), grain weight (12.50 g/plant) and hundred grain weight (24.23 g) of Bengalgram were recorded after maize (90 cm × 20 cm) + lucerne (green manuring) at 1:2 row proportion compared to rest of the treatments except after maize (90 cm × 20 cm) + lucerne (green manuring) at 1:1 row proportion. This can be attributed due to incorporation of higher biomass of lucerne in 1:2 row proportion over 1:1 row proportion. These results agree with the findings of Dasaraddy (1998) and Tiwari *et al.* (2004).

Significantly higher grain yield (12.51 q/ha), stover yield (14.76 q/ha) and harvest index (45.87%) of succeeding Bengalgram crop were recorded after maize

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(90 cm × 20 cm) + lucerne (green manuring) at 1:2 row proportion compared to rest of the treatments except lucerne green manuring treatments with which it was at par (Table 1). Significantly higher seed yield of Bengalgram in lucerne green manured plots could be attributed to better expression of yield components. The findings are in conformity with the results reported by Balyan and Seth (1989), who observed higher grain yield of wheat grown after maize + cowpea (green manuring). Similar results have been reported by Dasaraddy (1998), Tiwari *et al.* (2004), Jamwal (2005) and Yadav *et al.* (2005).

The higher grain and stover yield of Bengalgram in lucerne green manured treatments could also be attributed to higher soil moisture content. The lucerne green manuring helped to conserve soil moisture by acting as surface mulch after incorporation and increased infiltration rate of soil considerably, besides making the soil richer in organic nitrogen. Thus, there was increased yield of Bengalgram. The results agree with the findings of Gumaste (1981) and Balyan (1997).

Significantly higher net returns (Rs. 21133/ha) and benefit:cost ratio (4.29) of Bengalgram were realized after maize (90 cm × 20 cm) + lucerne (green manuring) at 1:2 row proportion compared to rest of the treatments except lucerne green manured treatments (Table 1). This can be attributed to higher gross income as result of higher yield of Bengalgram. Similar results were also reported by Jamwal (2005).

Higher amount of available soil nitrogen (249.17 kg/ha) was found after harvest of Bengalgram in preceding treatment of maize + lucerne (green manuring) at 1:2 row proportion over initial status of soil. Whereas, marked depletion with regard to available soil phosphorus and potassium after harvest Bengalgram were noticed over initial status of soil (Table 2). The higher amount of available soil nitrogen is attributed to symbiotic fixation of atmospheric nitrogen by root nodules of both lucerne

Table 1 : Total dry matter per plant (g), number of pods per plant, grain weight per plant (g),100-grain weight (g) yield and economics of Bengalgram as influenced by residual effect of maize-lucerne intercropping

Treatments	Total dry matter per plant (g)	Number of pods per plant	Grain weight per plant (g)	100-grain weight (g)	Grain yield (q/ha)	Stover (q/ha)	Harvest index	Net returns (Rs./ha)	B:C ratio
T_1: Paired row sole maize (90cm/30cmx30cm)	15.18	34.00	6.12	20.20	7.73	9.88	43.88	11225	2.28
T_2 : Sole maize (90 cm x 20 cm)	15.62	35.00	6.53	20.61	7.97	10.12	44.06	11728	2.38
T_3 : Sole maize (60 cm x 30 cm)	16.32	37.00	7.09	21.15	8.57	10.72	44.43	12971	2.63
T_4 : T_1+ lucerne (2:1),lucerne for fodder purpose	17.11	40.00	8.11	21.79	8.80	10.95	44.55	13233	2.69
T_5 : T_1+lucerne (2:2), lucerne for fodder purpose	17.34	41.00	8.23	21.75	8.84	11.02	44.51	13538	2.75
T_6 : T_2+lucerne (1:1), lucerne for fodder purpose	17.95	42.00	8.84	22.28	9.26	11.44	44.73	14401	2.93
T_7 : T_2+lucerne (1:2), lucerne for fodder purpose	18.23	43.00	9.11	22.33	9.39	11.57	44.79	14663	2.98
T_8 :T_1+lucerne (2:1), lucerne for green manuring	19.72	45.00	10.24	23.46	11.18	13.38	45.17	18370	3.73
T_9 : T_1+lucerne (2:2),lucerne for green manuring	20.02	47.00	10.45	22.78	11.51	13.71	45.63	19053	3.87
T_{10} :T_2+lucerne (1:1),lucerne for green manuring	20.72	49.00	11.08	23.31	12.05	14.27	45.78	20186	4.10
T_{11} :T_2+lucerne (1:2),lucerne for green manuring	21.96	53.00	12.50	24.23	12.51	14.76	45.87	21133	4.29
S.E.±	0.50	2.59	0.64	0.37	0.49	0.55	0.28	780	0.18
C.D. (P=0.05)	1.48	7.64	1.89	1.11	1.46	1.64	0.84	2301	0.55

DAS – Days after sowing

Table 2 : Available soil N, P_2O_5 and K_2O (kg/ha) after harvest of Bengalgram as influenced by residual effect of maize-lucerne intercropping

Treatments	Nitrogen (kg/ha)	Phosphorus (kg/ha)	Potassium (kg/ha)
T_1 : Paired row sole maize (90 cm/30 cm x 30 cm)	223.01	26.96	327.78
T_2 : Sole maize (90 cm x 20 cm)	225.70	27.15	329.35
T_3 : Sole maize (60 cm x 30 cm)	226.16	28.06	328.49
T_4 : T_1 + lucerne (2:1), lucerne for fodder purpose	236.54	25.05	322.88
T_5 : T_1 + lucerne (2:2), lucerne for fodder purpose	237.62	23.99	321.34
T_6 : T_2 + lucerne (1:1), lucerne for fodder purpose	236.14	26.37	323.32
T_7 : T_2 + lucerne (1:2), lucerne for fodder purpose	238.15	25.97	322.34
T_8 : T_1 + lucerne (2:1), lucerne for green manuring	243.17	29.03	324.05
T_9 : T_1 + lucerne (2:2), lucerne for green manuring	246.72	29.59	324.92
T_{10} : T_2 + lucerne (1:1), lucerne for green manuring	247.12	29.98	325.09
T_{11} : T_2 + lucerne (1:2), lucerne for green manuring	249.17	31.11	325.66
S.E.±	4.68	1.42	1.47
C.D. (P=0.05)	13.80	4.21	4.35

DAS – Days after sowing

and Bengalgram. In addition to incorporation of organic matter by lucerne. The results agree with the findings of Das and Mathur (1980), Shashidhar (1986), Dasaraddy (1998) and Tiwari *et al.* (2004). Whereas, lower amount of available phosphorus and potassium in soil. It is because of legume crops required more amount of P and K for their growth and development. Similar results were also reported by Padhi and Panigrahi (2006), who observed intercropping of legumes with maize resulted in significantly increased available soil nitrogen content and decreased available soil P and K content compared to initial status of soil.

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