

Performance of Maize in Intercropping System with Soybean under Different Planting Patterns and Nitrogen Levels

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Abstract: To study the performance of maize in intercropping system with soybean under different planting patterns and nitrogen levels an experiment was carried out at student's experimental farm, Sindh Agriculture University Tandojam during kharif season 1990. The results indicated that plant height, number of leaves per plant, 1000 grain weight of maize increased with an increase in nitrogen levels. Maximum grain yield of 1692 kg ha⁻¹ was recorded from highest dose (120 kg N ha⁻¹). Intercropping of soybean in maize rows did not show any adverse effect on maize plant height, number of leaves, 1000 grain weight as well as grain yield of maize. However, maize under mono- culture recorded greater grain yield ha⁻¹. The results further revealed that Soybean planted alone gave better performance in respect of seed yield ha⁻¹ and yield contributing parameters. While seed yield and other yield contributing parameters of soybean were significantly affected in intercrop treatments due to competition with main crop.

Key words: Maize, intercropping system, soybean, nitrogen level

INTRODUCTION

Maize (*Zea mays* L.) is a valuable food grain and high substitute of corn oil in the world. It has versatile usages in human food over tropical sub-tropical regions^[1].

Intercropping is a wise pre time management for increasing potentiality of soil and production per unit area as well as income. Intercropping system is more productive than the sole crop^[2], especially under adverse conditions^[3]. Intercropping advantages are substantial and are achieved by the simple experiment of growing crops together^[4]. Legumes which fix atmospheric nitrogen besides meeting their own N requirements, serves as a viable via media for soil enrichment. This eventually helps in meeting the N needs of cereals partially^[5]. Singh and Chand^[6] reported that maize gave grain yield of 2.15 t ha⁻¹ when intercropped with soybean, which gave an additional yield of 0.58 t ha⁻¹. Net profit of 120 kg N ha⁻¹ was higher in maize/soybean mixture than in maize alone. In general beneficial effect of legumes intercropped with cereals like maize has been observed under low fertility conditions^[7,8]. Willey *et al.*^[9] concluded that legume/non legume intercropping systems gave higher yields than mon-culture due to efficient utilization of resources over time. Khan^[10] reported that different maize- summer legumes intercropping systems did not affect plant population per unit area of maize crop significantly. Singh *et al.*^[11], Pandey *et al.*^[12] and Kalra and Ganger^[13] reported

an increase in maize yield and net profit when grown in association with soybean. In plains of Punjab, soybean or black gram increased maize yield by 2000-4000 Kg ha⁻¹ when grown in association^[14]. The multiplicity of possible plant combinations and the interaction in the crop mixtures have complicated the effective intercropping system. However, for a given set of combinations with in a specific system, a method of arranging two crops for maximum yield benefits could be formulated. Thus the present study was designed to develop such a method, using maize/soybean combinations under different planting patterns and N levels and to observe changes in yield and yield components of intercrops.

MATERIALS AND METHOD

To evaluate the performance of maize intercropped with soybean under different cropping patterns and nitrogen levels an experiment was carried out at student's farm, Sindh Agriculture University, Tandojam during kharif season 1990. The experiment was laid out under Randomized Complete Block Design with eight treatments and four replications. The ultimate plot size was 4x3.6 m. Nitrogen levels were 0, 60, 90 and 120 kg N ha⁻¹ and the intercropped treatments were maize alone, paired rows of maize at 40 cm + soybean, triple rows of maize at 90 cm + soybean. Seed bed was prepared by giving two dry ploughings with disc and gobble plough each followed

by clod crushing. The land was leveled to facilitate uniform irrigation etc. The sowing was done by the mean of single coulter hand drill on February, 1990. Uniform application of recommended fertilizer dose was made. All the cultural and insect pest control measures were carried out as and when required. For the record of various observations five plants were selected at random from each treatment and labeled. Data so collected were subjected to statistical analysis^[15].

RESULTS AND DISCUSSION

Maize-soybean intercropping

Plant height: Table 1 indicates that nitrogen treatments exhibited significant effect on maize plant height. Highest nitrogen levels of 120 kg ha⁻¹ recorded maximum plant height of 212.00 cm in pure stand followed by 209.50 and 209.25 cm in triple row arrangements and pure stand planting, respectively. However, maize in pure stand gave comparatively greater plant height than inter cropped treatments. Plant height under different intercropped treatments showed non-significant differences. The plant height under treatment I₂ (paired) and I₃ (triple) was 185.84 and 187.24 cm, respectively. However, maize gave greater plant height (196.34 cm) in pure stand (Table 2). Interactions of nitrogen levels x intercrop (F x I) treatments were non-significant. Similar results were reported by Ahmed^[16] and Nizamani^[17].

Number of leaves per plant: The results indicated that nitrogen levels significantly affected numbers of leaves maize per plant. At highest nitrogen dose (120 kg N ha⁻¹) maximum number of leaves (11.80) per plant was recorded in paired row arrangement followed by 11.70 and 11.65 leaves per plant in pure stand and triple row planting,

respectively (Table 1). The number of leaves per plant was not significantly affected under intercropped treatments (Table 2). The interaction of FxI was all not significant statistically. Similar results were reported by Herbert *et al.*^[18].

Number of cobs per plant: Table 1 reveals that the number of cobs per plant of maize was not significantly affected by nitrogen levels as well as by intercropping treatments. The results further indicated that maize planted alone gave significantly greater (1.0) number of cobs per plant in all nitrogen treatments as compared to maize intercropped with soybean (0.95). The differences however, were statistically non significant. Application of nitrogen at higher level F₂ (90 kg N ha⁻¹) and F₃ (120 kg N ha⁻¹) in different planting patterns gave slightly greater number of cobs per plant as compared to lower nitrogen levels.

1000 grain weight of maize: The data present in the succeeding Table 1 revealed that nitrogen levels exhibited highly significant effect on 1000 grain weight in all planting patterns. All nitrogen treatments in different planting patterns gave significantly greater 1000 grain weight as compared to no fertilizer (Control) treatment. Increase in nitrogen level resulted in correspondence increase in 1000 grain weight. Maize 1000 grain weight was not significantly affected by intercropped treatments (Table 2). The interactions (F x I) were all non-significant statistically. Similar results were reported by Kalra and Ganger^[13] and Nair *et al.*^[7].

Grain yield (Kg ha⁻¹): Table 1 revealed that nitrogen levels exhibited highly significant effect on grain yield of maize. Highest nitrogen levels of 120 kg ha⁻¹ recorded

Table 1: Mean grain yield and yield components of maize intercropped with soybean under different planting patterns and nitrogen levels

Incropping Systems	Fertilizer N kg ha ⁻¹	Plant height (cm)	Number of leaves per plant	Number of cobs per plant	1000 weight	Yield (Kg ha ⁻¹)
Mize alone	0 (Control)	166.50	10.30	1.00	233.75	1129.25
Mize alone	60	197.62	10.65	1.00	238.50	1434.50
Mize alone	90	209.25	11.30	1.00	240.75	1490.25
Mize alone	120	212.00	11.70	1.01	251.00	1694.25
Paired row	0 (Control)	149.87	10.65	0.95	234.00	1021.75
Paired row	60	189.00	10.70	0.98	237.25	1423.50
Paired row	90	200.00	11.25	1.00	244.75	1492.25
Paired row	120	204.50	11.80	1.00	250.00	1694.75
Triple row	0 (Control)	152.62	10.65	0.95	233.75	1075.50
Triple row	60	186.50	10.75	0.96	237.75	1423.75
Triple row	90	200.37	11.25	1.00	246.50	1490.00
Triple row	120	209.50	11.65	1.00	250.75	1687.50
Significant		*	*	NS	**	**
CV%		3.08	0.99	-	1.83	39.02
Cd-1		3.52	0.14	-	2.54	3725.68
Cd-2		4.75	0.19	-	3.55	9851.77
Interaction (F x I)		NS	NS	NS	NS	NS

*Significant

**Highly significant

NS. Non-significant

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Sole soybean, sole maize and the intercrop of soybean and maize constituted the treatments, which were laid out in a randomized complete block design with four replications. Intercropping produced taller soybean plants than that obtained from monocropped soybean (Table 1). The competition for light from the greater population of plants in intercropping might have induced taller soybean plants. International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria, pp Muneer, A.P., Fida, H.M., Mumtaz, A.K., Muhammad, I.S., Performance of maize in intercropping system with soybean under different patterns and nitrogen levels. *J. Appl. Sci.* 4(2), Olufajo, O.O., Response of soybean to intercropping with maize in a sub-humid tropical environment. Key Words: Sorghum, COWPEAS, Intercropping, cropping systems, Growth parameters. Performance of forage sorghum intercropped with forage legumes under different planting patterns. *Pakistan Journal of Botany* 39(2), 431-439. Alhaji IH. 2008. Yield performance of some varieties under sole and intercropping with maize at Bauchi, Nigeria. *African Research Review* 2(3), 278-291. Aliyu BS, Emechebe AM. Yield response to plant density of maize and sunflower intercropped with soybean. *Field Crops Research*, 121(3), 423-429. <https://doi.org/10.1016/j.fcr.2011.01.011>. Fujita K, Ofosu-Budu KG, Ogata S. 1992. Biological nitrogen fixation in mixed legume-cereal cropping systems. *Plant and Soil* 141(1-2), 155-176. <https://doi.org/10.1007/BF00011315>. Different patterns of maize and faba bean intercropping had significant effect on the grain yield of maize (Table1). In this regard the highest yield (1366 gm⁻²) was seen in the sole culture pattern and the lowest one (278.9 gm⁻²) was observed in 1:3 strip intercropping pattern (Table 2). Higher yield of maize in sole culture compared to its intercropping with faba bean is normally because of the higher number of maize bushes. (2000) the number of soybean pod per plant in intercropping with maize decreased compared to the sole culture. Also Getachew et al. Evaluation of crop yield African Yam bean, Maize and Kenaf under intercropping system. *American-Eurasian Journal of Agricultural & Environmental Science*. 2: 99-102.