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Green Fodder Yield and Land Equivalent Ratio of Sorghum-Legume Association

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Abstract: The experiment consisted of two sorghum based inter-cropping system i.e. sorghum + guara and sorghum + cowpea in 1-row, 2-row and 3-row strips including sole cropping of all the component crops. Total fodder yield and mean land equivalent ratio (LER) was fairly high in all inter-cropping treatments but the highest LER 1.89 was recorded for sorghum-cowpea 3-rows inter-cropping system. This showed that 70-89 percent yield advantage was gained due to inter-cropping. However, maximum fodder yield of sorghum was obtained after three months of sowing from all the inter-cropped treatments.

Key words: Green fodder, land equivalent ratio, sorghuki-legum

Introduction

The available fodder production is approximately 52-54 percent less than actual requirement (Bhatti, 1988). Moreover, with the rapid increase in farm population, and limited land for cultivation, inter-cropping is being looked upon as an excellent strategy for increasing productivity per unit area and intensifying land use. Inter-cropping has long been practiced in tropical countries and its popularity all over the world is increasing because of its sound advantages. Cordero and McCollum (1979) reported that land equivalent ratio from 1.2 to 11.4 from inter-cropping maize and soybean. To utilize the land effectively and increase green fodder yield and improve the nutritive worth of sorghum fodder. Its inter-cropping and multiple cropping with legumes seems to have a great promise. It also reduces the chemical fertilizer requirements. With these objectives investigations were carried out to find the best sorghum-legume inter-cropping systems for high fodder yield from legume-cereal mixture.

Materials and Methods

The experiment was conducted at Faculty of Agriculture, Gomal University, D.I.Khan during 1993. The experiment was laid out in split plot design with four replication. The sub-plot size 3.20×6 m^2. The sorghum variety "Giza-3" and local varieties of guara and cowpea were studied. The date of harvesting were the main plots, whereas the sole/inter-crops were arranged in the sub-plot. The dates of harvesting were as under:

D_1	23-07-93	D_2	06-08-93
D_3	22-08-93	D_4	03-09-93
D_5	17-09-93	D_6	02-10-93

The sole/inter-crops included in the trial were as under:

T_1	Sole sorghum single row
T_2	Sole sorghum two row strips
T_3	Sorghum two row strips + guara one row
T_4	Sorghum two row strips + guara two rows
T_5	Sorghum two row strips + guara three rows
T_6	Sorghum two row strips + cowpea one row
T_7	Sorghum two row strips + cowpea two rows
T_8	Sorghum two row strips + cowpea three rows
T_9	Sole guara
T_{10}	Sole cowpea

Conventional planting in rows 40 cm apart as control was maintained for inter-cropping, sorghum was sown in 2-rows strips 20 cm apart with gapes of 60 cm between strips (20/20 cm) for fodder. The usual seed rate of sorghum (25 kg/ha) for fodder was used. The recommended seed rate of guara, cowpeas was used for sole and as well as for inter-crops. Total number of rows in each sole plot of guara, cowpea were 8 and row to row distance was 40 cm. A basal dose of 50 kg P_2O_5 and 70 kg nitrogen/ha was applied. Half of nitrogen was mixed with soil before sowing and remaining half was applied at first irrigation. The data was analysed by using analysis of variance technique and Duncan's multiple range test at 5 and 1 percent level of significance to test the treatments differences (Steel and Torrie, 1980).

Results and Discussion

Total fodder production efficiency: The results showed that total fodder yield of sorghum + inter-crops were significantly influenced by inter-cropping systems dates and their interaction (Table 1). The 2-row sorghum + 3-row cowpea produced higher total fodder yield as compared to other treatments. Among the dates of harvesting, the last harvest produced higher yield. While the maximum fodder yield was produced by T8 on 17-9-93. The differences in the total fodder yield might be attributed to variable degree of competition between the component crops grown in association with each other by Waghmaref and Singh (1984), Gabra and Sherif (1985), Bhagat *et al.* (1986), Shahani (1990), Rout *et al.* (1990) and Salim (1992).

Land equivalent ratio: The land equivalent ratio was significantly influenced by different inter-cropping as well as their interaction with dates (Table 2). It is evident from the table that LER for different inter-cropping systems and planting patterns ranged between 1.70 to 1.89. This

Table 1: Total fodder production at 15 days interval

Treatment	23-7-93	6-8-93	22-8-93	3-9-93	17-9-93	2-10-93	Mean
T_1	14.60 SU	26.90 PR	42.21 LN	43.31 LN	44.92 LM	44.35 LN	36.04 D
T_2	14.80 SU	28.30 OQ	47.38 LM	48.04 LM	48.44 LM	46.64 LM	38.94 D
T_3	22.58 PS	43.90 LN	67.34 JK	75.05 GJ	85.31 CF	81.72 CG	62.65 BC
T_4	20.73 QT	43.40 LN	67.28 JK	80.07 CG	85.55 CF	87.40 BD	64.07 BC
T_5	23.90 PS	43.80 LN	68.45 1K	81.60 CG	87.13 BE	88.45 BC	65.55 B
T_6	27.63 OR	44.30 LN	70.18 HK	77.82 DH	80.85 CG	77.80 OH	63.10 BC
T_7	26.74 OR	04.20 MN	66.11 JK	77.47 EH	78.30 DH	78.38 DH	61.21 C
T_8	31.67 OP	46.90 LM	66.96 JK	76.78 FI	109.4 A	95.35 B	71.18 A
T_9	09.90 U	12.00 TU	18.50 RU	40.50 MN	44.50 La	62.70 K	31.35 E
T_{10}	20.15 OT	21.30 QT	21.25 QT	34.92 NO	41.25 MN	52.05 L	31.82 E
	21.28 E	35.10 D	53.57 C	63.56 B	70.57 A	71.48 A	

Table 2: Land equivalent ratio of fodder based legume at 15 days interval

Treatment	23-7-93	6-8-93	22-8-93	3-9-93	17-9-93	2-10-93	Mean
T_1	0.98 N	0.95 N	0.89 N	0.89 N	0.93 N	0.97 N	0.93 E
T_2	1.00 N	1.00 N	1.00 N	1.00 N	1.00 N	1.00 N	1.00 E
T_3	1.82 BI	2.02 A	1.89 AF	1.74 DL	1.79 CI	1.72 FL	1.83 AB
T_4	1.55 M	1.89 AF	1.89 AF	1.90 AE	1.81 BI	1.76 DK	1.80 BC
T_5	1.76 DK	1.94 AC	1.92 AD	1.91 AE	1.83 BH	1.80 B1	1.86 AB
T_6	1.64 IM	1.73 EL	1.96 AC	1.81 BI	1.69 GM	1.62 JM	1.74 CD
T_7	1.61 KM	1.69 GM	1.84 BH	1.80 BI	1.68 HM	1.58 LM	1.70 D
T_8	1.88 AF	1.82 BI	1.87 AG	1.79 CJ	1.98 AB	1.98 AB	1.88 A
T_9	1.00 N	1.00 N	1.00 N	1.00 N	1.00N	1.00N	1.00E
T_{10}	1.00 N	1.00 N	1.00 N	1.00 N	1.00N	1.00N	1.00E
	1.42 AB	1.50 A	1.52 A	1.48 AB	1.47 AB	1.44 AB	

Means followed by different letter(s) in each column are significantly different according to Duncan's multiple range test

indicates that there were 70 to 89 percent yield advantage from different inter-cropping treatments sorghum + 3-row cowpea recorded the highest LER of 1.89. This might be due to beneficial behaviour of crops and less competition of both crops for nutrients, light and moisture (Babu *et al.,* 1988; Menezes, 1988; Conniff, 1989; Tripathi, 1989; Rout *et al*., 1990).

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