TARC Note

Yield of Wheat as Affected by the Preceding Cropping of Leucaena

Leucaena leucocephala (Lam.) de Wit has a wide spectrum of potential uses ranging from forage crop to a source of charcoal[4], and appears to be one of the best sources of organic fertilizer in the tropics and sub-tropics[1].

With these reports in view, the field used for a cropping experiment in which leucaena and forage grasses were grown, either singly or in combination, in the preceding 15 months was planted to wheat in order to evaluate the role of leucaena as a source of organic fertilizer in a rotation system.

The trial was conducted on Red-Yellow Podzolic Soil[5] at Ishigaki (24°25′N, 120° 10′E). The long-term annual mean temperature and rainfall are 23.7°C and 2100 mm, respectively.

The treatments employed in the preceding experiment[2] were of a split plot design with three replications: The main plots were concerned with clipping intensity of leucaena, viz., clipping was made when leucaena attained 100, 150, or 200 cm of height, the sub-plots dealt with cropping system, viz., leucaena in single cropping, and Guinea grass or Napir grass either singly or mixed with leucaena, and sub-sub-plots, which measured 4 × 5 m, dealt with inter-row spacing of leucaena, viz.,

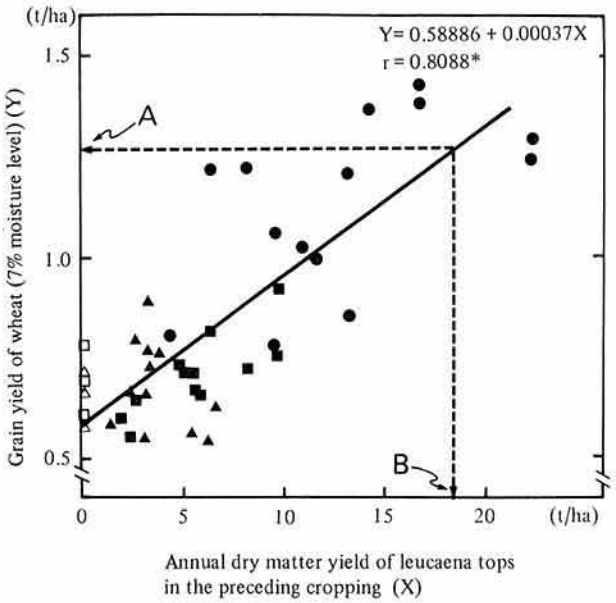

Fig. 1. Grain yields of wheat as related to annual dry matter yields of leucaena in the preceding cropping

A: Grain yield of wheat planted after grasses with 75 kg N/ha

B: Dry matter yield of leucaena which showed residual organic matter equivalent to 75 kg N/ha

Preceding crops: ● Leucaena, ■ Leucaena + Guinea grass, ▲ Leucaena + Napier grass, □ Guinea grass, △ Napier grass

*P=0.05

Table 1. Grain yields of wheat as affected by the preceding cropping patterns of leucaena and forage grasses (t/ha at 6% moisture level)

Crops	Inter-row spacing	Average height of leucaena at the time of clipping		
		100cm	150cm	200cm
Leucaena	15	1.20 (13.32)*	1.28 (22.31)	1.43 (16.75) (t/ha)
	30	1.06 (9.54)	1.25 (22.25)	1.38 (16.71)
	60	1.23 (6.44)	0.99 (11.72)	1.37 (14.24)
	100	0.80 (4.27)	1.02 (10.81)	1.23 (8.23)
Leucaena mixed with Napier grass	15	0.66 (3.15)	0.62 (6.67)	0.54 (6.28)
	30	0.77 (3.44)	0.89 (6.68)	0.55 (5.23)
	60	0.66 (2.35)	0.77 (3.81)	0.73 (3.34)
	100	0.58 (1.50)	0.80 (2.67)	0.54 (3.01)
Leucaena mixed with Guinea grass	15	0.71 (5.42)	0.82 (6.41)	0.92 (9.80)
	30	0.67 (7.83)	0.73 (8.12)	0.75 (9.71)
	60	0.65 (2.61)	0.65 (5.89)	0.71 (5.18)
	100	0.61 (1.94)	0.55 (2.38)	0.73 (4.91)
Napier grass	−N	0.66 (0)	0.70 (0)	0.58 (0)
	+N**	0.90 (0)	1.51 (0)	1.36 (0)
Guinea grass	−N	0.71 (0)	0.61 (0)	0.79 (0)
	+N**	1.33 (0)	1.36 (0)	1.23 (0)

	F−value (grain yield)		
		Theoretical	
	Calculated	5%	1%
Height at clipping	2.23	3.34	5.45
crops	66.24	2.71	4.07
spacings	2.64	2.95	4.57

* Figures in parenthesis represent annual dry matter yield of leucaena in the preceding cropping.
** Nitrogen fertilizer at 75 kg/ha was dressed at planting time of wheat.

15, 30, 60, or 100 cm, except in the sub-plots for single crop of grasses.

The field used for the preceding experiment was ploughed immediately after the final harvest and then roto-tilled. *Triticum aestivum* cv. Saikai 148 was broadcasted at 80 kg/ha in early January 1981, or seven weeks after the final harvest of leucaena. No fertilizer was applied to the field excluding a half area of the sub-plot of single grasses which received N at 75 kg/ha in order to serve estimating relative nutritional effect of residual organic matter of leucaena.

As compared with other report[3], the grain yield of wheat was very low in each plot possibly due to the cultivar used which was not suitable for growing in South-West Islands of Japan.

However, the grain yields obtained in this trial differed significantly with the preceding croppings, but not with the clipping intensities or inter-row spacings of leucaena (Table 1). The grain yield of the plots where single cropping of leucaena was made previously was the highest, followed by the mixed cropping of leucaena with grasses, and the single cropping of grasses in that order.

The grain yield of wheat showed a tendency to increase with lower clipping intensity and higher planting density of leucaena, although not significant statistically as stated above.

The grain yields were highly correlated with the levels of annual dry matter yields of leucaena in the preceding experiment (Fig.

1), suggesting that there exists a significant role of residual organic matter supplied from root systems of leucaena grown in the preceding experiment. Estimated effectiveness of the residual organic matter of leucaena singly cropped at higher planting densities and clipped at 200 cm of plant height was approximately equivalent to the application of 75 kg N/ha or more: The grain yield of the former case was twice as high as the average yield of wheat grown after grasses without N fertilizer application.

Accordingly, the bio-mass of leucaena of the preceding cropping system must have played a key role in increasing grain yield of wheat planted after leucaena.

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