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Intercropping of Pioneer Sorghum with *Lablab purpureus* L. Under Irrigation at Shambat

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Abstract The performance of pioneer (*Sorghum bicolor* X *Sorghum sudanensis* (Piper) Stapf. var. Pioneer) was assessed under three intercropping system with a leguminous crop, Lubia (*Lablab purpureus* L.) viz, broadcast intercropping, alternate row intercropping and alternate hole intercropping. Broadcast intercropping showed the best results (P = 0.05). Number of internodes were significantly higher (P = 0.05) for row intercropping while leaf area index was significantly higher (P = 0.05) for alternate holes. Row planting had the best performance for most biomass characters and quality characters. Alternate holes intercropping was the next best. The importance of intercropping was clearly evident as dry matter percentage was high for all intercropped treatments.

Key words Intercropping, Pioneer sorghum, Legume, Irrigation

Various systems of intercropping are receiving greater interest among researchers in the developing countries. The advantages of growing a mixed stand of crops include reduced levels of diseases and pests, creation of a suitable microclimate, and soil improvement (Osman & Osman 1982, Rao & Willey 1980). Hiebsch and Mc Collum(1987) reported that legume and non legume intercrops may, under some conditions, utilize land area and time more efficiently than when they are grown as monoculture. Greater quantities of nutrients were taken up by intercropping systems than by pure stands (Mason *et al.* 1986) which may be a reflection of greater dry matter production due to better use of light and water.

Pioneer, an interspecific hybrid of sorghum and Sudan grass (*Sorghum bicolor* x *Sorghum sudanensis* (piper) Stapf. var. pioneer), is a recently introduced fodder crop to the Sudan. Cereal forages in general perform well on the saline soils of the Sudan (El Karouri & Mansi 1980). In view of its potential for improved productivity, as also high quality, raising forage crops deserved a test of feasibility by growing two different crops on the same land. Therefore, the yield and the quality of fodder as affected in different intercropping systems and pure stands of pioneer and Lubia (*Lablab purpureus* L.) are reported here.

Materials and Methods

The study was carried out at Shambat College of Agricultural Studies, Sudan. Soil samples were taken at random from different sites at a depth of 0-30 cm. Air dried, 2 mm passed soil analysed following Richard (1954), had pH 8.3, EC 1.6 dS m^{-1}, saturation percentage 55, mechanical composition (sand 33%, silt 22%, clay 45%), total N 0.55 %, P 6.33 ppm. exchangeable cations (Na 20.7, Ca 12.7, Mg 4.1 and K 0.15 cmol $(P^{+})kg^{-1}$.

A field experiment was conducted in 1987 during the period October-December. The experimental design was a randomised complete block with four replications and five treatments of different seeding combination (Table 1) of Pioneer and Lubia. Each plot was 6 x 7 m and consisted of seven ridges, 80 cm apart. Plots were fertilized with urea (43 kg ha^{-1}) and superphosphate (62 kg ha^{-1}) at planting and irrigated weekly to the field capacity.

Measurements began 60 days from sowing (DAS) on the inner four ridges. Plants growing on 1 m length of each of the inner two ridges were selected, cut and weighed fresh and sun dried to constant weight. Height of pioneer plants from the soil surface to the tip of the longest leaf was measured. Number of tillers $plant^{-1}$, stem

Table 1 *Cropping system, sowing method and seeding rate of Pioneer and Lubia*

Treatments	Sowing method	Seeding Rate (kg ha^{-1})	
		Pioneer	Lubia
Monocrop pioneer (MP)	Drilled by hand	40	–
Monocrop Lubia (ML)	Drilled by hand	–	60
Broadcast intercropping (BI)	Broadcast by hand	45	65
Alternate row intercropping (ARI)	Drilled by hand	40	60
Alternate hole intercropping (AHI)	Drilled by hand	40	60

diameter, number of internodes, and leaf area index of pioneer plants were also measured.

The dried samples were ground for laboratory analysis. Total N by the micro-Kjeldhal method, and percentage crude protein was calculated from total N content. Crude fibre, dry matter and ash percentage were also measured.

Results and Discussion

Soil analysis of the site indicated deficiencies in total N and available P. Urea(46% N) and superphosphate (20% P_2O_5) were therefore added at the rate of 43 and 62 kg ha^{-1}, respectively.

The number of internodes were significantly higher for alternate row intercropping (ARI) than for the other treatments (Table 2) while the leaf area index was significantly higher for alternate hole intercropping (AHI). There was a highly significant difference in crude protein percentage between the legume pure stand and other treatments. The other parameters were not significantly affected by the treatments.

Alternate intercropping had the highest fresh weight of plants (3.0 kg plant^{-1}) followed by AHI (2.8 kg plant^{-1}). Alternate intercropping had also the highest number of internodes (8.3). Dry weight of plants was 2.2 kg plant^{-1} for broadcast intercropping (BI) and 2.1 kg plant^{-1} for ARI (Table 2). The height of pioneer was greatest for AHI (155 cm) and was 139 cm for the pure stand crop (Table 2). The highest number of tillers (13.3) were obtained by BI (Table 2). The pure stand of pioneer showed the largest stem diameter. Table 2 also indicates that AHI had the highest leaf area index (251.8).

Per cent crude protein was 9.8 for row intercropping compared to 7.8% for alternate holes intercropping. The same can be said for per cent crude fibre as row intercropping showed the lowest percentage (26.6) compared to pure stand (Table 2). Dry matter percentage was almost the same for all intercrop treatments but it is lowest for the pure stand. The lowest ash percentage was in the alternate hole intercropping. The differences were statistically significant ($P = 0.05$).

The results, thus show that dry matter percentage was almost the same and high for all intercropped treatments and low for pure stand. Nitrogen fixed by legumes in symbiosis with rhizobium bacteria is contributed to succeeding non fixing crops, but it is very difficult to accurately partition this contribution. Beside this, Willey (1985) added that interest in quantifying the productivity of intercropping land is high, but the results have been hampered by lack of satisfactory method for comparing yields.

Table 2 *Effect of cropping system on yield parameters of Pioneer*

Treatments	Fresh weight kg	Dry weight kg	Plant height cm	Number of tillers	Stem diameter cm	Number of internodes	Leaf area index	Crude protein %	Crude fibre %	Dry matter %	Ash %
MP	2.53	1.65	139.3	11.3	4.7	7.6	248.4	9.00	28.3	84.8	9.77
ML	2.59	1.60						19.15	23.6	97.1	13.55
BI	2.67	2.15	128.0	13.3	3.2	7.8	164.3	9.47	26.7	95.8	12.25
ARI	3.01	2.10	135.0	10.3	3.4	8.3	191.6	9.77	26.6	95.9	11.17
AHI	2.78	1.87	155.3	10.5	3.8	7.8	251.8	7.75	27.4	95.1	9.45

Row planting showed the best performance for most biomass characters and quality characters (Table 2). The spaced alternate holes relieve competition which get credence from the fact that the intercropping ranked second to row spacing as it had the highest plant height, the highest leaf area index, and the lowest plant height, the highest leaf area index, and the lowest ash percentage. However, some of the findings were not on the same line of interpretation for no clear reason. The broadicasting intercropping had the highest number of tillers (13.3), and the pure stand had the highest stem diameter (4.7 cm) (Table 2).

The experiment thus proved the importance of intercropping, as most of the intercropped treatments performed better than pure stand. Among the intercropped treatments, those with the least competition effects were better. Row intercropping was found to be the best for both quantity and quality measures.

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