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Performance of Pioneer Sorghum as an Intercrop with Lablab Beans Under Emirates Conditions

Yassin M. Ibrahim

Dept. of Botany, Faculty of Science, University of Qatar,
P.O. Box 2713, Doha, Qatar

ABSTRACT

The performance of Pioneer sorghum (*Sorghum - bicolor* X *Sorghum sudanensis* (Piper) Stamf. Var Pioneer) was assessed under different intercropping systems with a leguminous crop, Lubia (*Lablab pupureus* L.). The yield of Pioneer, expressed as fresh and dry weights, was significantly higher when 25% of sorghum was sown with 75% Lubia, or when the two crops were sown in alternate holes. The same trend was observed for percent crude protein and percent crude fiber.

The experiment showed the importance of intercropping as most of the intercropped treatments were better than the pure stand. Among the intercropped treatments, those with the Least Competition effects were better. 25% sorghum stand or alternate holes intercropping were found to be the best for both biomass and quality measures.

Key Words : Biomass, Intercropping, Leguminous crop, Quality.

INTRODUCTION

Intercropping is a crop management system involving two or more economic species grown together for at least a portion of their respective production cycles and planted sufficiently close to each other so that inter - specific competition occurs. Economic plant species are grown in mixture for many reasons, but the most cited reason for producing food in intercrops is to increase land use efficiency. Land use efficiency in turn, is usually equated with biological efficiency (Hiebsch and McColum, 1987). As Willey (1985) pointed out, however, there may be some practical advantages to intercropping that are not necessarily due to an increase in biological efficiency.

Various systems of intercropping are receiving increasing interest among researchers in the developing countries. There are

several advantages in growing a mixed stand of crops, which include reduced build-up of diseases and pests, creation of microclimate, soil improvement, etc. (Osman and Osman, 1982; Rao and Willey, 1980). Hiebsch and McColum (1987) added that Legume-nonlegume intercrops may, under some conditions, utilize area and time more efficiently than monoculture of their components. Greater quantities of nutrients were removed by intercropping systems than by pure stands (Mason et al., 1986). Another advantage of intercropping system is greater total uptake of nutrients from soil, although this may be a reflection of greater dry matter production due to better use of light or water.

Pioneer sorghum is an interspecific hybrid of sorghum and Sudan grass (*Sorghum bicolor* L. x *Sorghum sudanensis* "Piper Stamf" var. Pioneer). Cereal forages in general, are performing well under saline-arid soils. Preliminary experiments have shown Pioneer sorghum to be superior in resistance and in fodder quality aspects compared to its parents and other species (Bebawi and Mazloum, 1986; Ibrahim, 1996; and Ibrahim et al., 1993b).

The crop was recently introduced to the United Arab Emirates and not much work was done on it. The objective of this research was to evaluate the fodder yield and quality of intercropped Pioneer with Lubia (*Lablab purpeurus* L. Brazilian Variety) in different associations (Planting methods).

MATERIALS AND METHODS

The study was carried out at Al-Oha Faculty Farm, Al-Ain, UAE (Latitude 24° 15', Longtitute 55° 45', and Altitude 301.6 m above sea level) during 1991 and 1992 seasons. The experimental design was a randomized complete block with four replications and five treatments of different seeding combinations (Table 1) of Pioneer and Lubia.

The crops were sown on 15 and 19 March in the respective years with row spacing of 50 cm apart and 20 cm between plants. The field was fertilized with 120 kg N/ha in three equal doses; before planting, after germination, and after the first cut. Superphosphate was added before planting at a rate of 100 kg P_2O_5/ha, while Potassium was added at a rate of 100 kg K_2O/ha before planting and one month later. Plots were irrigated by sprinkler to the field capacity at two-day intervals. Cultural practices were performed as practiced in the area.

Measurements were taken at 50% flowering. Plants were cut for fresh weighing, then dried until a fixed weight was obtained and

weighed again for dry weight. The same samples were dried out and ground for laboratory analysis to determine total nitrogen using the micro-Kjeldhal method. The values of total nitrogen were then used to calculate the percentage crude protein in the forage. Crude fiber percentage was also measured.

Table 1. Cropping systems of Pioneer sorghum with Lubia.

Treatment	Sowing Method
1. 2:2=50% Sorghum and 50% Lubia	2 Seeds of Sorghum and 2 seeds of Lubia per - hole
2. Sorghum and 75% Lubia	1 Seed of Sorghum and 3 seeds of Lubia per hole
3. 3:1=75% Sorghum and 25% Lubia	3 Seeds of Sorghum and 1 seed of Lubia per hole
4. 4:0=100 Sorghum (Pure stand)	4 Seeds of Sorghum per hole (Monocropping)
5. Alternate holes of Sorghum and Lubia	4 Seeds of Sorghum per hole alternating with 4 seeds of Lubia per hole

RESULTS AND DISCUSSION

The fresh weight of Pioneer sorghum was significantly higher when 25% sorghum, or when the two crops were sown in alternate holes. This trend was observed in both seasons for both cuts (Table 2). The second cut was generally better than the first cut, while the yield of 1992 was generally higher than that of 1991. The pure stand of sorghum or 75% sorghum gave the lowest yield for both cuts as indicated in Table 2. The dry weight yield showed the same trend, except that for the second cut of 1992, 50% Sorghum gave the highest yield (5.8 t/ha).

The significantly tallest plants were obtained for the pure stand of sorghum in both seasons for both cuts (Table 2). Generally the second cut was significantly shorter than the first cut in both seasons. The 75% stand of sorghum ranked second for both cuts. As indicated in Table 2, the highest significant tiller number was obtained for the

monocropping, followed by the alternate hole planting. The difference between the two cuts was not consistent in both seasons. Table 2 also showed that number of leaves were significantly higher for the pure stand in both seasons for both cuts. Leaves number were higher in 1991 than 1992 for the first cut, while the number of the second cut was not consistent in both seasons. The general number of leaves was found to be higher for the second cut (Table 2).

Table 2. Yield and quality of Pioneer sorghum intercropped with Lablab beans

Treatment	Year	Fresh weight (t/ha)		Dry weight (t/ha)		Plant height (cm)		Number of Tiller No/Plant		Number of Leaves No/Plant		Crude Portion %		Crude Fiber %	
	-	First cut	Second cut	First cut	Second cut	First cut	Second cut	First cut	Second cut	First cut	Second cut	First cut	Second cut	First cut	Second cut
1	1991	17.3	19.4	3.6	4.1	134.6	129.7	3.4	3.5	38.9	40.2	10.7	11.6	25.6	25.1
2:2	1992	19.3	22.5	4.0	5.8	130.5	126.0	3.3	3.4	38.3	41.3	10.5	11.5	26.1	25.9
2	1991	21.2	20.6	3.7	4.2	134.2	128.7	2.8	3.0	32.6	37.5	11.0	12.4	23.1	23.2
1:3	1992	19.7	21.3	4.1	3.8	129.2	122.8	3.0	2.9	31.8	35.6	10.9	12.1	23.4	23.1
3	1991	16.7	18.8	2.8	3.9	136.0	131.2	4.1	3.9	42.1	42.7	10.8	11.7	25.4	25.2
3:1	1992	18.1	19.2	3.0	4.1	133.0	128.6	3.9	4.1	40.5	41.1	10.8	11.8	27.1	26.7
4	1991	17.5	18.1	3.4	4.0	140.6	135.5	5.8	4.4	58.5	53.7	10.5	11.6	26.9	26.1
4:0	1992	18.2	18.7	4.1	3.9	137.8	131.8	5.4	4.2	55.0	56.4	10.5	11.5	28.1	26.8
5	1991	20.2	21.8	4.0	3.8	125.5	120.1	4.3	4.0	44.6	45.5	10.9	12.3	23.3	23.2
Alternate holes (AH)	1992	21.3	22.3	3.7	4.6	122.9	117.8	3.7	3.9	39.6	41.3	11.6	12.8	24.0	23.4
CD	(0.05	2.0	2.5	0.5	1.2	2.1	2.6	1.2	0.8	9.6	8.1	0.5	0.8	2.2	1.6

As far as Pioneer sorghum quality is concerned, alternate holes or 25% sorghum stand had the best performance in both seasons for both cuts (Table 2). Percent crude protein was higher for both cuts in 1991 than in 1992 except for the alternate hole treatment (11.6%, 12.8% for first and second cuts, respectively). The value was better for the second cut than for the first one (Table 2). The percent crude fiber followed the same trend. However, the percent was lower in 1991 than in 1992 and it was lower for the second cut.

The importance of interceropping was clearly evident from this study. The pure stand of Pioneer sorghum showed the least significant yield and forage quality as shown in Table 2. These findings were supported those obtained by Elmore and Jackobs (1986) who indicated that intercropping Legumes and non-Legumes occasionally results in greater yield of non-legumes than those of monocultures. The results were also in line with Burton et al. (1983) who found that intercropping increased yield, total protein, and percent protein compared to monoculture.

Nitrogen fixed by legumes in symbiosis with *Rhizobium* bacteria is contributing to succeeding non-fixing crops, but it is very difficult to accurately partition this contribution. Elmore and Jackobs (1986) stated that nitrogen transfer between intercropped legumes and non-legumes has not been consistently documented. Willey (1985) added to this difficulty the fact that interest in quantifying the productivity of intercropping land is high, but the results have been hampered by a lack of satisfactory method for comparing yields.

However, the difficulties mentioned here can be minimized by selecting the best method that reduces the competition for nutrients between component species in intercropping systems. Nutrient competition can be minimized in intercropping systems by selecting species with different rooting patterns, different nutrient requirements, different timing of peak demand for nutrient or by proper plant spacing. The best results obtained for this study were for alternate holes or 25% sorghum stand where interspecific competition was reduced. The second cut showed a general better performance than the first cut. This was supported by Ibrahim (1996) and Ibrahim et al. (1993a and b) findings that yield was higher for the second cut. The results were also indirectly supported by Bebawi (1987) who stated that tillering and thickness were more in the second and third cuts of sorghum.

In conclusion, the experiment clearly showed the importance of intercropping, as most of the intercropped treatments were better in performance than pure stand. Among the intercropped treatments, those with the least competition effects were better. 25% sorghum stand and alternate hole cropping were found to be the best for both quantity and quality measures.

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مجلة الإمارات للعلوم الزراعية (١٩٩٦) ٨ :١٣-١٩

تقـيـيم نمو علف الذرة المزروع مع لوبيـا اللابالاب تحت ظروف دولة الإمارات .

يس محمد إبراهيم
قسم النبات - كلية العلوم - جامعة قطر - ص.ب ٢٧١٣ - الدوحة - قطر.

ملخص :

تم تقـيـيم نمو علف الذرة بايونيـر المزروع مع علف اللوبيـا لابالاب بنسب وطرق مـختلفـة . أعطى علف الذرة بايونيـر إنتاجا معنويا أعلى عند زراعـته بنسبـة ٢٥٪ مع ٧٥٪ لوبيـا أو عند زراعتـه في جور متـعـاقبـة مع اللوبيـا ، وقد تلاحظ نفس النتيـجـة بالنسبة للبروتين والألياف الخام .

أثبتت التجربة أهمـية زراعة تحمـيل النجيليـات مع البقوليـات حيث أعطت معظم المعاملات المحملة إنتـاجا أعلى معنويا من زراعة الذرة لوحدها، وعند مقارنة معـاملات التحميل وجد أن المعاملات التي ليس بينها تنافسا كبيرا هي الأفضل حيث أعطت زراعة ٢٥٪ ذرة أو زراعة الجور المتعاقبة أعلى قيمة معنوية من حيث الكمية والنوعية .

كلمات مفتاحية : الإنتاج الكلي ، الزراعة المحملة ، محصول بقولي ، بايونير، النوعية.