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Full Length Research Paper

Intercropping kenaf and cowpea

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Experiment was conducted at Moor Plantation, Ibadan, Nigeria, to assess the compatibility of kenaf with cowpea in kenaf/cowpea mixtures. There were eight treatments. Each treatment was replicated four times in a randomized complete block design. Agronomic assessment indicated that kenaf and cowpea were compatible for intercropping and the land equivalent ratio values ranged from 1.5 – 2.0. Maximum advantage was however derived from intercropping Ifeken 100 kenaf with cowpea (LER = 2.0). In the intercrop treatments, Ifeken 100 also had the maximum fresh and dry weight yields per plant, indicating that it was most suitable as wet and dry season forage for cattle and sheep while its dry form would produce highest cellulose fibre for the pulping industry. Its fibre yield in the intercrop treatment was also the highest. Although Cuba 108 had the highest percentage moisture per plant, it was not significantly different from that of Ifeken 400, indicating that the two varieties could be suitable for only wet season forage production. Therefore, Ifeken 100 is recommended for intercropping with cowpea while Ifeken 400 is only suited for wet season forage.

Key words: Kenaf, cowpea, intercrops, fibre, LER.

INTRODUCTION

Kenaf (*Hibiscus cannabinus* L.) is a member of the malvaceae family and is closely related to okra and cotton. Kenaf is indigenous to Africa and is cultivated in small plots under different local names such as “Rama” in Nigeria, “Teal” in Egypt, “Dah” in most West African countries. It is a source of cellulose fibre for pulp production (Ahlgren et al., 1950; Francois et al., 1992). The world increasing consumption of paper and paper board materials has resulted in gradual diminishing of hardwoods and soft woods, which has inadvertently resulted in global desertification. Therefore, to stem the spread of the desert, and to meet the annual demands for fibre, the practical solution is to shift to the production of annual fibre species such as kenaf. Kenaf is 3-5 times more productive per unit area of land than pulpwood trees and produces a pulp that is equal or superior to any wood pulps (Theisen et al., 1978). It matures for harvest within 120 - 130 days. Paper produced from kenaf has excellent ink-retention characteristics and its high tensile strength is ideal for printing on high-speed press (Robinson, 1988). The stem contains both short and long fibres, both of which can be separately or jointly used for pulp production (Nieschlag et al., 1960). The plant tops have high digestibility and can be used as a source of roughage and protein for cattle and sheep.

In the early sixties, when kenaf was introduced into Nigeria, agronomic studies were conducted only on sole kenaf. But intercropping, rather than monoculture, is the prevailent farming system in developing countries of Africa (Jodha, 1979). The Food and Agriculture Organization (FAO) (1968) has recommended that the agronomic conditions in Nigeria are suitable for kenaf cultivation and that production should be encouraged on small plot basis. Studies on intercropping kenaf with arable crops are rare. Hence the evaluation of kenaf when mixed with cowpea, an important source of protein (23 - 27.0 %) which is commonly cultivated by peasant farmers. Cow-pea can be grown in both early and late seasons. The seeds are consumed by humans while the dry vines and leaves are used as dry season feeds for cattle and sheep in the dry savanna zones. Therefore kenaf evaluation under intercropping system of agriculture will indicate its compatibility with cowpea.

MATERIALS AND METHODS

Improved varieties of kenaf and cowpea were planted at Moor Plantation, Ibadan for two years. The kenaf varieties comprised of Ifeken 100, Ifeken 400 (breeding lines from the Institute of Agricultural Research and Training, Obafemi Awolowo University), Cuba

Table 1. The effects of intercropping on kenaf and cowpea in kenaf cowpea mixtures.

Plant	Kenaf fresh wt at harvest (gm/plant)	Kenaf dry wt at harvest (gm/Plant)	% Moisture in Kenaf at harvest	Kenaf height at harvest (cm)		Kenaf fibre yield (T/ha)		Cowpea yield (Kg/ha) in 2003	Land equivalent ratio
				2005	2006	2006	2006		
Ifeken 100	257.50	53.50	79.22	185.01	191.25	1.85	1.13	-	
Ifeken 400	140.00	28.25	79.82	197.20	218.00	1.97	1.60	-	
Cuba 108	225.00	35.00	84.44	172.26	215.25	1.70	1.43	-	
Local Kenaf	272.50	57.00	79.23	159.03	163.50	1.60	1.40	-	
Cowpea	-	-	-	-	-	-	-	762.94	-
Ifeken 100+Cowpea	265.00	55.25	79.15	169.11	187.00	1.69	1.45	541.51	2.0
Ifeken 400+ Cowpea	223.75	40.00	82.12	144.21	192.25	1.42	1.40	498.49	1.5
Cuba 108+Cowpea	244.00	46.00	81.15	191.11	188.00	1.68	1.23	509.78	1.5
Local Kenaf + Cowpea	123.75	43.25	65.05	141.00	204.75	1.51	1.23	447.98	1.5
SE	3.60	0.86		8.01	6.45	0.08	0.04	12.84	
CV%	9.30	10.49		28.77	20.39	28.70	17.80	10.40	

108 (an introduction from the United States), local kenaf (check) and Ife brown cowpea (a day neutral cowpea variety) and their various intercrop combinations in alternate rows. After ploughing and harrowing, kenaf and cowpea were planted at 50 cm x 20 cm and 60 cm x 30 cm respectively. Gramoxone was applied at the rate of 0.94 kg a.i/ha after planting. Each treatment was replicated four times in a Randomized Complete Block Design (RCBD) during the early and late seasons of each year. Both crops were planted simultaneously and 200 kg/ha of NPK 25-10-10 fertilizer (equivalent to 50 kg N, 20 Kg P2O5 and 20 kg P2O5 per hectare) were applied as band application to kenaf at one week after planting. Two weedings were carried out at seven and eleven weeks after planting. Agronomic data were collected on both crops and analysed using the methods of Steel and Torrie (1980).

Cowpea pods were harvested thrice as they turned brown. Kenaf was harvested by cutting the bottom of the stem at the soil surface level. The succulent top was removed and harvested kenaf plants in each plot were tied with nylon ropes before dipping into a flowing stream for retting. After two weeks, the fibres were separated from the core, rinsed in water and then sun dried before weighing. In the early season, pests consumed cowpea pods before maturity. The effects of intercropping were analysed using the Relative Yield estimates of De-Wit and Van den Bergh (1965).

RESULTS AND DISCUSSION

Of the four varieties of kenaf, local kenaf in the sole crop treatment had the maximum fresh and dry weight yields, followed by Ife-ken 100, which was 5.83 and 7.48%, respectively less than the former (Table 1). Conversely, in the intercrop treatments, Ife-ken 100 had the maximum fresh and dry weight yields whereas the local kenaf had the least fresh weight (123.75 gm/plant). Thus, in intercropping agriculture, Ifeken 100 is the best when kenaf is to be stored in dry form for livestock feed (Hays, 1989; Killinger, 1967; Swinle, 1978). It might also serve as the best source of cellulose fibre for pulp production (Ahlgren et al., 1950; Nieschlag et al., 1960). The moisture regime of kenaf plant is relatively high and ranged, from 65.05% under intercrop situation to 84.44 % in the sole cropping system. It is therefore suggested that relatively high water content of kenaf plant accounts for the high relish for its consumption as forage crop by cattle and sheep as it might slightly reduce their water needs (thirst). Although Cuba 108 had the maximum percentage moisture per plant (84.44%) in sole cropping system, Ifeken 400 had the maximum moisture content (82.12%) in the intercropping system and was not significantly different from the former (P = 0.05).

Intercropping significantly affected kenaf heights in each year (P = 0.05). In the sole cropping system, kenaf height ranged from 159.03 - 197.20 cm but was 141.00 - 191.11 cm in the intercropping system. Thus intercropping cowpea with kenaf resulted in reduction of kenaf height by 28.49 and 14.22% in 2002 and 2003 respectively. Thus, although cowpea crop was lower in height, it still exerted competition stress on kenaf.

Of importance was that intercropping cowpea with kenaf did not have significant effect on fibre yield in both years. Also, although Ifeken 400 produced the highest fibre yield under sole cropping system in each year, Ifeken 100 produced the maximum fibre yield under intercropping system in both years. Thus, of all kenaf varieties tested, Ifeken 100 is most suited for fibre production under kenaf/cowpea mixtures.

Field observations indicated that cowpea intercropping with kenaf is best suited to the late season and kenaf should be planted two weeks before cowpea (relay intercropping). Also, intercropping both crops is highly prone to pest infestation e.g. rats rabbits, hare, squirrel, cane rats and green snakes. All but the last feed on immature and mature cowpea pods especially in the early

season. Hence the inability to report more than one season's yield of cowpea after more than four seasons of experimentation. The highest intercrop yield of cowpea was obtained from the combination of Ifeken 100 + cowpea. This was only 29.02% less than sole cowpea yield. Also, although the LER values indicated advantage in intercropping both crops, the maximum advantage was obtained when Ifeken 100 was intercropped with cowpea.

Conclusion

Both kenaf and cowpea are compatible for intercropping system of farming. Of the four varieties tested, |Ifeken 100 was the most suitable for intercropping agriculture as it produced the maximum fibre yield. Also, its fresh and dry weight yields were the highest, thus making it most useful for forage. In both sole and intercrop treatments, Ifeken 400 had the highest moisture content. Therefore, its cultivation for the wet season forage might quickly fill the stomach compartment of cattle and sheep during the season.

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