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THE EFFECT OF INTERCROPPING SWEET POTATO AND PIGEON PEA ON SOME GROWTH PARAMETERS AND YIELD OF MAIZE

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ABSTRACT

A study on the effect of compatibility of sweet potato, pigeon pea with maize was carried out at the Teaching and Research Farm, University of Ibadan, Nigeria in the growing season of 1991 to 1992. The growth parameters used were height, girth, leaf number, leaf area of maize, % vine coverage of sweet potato, weed biomass and economic yield.

The result showed that sole sweet potato and in association with maize and pigeon pea suppressed weeds significantly compared to the other cropping systems. The economic yields of crops were significantly higher in sole crops than in their mixtures. The LER was highest in a 3crop mixture of 1.67. It was concluded that inter-specific competition among crops was due to better utilization of growth resources in the system.

INTRODUCTION

The commonest practice by peasant farmers in many parts of the tropics, especially in Africa is the growing of two or more crops on the same piece of land simultaneously or in relay such that the period of overlapping of crops is enough to include vegetative phase (Okigbo and Greenland 1976, Gomez and Gomez 1983, Agboola 1989). The association of crops with different growth duration improves the total yield, through better use of space, growth resources in time and space (Leihner 1983).

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With high intensity of cropping and shorter fallow periods, decline in soil fertility occurs. This could be minimized by adopting a cropping system of multi-storey structure that has some capability to control erosion and recycle nutrients in order to sustain land productivity. The use of low growing crops in particular helps to control erosion. Pigeon pea and sweet potato are some of the farmers popular crops. This can be grown in combination in order to maximize land use. However, the compatibility of these crops with a major crop such as maize needs to be properly understood so as to fully appreciate the practability of the mixture. The objective of this study; therefore is to determine the compatibility of maize with sweet potato and pigeon pea.

MATERIALS AND METHODS

This experiment was conducted at the Teaching and Research Farm, University of Ibadan from 1991 to 1992. The experiment was a randomized complete block design with four (4) replicates. Each plot measured 4m x 4m ($16m^2$) with 1m pathway. There are six treatments as follows: 1. Maize 2. Sweet potato 3. Pigeon pea 4. Maize + Pigeon pea 5. Maize + Sweet Potato 6. Maize + Sweet Potato + Pigeon pea. The crop varieties were TZSR maize, ICPL 84060 pigeon pea and TIS/82064 sweet potato. Maize was obtained from Department of Agronomy, University of Ibadan while the others were from the International Institute of Tropical Agriculture (IITA), Ibadan. They were sown on 11 May, 1991 and vacancies supplied two weeks later. All the crops except sweet potato which was planted using vine cuttings of 30cm in length were sown at the rate of four seeds per hill and thinned to three (3) as a result of the spacing in the mixture. Each of the crops were planted at a spacing of 100cm x 100cm, thus the crop population stood at 30,000 seeds per hectare for each sole plot of maize and pigeon pea while sweet potato was 10,000 per hectare.

In the crop mixtures, the crop population were as follows:

	Maize	Pigeon pea	Sweet potato
Sole crops	30,000	30,000	30,000
Maize + pigeon pea	30,000	22,500	
Maize + sweet potato	30,000		7,500
Maize + sweet potato + pigeon pea	30,000	22,500	7,500

Maize height, girth (second internode from soil level) and leaf area were measured from the second week after planting and monitored up to the 8th week. Similar observations were carried out on pigeon pea, hile % vine coverage of sweet potato was assessed within quadrants randomly located within each plot. Within each quadrant, weeds were harvested, dried and weighed. Total weed weight per hectare were further calculated from the mean weight of 3 quadrant samples/plot. Data were also collected from the central part of each plot for economic yield.

RESULT AND DISCUSSION

By the second (2nd) week after planting, maize was tallest in association with sweet potato and pigeon pea, though not significantly so, compared to other mixtures (Table 1).

Table 1: Maize Height in cm influenced by crop combinations.

	MAIZE HEIGHT						
	TIME (Weeks after planting)						
TREATMENT	2	3	4	5	6	7	8
Maize	24.30A	41.00A	65.18A	94.45A	113.29A	147.82A	217.86A
Maize/ sweet potato	24.64A	37.86AB	59.42B	83.31B	99.14B	117.2C	157.67D
Maize pigeon pea	24.27A	36.14B	62.22AB	92.63A	102.77AB	127.69B	168.48C
Maize/ sweet potato pigeon pea	26.14A	40.51A	61.45AB	83.06B	103.20AB	130.74AB	188.30B
Mean	24.84	38.88	62.06	88.36	104.60	130.86	183.08

** *Means followed by the same letter(s) are not significantly different at P 0.05 or. 15 level,*

The better performance of sole maize compared to maize in the mixtures could be attributed to competition among the crops in mixtures for the same growth resources as were available for sole maize. This is in agreement with Lizanga (1980) who observed better growth performance for each crop under sole than in their intercrops. Pigeon pea height (Table 5) did not follow a very consistent trend.

Table 5: Pigeon pea height in cm as influenced by Crop combinations

	.....TIME (Weeks after planting).....									
TREATMENT	2	3	4	5	6	7	8	9	10	11
Pigeon pea	16.99A	21.00AB	29.99B	45.13A	51.48A	59.08AB	65.59B	70.59AB	71.14A	75.55A
Pigeon pea /maize	15.47A	19.03B	30.83B	39.24B	50.12A	55.70B	66.18B	68.21B	71.82A	75.69A
pigeon pea/maize / sweet potato	16.28A	22.70A	35.84A	46.45A	56.49A	61.57A	69.96B	72.68A	75.38A	77.85A
Mean	16.25	20.91	32.22	43.61	52.69	58.78	67.24	70.49	72.78	76.36

The other treatments affected pigeon pea height similarly. Pigeon pea girth (Table 6) was similar among the treatments all through the study period except in week 10, when maize depressed this pigeon pea girth significantly compared to others.

Table 6: Pigeon Pea Girth in cm^2 as influenced by Crop combinations

.....TIME (Weeks after planting).....

TREATMENT	2	3	4	5	6	7	8	9	10	11
Pigeon pea	0.52A	1.26A	11.31A	1.33A	1.62A	1.82A	1.94A	2.08A	2.08A	2.37A
Pigeon pea /maize	0.50A	1.19A	1.21A	1.24A	1.53A	1.65A	1.77A	1.87A	1.89B	2.13A
pigeon pea/maize / sweet potato	0.50A	1.22A	1.29A	1.35A	1.61A	1.76A	1.85A	1.95A	2.14AB	2.27A
Mean	0.51	1.22	1.27	1.31	1.59	1.74	1.85	1.97	2.10	2.26

Leaf production of pigeon pea showed similarity among the crop mixtures (Table 7) although the sole crop hand higher leaf count.

Table 7: Pigeon Pea Leaf number as influenced by Crop combinations

.....TIME (Weeks after planting).....

TREATMENT	2	3	4	5	6	7	8	9	10	11
Pigeon pea	3.77A	5.67B	9.34A	13.92A	17.98A	17.42A	18.45AB	28.68A	33.67A	38.28A
Pigeon pea /maize	3.65A	4.85C	8.55A	10.75B	16.55B	15.30B	17.75B	25.87B	27.94B	34.25B
pigeon pea/maize / sweet potato	3.60A	7.00A	9.75A	13.95A	18.55A	18.10A	19.52A	27.95A	33.44A	38.48A
Mean	3.67	5.84	9.21	12.87	17.69	16.94	18.57	27.50	31.68	37.00

This development is not unconnected with the growth habits of the crops. The maize and pigeon pea which has limited canopy spread over the soil would allow more sunlight to reach the ground thereby enhancing weed growth. With sweet potato, there was complete overlap of the foliage and coverage of the soil surface and by this, suppressed weed emergence. This observation is in agreement with Cleave (1974), Rao and Shetty (1977) who observed less weed in mixtures than in their sole corps.

The yield of maize was significantly higher in sole crop than in the mixtures (Table 10).

TABLE 10: Economic yield of maize based cropping system

	Maize	Sweet potato	Pigeon pea
Sole crops	3.52a	0.90a	0.89a
Maize + sweet potato	1.53b	0.65b	
Maize + pigeon pea	1.54b		0.79b
Maize + sweet potato +pigeon pea	1.55b	0.50c	0.60c

Value with similar alphabets are not significantly different at 5% level of probability using DMRT.

Tuber yield of sweet potato was significantly higher in sole crops than in the intercrops (Table 10), and also sweet potato in association with maize was significantly higher than in the three crop mixture. The grain yield of pigeon pea was significantly higher in sole crop than in their different crop associations.

(Table 10). Pigeon pea in association with maize was significantly higher than with two other crops. The better performance of sole crops than in the mixtures is in agreement with Lizanaga (1980) who observed better performance in growth and yield of sole crops than in their intercrops.

The LER, was the reverse of RY (Table 11).

Table 11: Land equivalent ratio (LER) of maize based cropping system

	Maize	Sweet potato	Pigeon pea	LER
Sole crops	1.00	1.00	1.00	1.00
Maize + sweet potato	0.43	0.72		1.15
Maize + pigeon pea	0.44		0.89	1.33
Maize + sweet potato + pigeon pea	0.44	0.56	0.67	1.67

The three crop mixture has the highest LER. This implies that the growth resources was intensively utilized in the three crops mixture than in sole crops. This is in agreement with Francis *et al* (1986), who observed higher yield in mixtures over those attained in sole crops.

The general trend of this study indicates some degree of inter specific competition in each mixture. This accounts for the better performance of the sole crops. The higher the number of crops in the mixture, the lower the performance of each crop. The higher demand for growth resources by all the crops in the mixture may make the resources inadequate for optional growth.

However, the lack of significant difference in the growth parameters irrespective of the crop mixture and higher yield of sole crops than in the mixtures, implies effective utilization of available growth resources in the system. Okpla – Jose *et al* (1989), observed similar depression in the oil palm food crop system but recommended intensive cropping due to higher LER.

To sustain a complex mixture as maize/sweet potato and pigeon pea, it is necessary to support the system with appropriate fertilizer recommendatins. A cropping sequences that will minimize light constraint while effective maximizing land use needs to be designed.

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