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Effects of Geographical Locations and Soil on Growth and Yield Characters of Cotton *(G. Hirsutum)* in Kano State, Nigeria.

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Field trials laid out in a completely Randomized Design were conducted in one location in each of the three Geo-political zones of Kano state and a control in Katsina state, a known cotton growing state, during the 2004 wet season. The objective was to assess the impact of geographical location on the growth and yield parameters of SAMCOT 9 cotton variety and to determine the possibility of growing cotton throughout the state. Most growth parameters were significant ($p<0.001$) in relation to location (site). A low yield ranging from 700 to 800Kg/ha seed cotton was obtained in different locations when cotton was grown under the same agronomic practices which could be attributed to early ending of rainy season in September, 2004. It appeared that the three geographical zones of the state could support substantial cotton production depending on the amount and distribution of rainfall and other ecological factors. Farmers in all the zones are ready to grow cotton if market is made available to them nearby.

Keywords: cotton, growth, yield, geographical location.

INTRODUCTION

Cotton essentially refers to about fifty species in the genus *Gossypium*. It belongs to the family malvaceae comprising of four major species grown worldwide; *G.hirsutum* L., *G. barbadense* L., *G. aboreum* L. and *G. herbaceum* L. Of these four widely grown species, the most commercially cultivated cotton is derived from two species; G. *hirsutum* (upland cotton) accounting for about 90% of world plantings and G. *barbadense* (long staple cotton) usually cultivated as shrubby annual in temperate and few tropical areas of the world (Brubaker *et al.,* 1999).

Upland cotton (G. *hirsutum*) is one of the major cash crops in Northern Nigeria and one of the crops that have introduced the peasant farmers of the region to a cash economy (Kumar and Ogunlela, 1985). It is currently the leading fiber crop worldwide and is grown commercially in more than fifty tropical and temperate countries of the world (Smith, 1999).

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In nature, the crop is a perennial shrub that grows to about 1.5meters in height but it is commercially cultivated as an annual with destruction of plant after harvesting the fruit for seed and fiber. In short, the economic importance of cotton production could favorably be compared with that of livestock farming in Northern Nigeria. However, there is an increasing concern about the sustainability of cotton production in Northern Nigeria because the Federal Government as well as the state Governments of the region do not realize the benefit that accrue from the production of such an important product. Also, several physical and biological factors constrains the growth and development of cotton plant. For instance, the lack of adequate rainfall and its uneven distributions, ecological factors such as soil nutrients, pest and disease etc. are the foremost of these constraints.

Statement of the Problem

The major Nigerian cotton producing areas are concentrated within the Savannah region, an area lying between 7^0 and 14^0N, it is a common knowledge that within the North-Western sub-region where cotton is grown in large amount, most of the cotton processing industries (textiles) are concentrated at Kano. However, a critical survey of the state over the past years have revealed that cotton is grown as cash-crop in only one out of the three geopolitical zones of the state. i.e Kano north-west, accounting for less than 1/3 of the total land area of the state. And with the current ban on the importation of cotton into Nigeria and the deliberate encouragement given to private sectors, there is need to investigate on the reasons why cotton is not grown in other parts of Kano state; while it is grown in most of its neighboring states such as Katsina, Kaduna, etc. This research is aimed at determining the growth and yield of cotton in the three Geographical locations of Kano State and to determine the possibility of growing cotton in all parts of Kano State as opposed to the current situation where it is grown in only Kano North West Zone.

MATERIALS AND METHODS

Study Sites

Field experiment was conducted in each of the three geo-political zones of Kano State, namely; 'A' Kano North-West (Gwarzo), B' Kano South-West (Kiru), 'C' Kano Central (Gaida), and a control experiment 'D' in Katsina State (Dayi) in Malumfashi Local Government.

Field Trials

One acre of land was obtained in the different locations of the three geo-political regions of Kano State under study and another one acre in the control farm. The field layout was a completely randomized block design experiment was employed to determine the growth and yield of cotton as affected by soil and geographical location.

Collection and Planting of Seeds

An improved cultivar specially adapted to the North-North and North-West geographical locations of Nigeria called SAMCOT. 9 was obtained from the fiber breeding unit of the Institute for Agricultural Research (IAR), Samaru, Zaria, in May, 2004. Planting was done in mid June at the rate of 4-6 seeds per hole and 45cm apart after seed dressing with 45% copper powder as fungicide. One week after germination, thinning was done leaving only two plants per stand. Cipermethrine insecticide in the form of Cymbush was sprayed three times at two weeks interval beginning from 6WAS. Also, nitrogen fertilizer in form of nitrate as well as boronated super phosphate fertilizer were applied in a ring form round each stand at the rate of 100Kg/ha and 24Kg/ha respectively. Growth parameters were taken two weeks after germination while yield parameters were taken at the eighth week.

RESULTS AND DISCUSSION

Growth Parameters

Plant height (cm) per plant was statistically different ($P<0.001$) between sites and control site and between periods (table 1.0). There was also significant interaction between period and site. However, highest plant height was obtained in zone B. Number of leaves per plant was significantly different ($p<0.001$) between site and across the period of growth.

These findings have indicated similarities in the vegetative growth characters of cotton in all the areas under study and conforms with the results obtained by Kumar and Ogunlela, (1991b) who reported that vegetative growth components similarly resemble each other under the influence of the same factor. Also, the high vegetative growth component obtained from the different planting sites was not unconnected with the level of nitrogen present in the soil plus the added nitrogen fertilizer in the form of nitrate. This corresponds to the findings of Wankede (1973), Maples and Frizzel (1985) that high nitrogen in the soil stimulated vegetative growth parameters such as plant height, branches and internodes in tall cotton varieties but not in short varieties.

Number of branches per plant was statistically different ($p< 0.001$) in relation to site and period. However. Lowest number of branches were obtained in the control site. This could be attributed to the low content of exchangeable potassium of 0.11me/100g (table 1.0). This is at par with the result of Lombin and Mustapha (1981) which tried to

TABLE 1.0 MEAN PLANT HEIGHT (CM) AND NUMBER OF BRANCHES/PLANT OF COTTON AS INFLUENCED BY GEOGRAPHICAL LOCATIONS

WK N0 Planting Site	**WK 2**		**WK 4**		**WK 6**		**WK 8**		**WK 10**		**WK 12**		**WK 14**		**WK 16**	
	Ph	Nb	Ph	Nb	Ph	Nb	Ph	Nb	Ph	Nb	Ph	Nb	Ph	Nb	Ph	Nb
A. Kano North	41.18	2.56	53.67	8	62.35	9.0	76.64	12.44	105.40	13.78	111.30	150	111.40	150	111.40	15.6
B. Kano South	24.58	0.0	39.54	3	54.68	6.11	81.77	9.78	106.23	13.33	112.34	14.56	112.31	14.56	112.31	14.56
C. Kano Central	27.48	0.0	44.58	5	75.20	11.11	88.95	12.67	104.63	13.89	107.27	15.22	107.30	15.22	107.30	15.22
D. Katsina Day	25.24	0.11	42.12	5	57.97	6.78	77.73	11.44	83.27	12.11	84.12	12.44	84.08	12.44	84.12	12.33
Mean	29.62	0.67	44.97		62.56	8.25	81.29	11.58	101.40	13.28	103.80	14.42	103.8	14.31	103.8	14.42
LSD		PLANT HEIGHT					No. of branches				Key					
Period		11.96					1.819				Ph – Plant height (cm)					
Site:		4.524					0.653				Nb – N0. of branches/plant					
Interactions (PxS)		4.616					0.886									

TABLE 2.0 MEAN NUMBER OF LEAVES/PLANT & SHOOT WEIGHTS (g) (FRESH AND DRY) OF COTTON AS INFLUENCED BY GEOGRAPHICAL LOCATION

									SHOOT WEIGHT (g)	
N0. of Wks Planting site	2	4	6	8	10	12	14	16	Fresh weight (g)	Dry Weight (g)
A. Kano North	24.22	31.78	42.44	54.22	65.29	40.33	23.89	16.44	399.0	195.5
B. Kano South	8.67	25	42	75.89	97.24	108.4	40.44	7.56	389.0	182.6
C. Kano Central	12.78	33	73	93.33	116.7	133.4	35	6.11	427.0	208.2
D. Katsina	10.89	24.67	34.89	48.33	58.82	36	24.22	8	319.0	206.0
Mean	14.14	28.61	48.08	67.94	84.51	79.56	30.89	9.53	384.0	198.1
LSD	Number of leaves/Plant					**Shoot fresh weight**			**Shoot dry weight**	
Site	5.41					94.8			50.66	
Period	18.53									
Interaction P x S	12.81									

Table 3.0 MEAN NUMBER OF BOLLS PER COTTON PLANT AND WEIGHT OF SEED COTTON (Kg/ha) AS INFLUENCED BY GEOGRAPHICAL LOCATIONS

N0. of Weeks Planting Site	WK. 8	WK.10	WK.12	WK.14	WK.16	Weight of seed cotton (kg/ha)
A. Kano North	4	10	14	14	0	728.3
B. Kano South	3	8	12	15	0	777.4
C. Kano Central	4	11	12	15	0	800.0
D. Katsina	4	10	13	14	0	700.5
Mean	3.67	9.47	12.72	14.89	0.00	751.5
LSD	**N0. of Bolls/Plant**				**Weight of seed cotton**	
Site:	1.569				6.44	

assess the critical level of available potassium in solving the problem of cotton soil. They showed that soils that contains 0.19/100g exchangeable potassium may not require any K-fertilizer and that soils with exchangeable K-value of 0.1 or less may require about 50kg K_20/ha for maximum growth and yield.

Fresh and dry weights of shoots were not statistically different ($p>0.001$) with respect to site. This could be attributed to the length of the 2004 rainy season which terminated in the month of September as revealed I.A.R Kano station. This has conformed to the findings of Pretince (1972a), which revealed that although cotton can tolerate wide range in annual precipitation, the distribution of this rainfall is the controlling factor in the production of cotton.

Yield Parameters

Number of bolls/plant was only significant ($P < 0.001$) across the period but not with site (table 3.0). The fewer number of bolls/plant might be due to the type of tillage the time when insecticide was sprayed. This is similar to the report of Kumar and Ogunlela, (1991a) that the time when paraquat insecticide is applied greatly affects the time and rate of boll ripening. Similarly, Hoskinson and Howard (1992) demonstrated that the boll size and distribution within the canopy differs between conventional and conservational tillage cotton in full season planting.

Seed cotton was poor or low but there was statistically significant difference ($P<0.001$) between the sites and control. Highest yield was obtained in zone C of Kano state. This has agreed with the findings of Pretince (1972b) who summarized the general yield performance of cotton and stated that cotton is commonly regarded as a rather poor indicator crop for general yield work, largely because growth of the plant is not so closely associated with yield of produce as it is the case of maize for example, which is a good indicator crop in the sense of responding to soil resources.

CONCLUSION

The results have shown that both the growth and yield parameters significantly responded to soil and geographical locations in both treated and control area. Therefore, it can be deduced that the cotton variety used can thrive well in most parts of Kano State and produce high yield.

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