

## ASSESSMENT OF THE LEVELS OF SOME TRACE ELEMENTS IN SOILS AT KANO UNIVERSITY OF SCIENCE AND TECHNOLOGY RESEARCH AND COMMERCIAL FARM, GAYA

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### ABSTRACT

*Research was carried out in soils at Kano University of Science and Technology Wudil Research, Teaching and Commercial Farm, Gaya in 2012 to determine the levels of trace elements in the soil profile. Nineteen (19) soils samples were collected using Auger from four different profiles, located at each representative site of the farm. All samples were analyzed in the laboratory using double acid extraction method. The result obtained indicated that generally Copper, Iron, Zinc and Manganese are low, with the levels of copper ranging from (0.08 – 3.68ppm and average of 2.33ppm). Zinc from (0.03 – 1.38ppm with an average value of 0.59 in all units). Manganese from (0.01 – 65ppm) while iron varies from (0.37 – 0.75ppm). This showed that, generally the copper status is moderately available compared to other elements especially at the surface of soil profile which may be due to accumulation of organic matter and clay minerals at surface. Crop rotation and addition of soil amendments are recommended to increase the level of CEC and exchangeable bases in the soil.*

**KEYWORDS:** Micronutrients, Soil Sample, Horizon and Nutrients Status.

### INTRODUCTION

Soil fertility is the quality that enables a soil to provide adequate nutrients in proper balance for specified plant growth, other factors such as light, moisture, temperature and the physical condition of the soil being favourable. If the required amount of nutrients one not available in the soil, the crop yield remains low, and in most cases, farming becomes uneconomical. The micronutrients consist of seven essential elements: Boron, Copper, Chlorine, Iron, Manganese Molydenum, and Zinc. These elements occur in very small amounts in both soil and plants, but their role is equally as important as the primary or secondary nutrients.

These micro-elements which are needed only in trace amount plays an important role in crop production, and must be available, continuously, and in balanced proportion to support photosynthesis and other metabolic process of plants. However, soil acidity is one of the problematic factors which influences soil productivity as well as crop yield.

Trace elements sometimes are deficient and commonly limited due to continuous cultivation with increase in demand for higher yield and better quality which resulted in increasing demand for micro-elements. Plants productivity has increase along years due to genetic development and selection of high yielding cultivars. The cultivars with intensive cultivation methods were founds to remove high quantities of microelements from the soil, leading to deficiencies occurring in many soil. The study was undertaken to determine the level of copper (Cu) Zinc (Zn), Iron (Fe) and manganese (Mn) of soil of the study area.

### MATERIALS AND METHODS

#### Location of Study Area

The study was conducted at Kano University of Science and Technology, Wudil

Teaching, Research and Commercial Farm, situated in Gaya Local government area of Kano state. It is located on latitude 12° 11N to 12° 14N and longitude 7° 38 t to 8° 38 E. The area was therefore, located within the Sudan savannah on the mean annual rainfall recorded in last ten (10) years 2001—2011 by Kano Station of KNARDA area is usually sandy loan drive from wind drifts materials.

#### Field Work and Soil Sampling

Soil samples were collected from four different profile pit that are dug in each representative site of the study area. A total of nineteen (19) samples were collected in all profiles according to pedogenic horizon identified. All samples were air-dried thoroughly mixed, grounded gently using a porcelain pestle and mortar and passed through a 2mm sieves and stored in a separate polythene bags (labeled) and used for all laboratory analysis.

#### Laboratory Analysis

The soil pH was determined using electrometric method (Taylor 1955). Available iron fe, manganese mn, copper cu, and zinc zn were determined via double acid extraction method, (Baker and Amacher 1982). While exchangeable acidity (hydrogen and AL) were determine by using titration method as described by MC lean, (1965).

#### Land Capability Evaluation

The potential of the soil samples for agricultural production were evaluated using the land assessment according to Enwezor et al., (1982). F - test was used to analyzed data and means were separated using SED%

## RESULTS AND DISCUSSION

### Particle Size Distribution

The particle size distribution (%) in soil of the study area are shown in table 1. Sand, silt, and clay contents ranged from 71 - 88, 1 - 9 and 12 - 26 with 76.85, 4.78 and 18.9 mean respectively. The highest percentage of sand was obtained in soils collected from range unit, while the least value was obtained in soils collected from crop production unit. The sandy value appeared to decrease with depth at all locations. The soil texture was generally sandy loam to sandy clay loam. The nature of these soils could be attributed to the sandy nature of their parent materials from which they developed (Lekwa, 1992) Silt percentage was low at range unit (mean = 3.8%) while animal production unit have higher percentage of silt (mean = 6.5%) this may be due to alleviation of clay and other suspended materials from the surface horizon to underneath.

### Available Copper (Cu)

The available copper (Cu) content of soil range from (0.08 - 3.53ppm with an average of 2.33ppm). The moderate nature of copper (Cu) in the soil profile in all units could be attributed to the relatively high organic matter and long term fallowing. Tisdale *et-al*; (2005) maintained that organic material such as manure may supply chelating agent that aid in maintaining the solubility of micronutrient. Improved soil structure as a result copper (Cu) availability due to better soil aeration. As shown in Table 2.

### Available Zinc (Zn)

Table 2 shows the available Zinc (Zn) content of soils ranged from 0.03 - 1.3ppm with an average value of 0.59ppm in all units. The relatively low content of zinc in soil profile could be as a result of erosion, crop removal and leaching of essential nutrients. This is in conformity with the work of Nyle C. Brady *et-al*; (2004) which says micronutrient becoming increasingly important to the world of agriculture as crop removal of these essential element increases (Table 2).

### The levels of manganese (Mn) and Iron (Fe)

The levels of manganese (Mn) and iron (Fe) content of soil in the study area were to be low in all four different units as shown in table 2. The levels of Mn varies from 0.01- 65ppm and the values of Fe in all profile of four different units varied from 0.37 - 0.75ppm. Generally iron (Fe) and manganese (Mn) values in soils of all the profiles decreased with increase in depth. Their content in range unit and crop production unit are lower which may be due to continuous cultivation, erosion, leaching and residues removal, crop uptake and bush burning. Micronutrients sometime are deficient and commonly limited due to continuous cultivation, Intensive cultivation were found to remove higher quantities of micronutrients from the soil leading to deficiencies occurring in many soils.

**Table 1:- particle size distribution of soils at Kano University of Science and Technology Wudil, Research and Commercial Farm, Gaya.**

Location	Horizon	Depth (cm)	Particle size Distribution (%)			textural class
			Sand,	Silt	Clay	
Animal production Unit	O	0-204	74	9	17	Sandy Loam
	A	204-62.4	73	7	20	Sandy Loam
	E	62.45-103.5	77	5	18	Sandy Loam
	B	103.5- 150	83	5	12	Loamy Sand
Range Unit			(77)	(6.5)	(16.5)	Sandy loam
	O	0-9	75	7	18	Sandy Loam
	A	9-59	81	1	18	Loamy Sand
	E	59-90	77	1	22	Sandy Clay Loamy
	B1	90-126	79	5	16	Sandy Loam
	B2	126-150	75	5	20	Sandy Loam
Crop Production Unit			(77.4)	(3.8)	(18.8)	Sandy Loam
	O	0-9	77	5	18	Sandy Loam
	A	9-29	73	3	24	Sand Clay loamy
	E	29-77	75	3	22	Sandy Clay Loamy
	B1	77-121	77	5	18	Sand Loam
	B2	121-150	77	7	16	Sand Loam
Horticultural Unit			(76.2)	(4.2)	(19.6)	Sandy Loam
	O	0-10	71	5	24	Sandy Clay loam
	A	10-31	69	5	26	Sandy clay loam
	E	31-67	75	5	20	Sandy Clay Loamy
	B1	67-117	79	5	16	Sandy Loam
	B2	117-150	78	4	18	Sand Loam
Overall Range			(76.8)	(4.6)	(20.4)	Sandy Loam
	Overall Mean		88 - 71	1 - 9	2 - 26	
	SE +		(76.85)	(4.78)	(18.9)	Sandy Loam
			2.01	0.52	0.45	

Values In Parenthesis Represent Means.

**Table 2:- The levels of some trace element soil at Kano University of science and Technology Wudil, Research and Commercial Farm, Gaya.**

Location	Horizon	Depth (cm)	Cu	Zn	Mn (Cmol/kg)	Fe
Animal production Unit	O	0-20.4	2.8	0.52	0.08	0.75
	A	20.4-62.4	2.5	0.52	0.07	0.47
	E	62.4-108.5	2.72	0.55	0.07	0.37
	B	103.5-150	1.81	1.38	0.65	1.11
Range Unit			(2.45)	(0.74)	(0.21)	(0.68)
	O	0-9	1.81	0.55	0.05	0.74
	A	9-59	1.81	0.27	0.03	0.74
	E	59-90	2.72	0.27	0.05	0.37
	B1	90-126	0.92	0.83	0.10	0.37
	B2	126-150	2.72	0.55	0.10	0.74
Crop Production Unit			(1.99)	(0.49)	(0.07)	(0.59)
	O	0-9	0.81	0.83	0.10	0.74
	A	9-29	0.81	0.83	0.07	0.74
	E	29-77	3.63	0.55	0.09	0.37
	B1	77-121	2.72	0.03	0.07	0.37
	B2	121-150	0.08	1.11	0.07	0.37
Horticultural Unit			(2.01)	(0.67)	(0.08)	(0.54)
	O	0-10	1.81	0.27	0.07	0.37
	A	10-31	3.63	0.27	0.03	0.37
	E	31-67	2.72	0.27	0.01	1.11
	B1	67-117	3.63	0.27	0.05	0.37
	B2	117-150	2.72	1.11	0.03	0.74
Overall Range			(2.90)	(0.44)	(0.30)	(0.62)
Overall Mean			0.08-363	0.03-138	0.01-06	0.37-0.75
SE ±			(2.33)	(0.59)	(0.17)	(0.60)
			0.25	0.04	0.02	0.03

Values In Parenthesis Represent Means.

**Table 3: Rating for the Status of Copper (Cu), Zinc (Zn), Manganese (Mn), Iron (Fe) Exchangeable Acidity (H<sup>+</sup>, AL<sup>3+</sup>) and (CEE) in the Savannah Zone its adopted by Tisdale *et al*; (1989)**

Percentages	RATING		
	Low	Medium	High
Copper (Cu) (ppm)	0 - 2.5	2.6 - 4.5	> 4.5
Zinc (Zn) (ppm)	1.0	-	> 1.0
Manganese (Mn) (ppm)	1.0	1.0	> 1.0
Iron (Fe) (ppm)	0.25	2.6 - 4.5	> 4.5
Exchangeable acidity	2	2 - 5	> 5 (mo(+))kg <sup>-1</sup>
CEC (Soil)	6	6 - 12	>12(mo(+))kg <sup>-1</sup>

Source: Tisdale et al., (1989)

### CONCLUSION

The study was conducted to determine the level of some trace elements of soil at Kano University of Science and Technology Research, Teaching and Commercial Farm, Gaya. The area lies within the savannah region of Northern Nigeria. Soil samples representatives were collected on the bases of land use and determined the level of copper (Cu), Zinc (zn) manganese (mn) and iron (fe) within the soil profile.

The status of copper, zinc, Fe and manganese in the soil refers to the percentage levels of the element in the soil. However, going by the findings of this research work, the analyzed data revealed that the soil has high

content of sand ranges from 71 - 88% followed by clay of 12 - 26% and the percentage of silt was very low range from 1 - 9%, available copper is moderate, while the other remaining of elements Mn, Zn and Iron is low or insufficient, and the value usually declines with increase in depth. The result of the study lead to the conclusion that, some micronutrient levels of soils in the study area were to be low because of the continuous cultivation and plant residues removal. The possible recommendation is the return of plants residues, use of organic and inorganic fertilizers and liming will improve the soil fertility and reduce the acidity of the soils.

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