Journal of Food Technology 3 (3): 350-352, 2005

Studies on the Variation of Macro Nutrient Level Uptake of Maize Plants Stem with Age

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Abstract: Variation of macronutrient level uptake of maize plant stem was studied at three different stages of growth namely; 30, 45 and 60 days after planting. The physico-chemical characteristics of the soul supporting the growth were determined by standard methods described in the literature. Results obtained in this study show that the soil was slightly acidic and sandy loam in texture. The exchangeable potassium (K), calcium (Ca) and Magnesium (Mg) in the soil had the mean values of 0.18meq/100g, 1.00meq/100g and 0.20meq/100g soil, respectively. The effect cation exchange capacity of the soil had a mean value of 1.64meq/100g soil. The exchange acidity content had a mean value of 0.10meq/100g soul while the carbon content was (0.078%). The soil contained low levels of nitrogen (N) (0.076%) and phosphorus (P) (4.41ppm), respectively. The levels of N,P and K in the stem wee found to decrease from second to the third stages of growth while there was slight increase for N and P from the first to the second stages of growth with K level remaining constant within period. There was a decrease in the levels of Ca, Na and Mg in the stem from the first to the second stages of growth, which tended to increase again for only Ca and Mg during the final stages of growth.

Key words: Macro nutrient maize, plant stem

INTRODUCTION

The mineral constituents and the organic matter of soils are known major sources of plant nutrients. These nutrients in the soil are usually present in various degree of availability of plants. Availability nutrients are those which plants can readily take up. Their amounts are not closely related to the total nutrients of a soils Sauchell, [1]. For example, the total nutrients of a soil may be high whereas the amount of available nutrients is low for another Vladimir. and Harold, [2]. Nutrient availability may vary seasonally with soul temperature and moisture conditions. Cool-season crops may not get sufficient phosphorus or nitrogen even where warm-season crops can [3].

Many soils do not have high degree of natural fertility for plant crops. The parent materials from which the soul was formed may have short of one or more essential elements. Soils of humid regions lose some of their nutrients by leaching Amon,[4]. Long period of cropping without the addition of nutrients can impoverish a soil. Soils of desert regions, when brought under irrigation, are frequently low in available nitrogen and phosphorus because of their low organic content [5,6] Some of the productive soils of the world have been made so by the use of plant nutrients, productive should of the world have been made so by the use of plant nutrients, provided that soil texture allowed good root development and water shortage capacity was adequate Dracke, [7] Jones,[8].

In this communication, the effect of variation in nutrient uptake of maize plant stem with age is reported.

MATERIALS AND METHODS

Seeds bed preparation and seeding: At the beginning of planting season (precisely in march) a plot of land measuring 10m by 12m was mapped out and cleared at Ihievbe in Owan East Local Government Area of Edo State. Two grains of maize per hole were planted on the land at a standard spacing of 75cm between and within rows, respectively.

Soil sampling: Soul samples (0-15cm) were collected from each row of the land of study and labeled, dated and sent to the laboratory, where they were air dried. The dried samples were then preserved in labeled polythene bags ready for analysis.

Tissue samples: Stem samples were obtained by randomly harvesting whole plants from the plot. Whole plants were later separated into stem, leaves and roots.

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Stem samples were collected three times, at 30, 45 and 60 days after planting respectively. The stem samples were stored in labeled envelops and sent to the laboratory where they were sliced into pieces, placed in beakers, labeled and left to dry for three days in an oven temperature of 100°C. the dried stem tissues were blended into powder and preserved in labeled polythene ready for analysis.

Soil analysis

Determination of soil pH in water: The pH was measured using a standardized pH meter model 290. The pH was recorded as soil pH in water Bates, [9].

Particle size analysis: In the analysis of soil particle size, hydrometer method of Bouyoucos was employed using sodium hexamtaphosphate (calgon solution) as the dispersing medium Bouyoucos, [10].

Organic matter analysis: The method used was the Walkey-Black Wet Oxidation Method Walkley,. and. Black [11]. The procedure was used to determine the amount of active or decomposed organic matter in the soil.

Total nitrogen analysis: The total nitrogen of the soul was determined by Kjedahl digestion method Thex, et al., [12] and the resulting ammonnium ion was measured calorimetrically on Technical II auto analyzer.

Determination of K, Na, Ca, Mg and P: Determination of the amount of K and Na was done by flame photometry. Ca and Mg levels were determined by EDTA titration. The available P was extracted using Bray method of 1945 Bray and Kurtz, [13].

Methods for plant analysis: Precisely, 1g of ground stem sample of the plant tissue (previously dried for an hour at 90°C) was ashed in a muffle furnace at 450°C and 500°C for 4 h. The ashed sample was cooled on top of asbetos sheet. The cooled ashed sample was transferred to a 250 cm beaker, 4cm^3 of 20% nitric acid was added and the mixure stirred vigorously for 5 minutes with a glass rod. The solution mixture was filtered into a 25cm^3 volumetric flask and was made up to 250cm^3 mark with distilled water, the extract was preserved for K, Na, Mg and p determination.

RESULTS AND DISCUSSION

Physico-chemical parameters and macronutrient levels in the soil: Some of physico-chemical parameters determined for are shown in Table 1. The Ph of the soil sample had the mean value of 6.05. This shows that the soil is slightly acidic. The soil texture was sandy loam. The silt content had a mean value of 3.7% while thee mean percentages of clay and sand were 10.0 and 86.3, respectively. These values show that the sand fraction of the soil sample was higher than clay then then much higher than silf in that order. Table 1 also shows that the carbon content (%) of the soil had the low mean value of 0.078%.

Table 1: physico-chemical data obtained for the soil

Soil parameter	Mean value
pH	6.05
Clay (%)	10.00
Silt (%)	3.70
Sand(%)	86.30
Carbon content (%C)	0.078
N (%)	0.076
P (ppm)	4.41
Na (meq/100g)	0.19
K (meq/100g)	0.18
Ca (mag/100g)	1.00
Mg (meg/100g)	0.20
EA (meg/100g)	0.10
ECE (meq/100g)	1.64

Table 2: Macronutrient levels in Maize stem sample within three stages of growth

Age	Nutrients amount %					
days	N	P	K	Ca	Mg	Na
30	0.86	0.13	3.35	0.35	0.54	0.06
45	0.87	0.19	3.50	0.10	0.30	0.04
60	0.60	0.08	1.50	0.35	0.51	0.04

The mean value of total nitrogen for the soil was 0.076% This value obtained is quite low compared with the value of 0.300% reported by Blackmore,[14]. The total available phosphorus in the soil had the mean value of 4.41 ppm. This value is found to be lower than the sufficiency range of 10-17 ppm earlier reported by Bray *et al.,* [13] and Oko.[15] The mean values of exchangeable potassium, calcium and magnesium were 0.18, 1,00 and 0.20meq/ 100g soil earlier reported by Doll and Lucas [16]. The value of calcium in the soil obtained was lower than the range of 2.0-5.0 meq/100g soil reported by Taylor and Pohlew [16]. The value of Mgis found to satisfy the range of 0.15-100meq/ 100g soil reported by Tinker,. and Ziboh[17] The mean exchange acidity of the soil was 0.10meq/ 100g soil while the cation exchange capacity was 1.64meq/ 100g.

Macronutrients level in the maixestem tissue: Table 2 shows the summary data of macronutrient levels in the maize stem samples obtained at three stages of growth. The levels of nitrogen in the stem were 0.86, 0.87 and 0.60% at the first, second and third stages of growth, respectively. The fall in the level of nitrogen from the second to the third stages of growth indicates the need for more nitrogen at this stage. The potassium level in the

stem decreased significantly from the second to the third stages of growth, indicating a deficiency of this element in the stem.

Initially, there was appropriate rise in phosphorus uptake from the first to the second stages of growth, showing that there was no deficiency of phosphorus in the stem during this period. However, there was a remarkable fall in phosphorus from the second to thee third stages of growth, meaning that the stem needed more of the element for maturity.

Calcium level in the stem fell from the first to the second stages and subsequently increased at the third stage of growth. More calcium was therefore required by the stem for growth within the period of 30 and 45 days after planting. sodium uptakes in the stem slightly decreased from the first to the second stage and remain constant up to the third stage of growth. The level increased again to almost the initial amount from the second to the third stages of growth.

Generally, the result presented in Table 2 reveals that the maize stem sample was deficient in nitrogen, phosphorus and potassium from 45 to 60 days of age.

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