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Effect Of Mycorrhiza On Plant Growth

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Abstract: *Nutrient depletion in soil has become a serious threat to agricultural production, incorporation of factor such as Am Fungi as an alternative amendment in enhancing crop production cannot be underestimated. However, this paper investigates potency of Arbuscular mycorrhirza inoculation on plant growth. The experiment was designed such that 3 planting pots were seeded with sorghum bicolor and Am Fungi, another 3 planting pots were seeded without Am Fungi, in all there were replicate of 4 treatments. Growth parameters such as length of the mid rib, necrosis and dieback were measured. The result obtained showed increases in the length of the mid rib which ranges between 12.70cm – 15.40cm at week 2, 37.80cm – 42.70cm at week 4 51.30cm – 55.30cm at week 6. and increase in major nutrient absorption with N(0.94% - 2.97%), P(0.50% - 0.41%),and K(5.88% - 6.07%) of sorghum bicolor unlike non inoculated sorghum bicolor. Dieback and necrosis of the inoculated sorghum bicolor were less compared to the higher value in non inoculated sorghum bicolor.*
Keywords: *Arbuscular mycorrhiza, Sorghum bicolor, necrosis, diebark, length of the mid rib*

I. Introduction

Soil degradation and nutrient depletion have increased thus posing a serious threat to agricultural production in the tropical region. The primary limitation of crop production is the deficiency of available nutrient especially phosphorous and water (Nagarathna *et al.,* 2007). The use of inorganic fertilizers by the poor small scale farmers and large scale farmers in some poor developing countries is made difficult by their scarcity. The incorporation of factors that enables plants to withstand nutrient deficiency and toxicity as well as drought stress would therefore be helpful to improve crop production. Inoculation of plant root with Arbuscular Mycorhiza is consider to be effective in improving crop production under nutrient and drought stress conditions (Nagarathia *et al.,* 2007).

Arbuscular mycorrhizae (AM) are symbiotic associations, formed between plants and soil fungi that play an essential role in plant growth, plant protection, and soil quality. The AM fungi expand their filaments in soil and plant roots. This filamentous network promote bi-directional nutrient movement where soil nutrients and water move to the plant and plant photosynthates flow to the fungal network. AM fungi are ubiquitous in the soil and can form symbiosis with most terrestrial plants including major crops, cereals, vegetables, and horticultural plants. In agriculture, several factors, such as host crop dependency to mycorrhiza colonization, tillage system, fertilizer application, and fungi inoculum's potential can affect plant response and plant benefits from mycorrhiza. Due to their obligate symbiotic status, AM fungi need to associate with plant for growth and proliferation.(Hapte, 2000).

Mycorrhiza colonize the cortical tissue of plants roots of most plant species and thus increase the root surface area. Among small proportion of all plants species examined, 95% of those plant families are predominantly Mycorrhiza.

Mycorrhiza play an important role in plant nutrient and water uptake, particularly on soil with low phosphorous level (Meyer, 2007). Absorptive capacity of immobile nutrient such as N, P, K, Ca, S, Cu ,Zn and other micro-elements from the soil cannot be underestimated. Mycorrhiza fungi have been suggested as having a role in mediating the uptake of water at times of drought stress and of metals on contaminated ground. (Farahani *et al.,* 2008).

AIM
To determine the influence of Mycorrhizal on crop production.

OBJECTIVES
To improve or increase agricultural produce.
To promote sustainable agricultural practices in the emerging globalization trend.

II. Methodology

Pot experiment was designed such that sorghum seedlings planted on wood shavings were transplanted into the experimental pots that were filled with good top loamy soil at two weeks. The experiment was designed such that 3 planting pots were seeded with sorghum bicolor and 7g of Am fungi, another 3 planting pots were seeded without Am fungi. In all there were replicate of four treatments: Inoculated Sorghum(S+), Non-Inoculated Sorghum(S-), Inoculated Sorghum(S+) and Non-Inoculated Sorghum(S-).

Each treatment was watered regularly with the sorghum growth being monitored and measured at week 2, week 4 and week 6 after transplanting. The plants were then harvested, blended and the plant biomass tissue was analyzed using (IS0, 2006) technique.

III. Results And Discussion

TABLE 1: Growth analysis of the effect of mycorrhiza on *sorghum bicolor.*

WEEK 2			
Treatments	**Length of the Midrib (cm)**	**Necrosis**	**Die Back**
S+	12.70	2.00	18.00
S-	11.60	4.00	23.00
S+	15.40	3.00	9.00
S-	15.20	4.00	18.00
WEEK 4			
S+	37.80	5.00	7.00
S-	35.60	11.00	12.00
S+	42.70	6.00	6.00
S-	40.00	9.00	10.00
WEEK 6			
S+	55.30	5.00	5.00
S-	51.00	9.00	9.00
S+	51.30	8.00	8.00
S-	47.00	7.00	7.00

KEY
S+: Inoculated Sorghum
S-: Non-Inoculated Sorghum

TABLE 2: Analysis of the percentage concentration of nutrient uptake by *sorghum bicolor.*

Treatments	**N(%)**	**P(%)**	**K(%)**	**Ca (%)**	**Mg(%)**
S+	2.97	0.50	6.07	14.95	29.82
S-	1.80	0.30	3.82	13.60	23.47
S+	0.94	0.41	5.88	60.50	29.82
S-	0.86	0.30	4.62	53.75	16.62

IV. Results

Table 1 indicates the growth analysis of the effect of mycorrhiza on *sorghum bicolor* at Week 2.

It was observed that the length of the mid rib of the inoculated *sorghum bicolor* ranges from 12.70cm to 15.40cm while non-inoculated *sorghum bicolor* ranges from 11.60cm to 15.20cm. Also the necrosis of the inoculated *sorghum bicolor* was between 2.00 to 3.00 and non-inoculated *sorghum bicolor* was 4.00.

The die back of inoculated *sorghum bicolor* falls between 9.00 to 18.00 and non-inoculated *sorghum bicolor* falls between 18.00 to 23.00.

The length of the mid rib of inoculated *sorghum bicolor* was measured between 37.80cm to 42.70cm and also non-inoculated *sorghum bicolor* was between 35.60cm to 40.00cm.

The necrosis of the inoculated *sorghum bicolor* range was between 5.00 to 6.00, while non inoculated *sorghum bicolor* was between 9.00 to 11.00.

The die back of inoculated *sorghum bicolor* range was between 7.00 to 10.00 while non inoculated *sorghum bicolor* ranged between 10.00 and 12.00.

The ranges of the length of mid rib of inoculated *sorghum bicolor* are between 47.00cm to 53.00cm while non-inoculated *sorghum bicolor* ranges are between 47.00cm to 51.00cm.

Necrosis of the inoculated *sorghum bicolor* was between 5.00 to 8.00 and non-inoculated *sorghum bicolor* was between 7.00 to 9.00.

The die back of inoculated *sorghum bicolor* was between 5.00 to 8.00 and non-inoculated *sorghum bicolor* was between 7.00 to 9.00.

Table 2 shows the analysis of the concentration of nutrients uptake by *sorghum bicolor*.

The percentage concentration of Nitrogen in inoculated *sorghum bicolor* was between 0.94% to 2.97% while concentration of Nitrogen in non-inoculated *sorghum bicolor* was between 0.86% to 1.80%. Percentage concentration of Phosphorous of inoculated *sorghum bicolor* was at the range of 0.41% to 0.50%, while concentration of Phosphorus in non-inoculated *sorghum bicolor* was 0.30%.

The percentage concentration of Calcium in inoculated *sorghum bicolor* was between 14.95% to 60.50% and concentration of Calcium in non-inoculated *sorghum bicolor* was between 13.60% to 53.75%.

Mg concentration was 29.82% in the inoculated soil and was valued between 23.47% to 16.62% in non-inoculated soil.

V. Discussion

Increase in the length of the mid rib of the inoculated *sorghum bicolor* could be attributed to the increase in the surface area of the *sorghum bicolor* roots that enhances nutrients absorption, as reported by (Selose *et al*., 2006).

The negative growth measurement - necrosis and die back of the inoculated *sorghum bicolor* was lower compared to non-inoculated *sorghum bicolor*. This is as a result of the inoculum that enhances diseases resistance on the inoculated *sorghum bicolor* (David *et al.,* 2000).

Higher nutrient absorption of inoculated *sorghum bicolor* compared to non-inoculated *sorghum bicolor* was as a result of the symbiotic relationship between plant root and soil fungus, thus nutrient obtained by inoculated *sorghum bicolor* was enhanced especially phosphorous which usually lower or lacking in non mediated soil (Hogan, 2011).

Arbuscular mycorrhiza affect plant and soil microbial activity by stimulating the production of root exudates, phytoalexins and phenolic compounds which increases activity of plant defence genes especially chitinases, glucanases and flavonoid biosynthesis (Al-karaki *et al*, 2004).

However, this has been observed in the inoculum treatments, thus *Mycorrhiza* promotes drought and disease resistance.

VI. Conclusion And Recomendation

Data obtained from this research work showed potency of mycorrhiza inoculum on plant growth and crop production due to its nutrient absorptive capacity and diseases resistance. However, Am mycorrhiza could be used in cultivating crop in order to maximize agricultural produce as well as sustainable agriculture.

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