EFFECT OF ZINC CURING ON ROOT ROT BLIGHT COMPLEX AND ON YIELD OF COCOYAM (*XANTHOSOMA SAGITIFOLIUM*)

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ABSTRACT
An experiment was conducted at Umudike and Igbariam, South Eastern Nigeria to determine the rate of Zinc sulphate ($ZnSO_4$) curing that will reduce the incidence of root rot blight complex of cocoyam (Xanthosoma sagitifolium). Varied levels of zinc sulphate were dipped in 100 ml acetic acid (CH_3COOH) in 10 litres of water for 15 minutes. At Umudike, the treatment applied were not significant in reducing the blight incidnce of the disease but was significant in blight severity. A 20g zinc sulphate concentration gave the highest reduction with a severity score of 2.4%. But at Igbariam, the effect of treatment on blight incidence was not significant while blight severity had a significant ($P<0.05$) effect on cocoyam (Xanthosoma sagitifolium) by 56% higher compared with results obtained from Umudike. The non-significant effect of zinc sulphate on the performance and yield of cocoyam indicate that zinc sulphate was not applied as a nutrient source of fertilizer.

INTRODUCTION

Cocoyam is usually one of the last crops to cultivate in the cropping seasons more especially in the South-Eastern States of Nigeria. In 2008, Nigeria produced 2068000 mt of cocoyam harvested from about 70,000 ha (FAO, 2008). Planting is done between June and July when the rains have become stable. This period is critical period of Root Rot Blight Complex incidence. But early planting of the crop could avert the disease, but there is the risk of crop failure due to moisture stress. Cocoyam Root Rot Blight Complex (CRRBC) is a soil-borne disease of *Xanthosoma sagitifolium* CV "Ede Ocha" caused by *Pythium spp.* The pathogen exists in the soil and attacks the roots, corms and cormels, causing them to rot. The disease has become endemic leading to cocoyam crop loss of 80% in the South-East where the crop is predominantly grown (Nnoke *et al*,. 1987). The absence of lateral roots decay of the corm and roots which is usually accompanied by a fowl smelling sour odour of putrefying tissues is suggestive of *pythium* infection. These are major constraints to cocoyam production. However, Somani (1986) reported that the incidence of black-scurf (*Rhizoctoctonia solani)* of potato was reduced from an average of 97% to 12% by dipping the tubers in 0.05% of Zinc sulphate ($ZnSO_4$), plus 1% Acetic acid for 15 minutes in water before planting. Against this background, this experiment was conducted to determine the rate of zinc sulphate curing that will effectively reduce the causal organisms of root rot blight complex.

MATERIALS AND METHOD

The experiment was conducted at the research farm of the National Root Crops Research Institute, Umudike and its Sub-station at Igbariam in 2006 and 2007 cropping seasons. Field preparation was by tractor. The experimental design was randomized complete block with three replications. The plot size was 5m x 4m. About 50g setts of cocoyam cultivar NXs 001 (*Xanthosoma sagitifolium*) was planted at a spacing of 1m x 0.5m ridges in June in both years and sites. Varied levels of zinc sulphate ($ZnSO_4$) were dipped in the solution for 15 minutes before planting.

Treatments

1. Control
2. 5g ($ZnSO_4$) + 100ml CH_3COOH + 10 litres of H_2O dipped for 15 minutes
3. 10g ($ZnSO_4$) + 100ml CH_3COOH + 10 litres of H_2O dipped for 15 minutes
4. 15g ($ZnSO_4$) + 100ml CH_3COOH + 10 litres of H_2O dipped for 15 minutes
5. 20g ($ZnSO_4$) + 100ml CH_3COOH + 10 litres of H_2O dipped for 15 minutes

Isolation: Composite soil samples were collected at random from each of the three replications at Umudike and Igbariam before planting in May and at Harvest in November in both years and sites. The samples were analyzed for presence of pathogenic organisms and percentage occurrence. This was carried out on the cocoyam setts planted and harvested for confirmation of the source of infection on the field. Two culture media-potato dextrose agar and nutrient agar was used for the bacteria cultivation. Isolated fungi and bacteria were identified according to Barnet and Hunter (1998).

RESULTS AND DISCUSSION

Results obtained are shown in table 1 to 3. Table 1 shows the percentage occurrence of the pathogenic organisms sampled from the soil and infected cocoyam before planting. The result show repeated time of occurrence of organisms while the pathogenic load of the soil was more. In Umudike (table 2) the treatment applied were not significant in reducing the blight incidence of the disease but was significant in blight severity. A 20g $ZnSO_4$ concentration gave the highest reduction with severity score of 2.4%. While in Igbariam, the effect of treatment on blight incidence was not significant while blight severity had a significant ($P<0.05$) effect on cocoyam with 56% higher compared to results obtained from Umudike. Table 3 show the effect of zinc sulphate on the number of corms, cormels and total tuber yield (t/ha) of cocoyam during the 2006 and 2007 cropping seasons. In Umudike, treatment applied had no significant effect on any of the parameters in both years except on the number of cormels in 2007. At Igbariam, $ZnSO_4$ concentration of 20g gave the highest total yield of 7.7 t/ha in 2006 and 4.9 t/ha in 2007. From the results in table 1, it indicated that cocoyam may habour some of the pathogens. However, there was no pathogencity to determine what organism was the most virulent, parasitic or saprophytic. Fukui and Alverez, (2006); Onwueme and Charles (1994) found out that disease is induced by and interaction of pathogens. The no-significant effect of zinc sulphate on the general performance and yield of cocoyam indicated that zinc was not applied as a nutrient source of fertilizer.

CONCLUSION

Zinc sulphate at 20g concentration could likely reduce the blight severity of Root Rot Blight Complex on cocoyam. Also management of Root Rot Blight Complex is very difficult. It may be due to varied sources of infection. Soil, planting materials, and environmental factors such as water logging may likely induce the incidence of root rot blight complex. Some measures that can be adopted include: use of disease free planting materials, or plant in a well drained soil and use of rotational system.

Table 1: Percentage Occurrence of Pathogenic Organism in Cocoyam and Soil before and after Experimentation

Before Experimentation		
Pathogenic organism	**Percentage occurrence**	
Before experimentation	Cocoyam setts	Soil
Rhizoctonia solani	29.2	28.4
Sclerotium rolfsi	21.9	10.4
Pythium spp	8.1	7.6
Fusarium oxysporium	18.2	17.5
Pseudomonas spp	22.7	30.0
Total	**100.1%**	**93.9%**
After experimentation		
Pathogenic organism	**Percentage occurrence**	
Rhizoctonia solani	25.3	29.3
Sclerotium rolfsi	18.3	17.3
Pythium spp	17.7	15.3
Fusarium oxysporium	20.4	15.3
Pseudomonas spp	18.3	22.6
Total	**100.0%**	**99.8%**

Table 2: Effect of Zinc Curing on disease Incidence and Severity of Cocoyam

	Umudike		**Igbariam**	
Zinc Levels (gm)	**Blight incidence (%)**	**Blight severity (%)**	**Blight incidence (%)**	**Blight severity (%)**
Control	37.7	3.1	36.7	3.7
5gm	36.3	3.1	34.3	3.7
10gm	35.0	3.5	35.0	4.0
15gm	43.3	3.4	34.3	4.0
20gm	37.2	2.4	36.7	3.0
LSD (0.05)	NS	0.57	NS	0.73

NS = Not significant at 5% alpha level

Table 3: Effect of zinc on number of Corms, Cormels and Total Yield (t/ha) of Cocoyam

	UMUDIKE			IGBARIAM		
	2006			2007		
Traeatment	No of Corms	No of Cormels	Total Yield	No of Corms	No of Cormels	Total Yield
Zn (0g)	55	139	4.2	34	85	2.8
	24	51	2.3	23	46	2.5
Zn (5g)	51	154	4.6	39	136	2.6
	42	105	6.7	19	48	3.0
Zn (10g)	43	164	4.6	39	122	2.3
	46	172	8.4	21	55	3.6
Zn (15g)	50	155	4.4	41	135	2.6
	43	120	5.8	21	60	4.0
Zn (20g)	50	168	5.1	45	150	2.6
	39	106	7.7	22	74	4.9
LSD (0.05)	NS	NS	NS	NS	47	NS
	NS	61	2.2	NS	18	1.2

NS = Not significant at 5% alpha level

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