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THE EFFECTS OF SOIL AMENDMENTS WITH CASSAVA PEELS ON PYTHIUM WET ROT OF TOMATO CAUSED BY PYTHIUM APHANIDERMATUM (EDSON) FITZ.

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ABSTRACT

Studies on the effects of soil amendments with cassava peels on control of Pythium wet rot of tomato was conducted . Cassava peels were buried in pasteurized soil infested with P. Aphanidermatum and allowed to stay for 24 days before planting. This led to suppression of seedlingdamping of tomato plant. While in the control experiment (I) all the germinated seedlings collapsed and died.

The highest number of surviving seedlings were recorded in soil amended with cassava peels for 24 days before plantings. In control experiment (II) where soil was neither infested with P. Aphanidertum nor amended with cassava peels all the germinated seedlings survived till the end of the experiment.

In search of the mechanism of control with cassava peels Bacillius cereus, Bacillus subtilis, Trichorderma harzianum, and Pythium periplocum were isolated at the end of the experiment from soil sample amended with cassava peels for 24 days before plantings.

Bacillus cereus paired with P. aphanidermatum inhibited growth at a distance (antibiosis) whereas Bacillus subtilis compete with P. aphanidertum in the first four days of paired. Trichoderma harzianum was found to be active hyper-parasite which attacted the mycella of P. aphanidermatum. Microscopic observation showed fine hypae of P. periplocum wrapping around the hypae of P. aphanidertum. Penetration and parasitism were also observed.

The use of cassava peels to suppress Pythium wet rot disease is one of the cheapest and easiest method, which may a laeve a cleaner and unpolluted environment and complement other efforts in the integrated management approach to disease problems.

INTRODUCTION

The tomato plant, Lycopersicon esculentum (L) Karst grows well in the tropics as an annual plant with weak trailing much branched stems. The plant is a native of central and south America, but varieties of it are now grown in different environments. It is one of the most widely cultivated of the vegetables in Nigeria and the greatest aggregate production comes from the gardens. The fruit is a smooth -skinned berry, usually red or yellowish in colour when ripe and varring in size and shape. Tomato is highly accepted item of many traditional dishes in Nigeria. It is used as a condiment and it greatly enriches flavour of various dishes. The tomato also finds immediate uses as a salad vegetable and for canning purpose.

Large-scale losses of the crop result from fungal root diseases. A number of these diseases of tomato have been seperately observed and described in different parts of the world. The damping off diseases caused by Pythium aphanidermatum. Rhizoctonia solani, and P. deliense causes much loss in yield in England (Ebben and Williams, 1956; Adeniji, 1966), in Australia (Brittlebank, 1924; Fish 1939) and in Ireland (Mckay 1942). In Sokoto State of Nigeria, the 1991/92 growing season

experienced great loss in yield of tomato as a result of fungal root diseases. There is consederable evidence that various types of compost suppress different soilborne plant diseases Vaghn et. al (1954) found that composted wood residues reduced by Phytrophthora in straw berries. Since then it has been found that mature compost also suppress Rhizoctonia solani, Fusarium oxysporum and Pythium in many crops (Chen et. al , 1980; Nelson and Hoitink, 1982, Hoitink and Fahy, 1986). The use of chemicals to control soil borne plant disease in present day Nigeria is costly and may not be within the reach of peasant farmers. Also the increasing awareness on pollution problems and of toxic chemicals in our food chain impels us to use non chemical methods to solve our problems resulting from plant pathogens.

The present investigation aims at providing alternative method of controlling Phythium wet rot of tomato by soil amendment with cassava peels which do not involve the use of toxic chemicals so as to complement the integerated pest management approach to disease problem.

Materials and Methods

In order to determine the effect of soil amendment with cassava peels on incidence of Pythium wet rot of tomato caused by P. aphanidermatum, several 5 litre plastic buckets were filled with 5Kg pasteurized soil and arranged on bench in greenhouse in completely ramdomised design. Four replicates were made for each of the treatments. Two culture plates of P. aphanidermatum isolated from infested soil, maintained on potato dextrose agar (PDA) were homogenised with 50 ml of distilled water in blender and the suspension was added to the soil in each bucket . The suspension were mixed thoroughly with 2.5cm-3cm layer of the top soil. The buckets were divided into eight batches of 4 buckets each. Each batch was amended with 50g cassava peels in each bucket and watered slightly. The buckets were allowed to stay for 28, 24, 20, 16, 12, 8, 4, and 0 days, respectively.

There were two additional batches one inoculated with P. aphanidermatum and not amended with cassava peels to serve as control I. The other batch contained neither P. aphanidermatum nor cassava peels to determine germinability of seeds. The seed were those of tomato. 30 seeds were planted on the same day in each of the bucket of all the treatments.

Soil samples were taken from buckets amended with cassava peels for 24 days before planting at the end of experiment. 10 fold serial dilution technique was used. Each of the samples was seriously diluted technique was used. Each of thesamples serially diluted to 10-4 in sterile distilled water. From 102ml of the dilutions were plated on potato dextrose agar (PDA) in triplicate using the poured plate method. After 48 hours of incubation at 28 C the petri dishes were examined for the pattern of growth of microorganism that were present. Those colonies that have clear zones of inhibition of the growth of other microorganisms around them were then sub-cultured on PDA until a pure culture was established.

The target organism P. aphanidermatum was inoculated at the centre of fresh PDA while the antagonist were inoculated at 4 equidistant periperal points. Each inoculation was replicted 3 times. The plates were incubated for 2-4 days at 28 C after which they were observed for interaction between the target organism and antigonistic isolated microorganisms.

Results and Discussion

When pasteurized soil was amended with cassava peels and allowed to decompose at different times. seeds of tomato were planted. the results obtained showed

that percentage seedling emergence and establishment increased with fermentation time. In previous work, Lumsden (1993), Hoitkin and Fahy (1986) showed that composted hard wood trees bark was found to control Pythium damping off of many crop seedlings including cucumber, melon bean and tomato. Cassava peels will be more prefered to hard wood or tree back because of its availability in many regions of the world lacking forestry and because the former will decay faster than the latter. Therefore the use of cassava peels in this study has added to the subject of Pythium disease control.

In pots with unfermented cassava peels, severe disease was recorded within 2 weeks of planting. In control I, 100% germination was recorded. No death occured through out the period of the experiment. Analysis o Variance (ANOVA) showed that the effect of treatment was highly significant among all the seven treatment. However, there was no significant difference among the soil amended with cassava peels for 24 and 28 days and no significant difference also among the replicates of the treatments. Previous work by Mandelbaum and Hardar (1990) obtained similar results using composted separated cattle manure to control Pythium wet rot of cucumber, beans and tomato.

This work has added to the findings of Inbar et. al., (1990), and Chen et. al., (1988) that compost produced from agricultural wastes has been used as organic component in suppression of soilborne pathogens. It was observed that P. aphanidermatum was more pathogenic in the first 2 weeks of planting then subsequent days. It was observed that the highest percentage of healthy seedlings was recorded in pots amended with cassava peels for 24 and 28 days before plantings, 100% healthy seedlings was recorded at the 3rd day of plantings and at the 14th day 97% healthy seedlings were recorded (Table 1).

In search of mechanism of cintrol to Pythium wet rot disease by cassava peels. Bacillus cereus. Bacillus subtiles, Trichoderma harzianum and Pythium periplocum solated from same soil found to be inhibitory to growth of P. aphanidermatum.

Bacillus cerus gave a permament zone of inhibition to growth of P. aphanidermatum two weeks of paired. It is probably that anibiosis had occured. Similar results on Antinomyces sp. I on Macrophomina phaseolina was reported by Itekun and Adekunle (1990). Bacillus subtilis restricted growth of P. aphanidermatum to inoculation point 4 days after paired. However P. aphanidermatum overgrew B. subtilis7 days after paired. This result showed B. subtilis compete with P. aphanidermatum for available nutrients in the first 4 days. To the authors knowledge no studies have looked directly at competition for nutrients in biological control seedlings damping off caused by P. aphanidermatum on tomato plant.

When Trichderma harzianum was paired with P. aphanidermatum, contact between both was made after 4 days. However, at the point of contact of the two fungi, there was no mycelial thickening and the colour of the of P. aphanidermatum mycelia changed from white to dark-brown colour. Also the advanced of mycelia of P. aphanidermatum was halted by those of T. harzianum. Microscopic observations of the area where mycelial thickening occured showed that the mycelia of T. harzianum coiled tightly around those of P. aphanidermatum and appeared to parasitize them. Pythium periplocum when paired with P. aphanidermatum wrapping around the hypae of P. aphanidermatum. penertration and parasitisms were also observed. Similar results were reported by Lifshift et. al. (1986) on biological control damping off of peas, who observed mycoparasistism of P. ultimum by Trichoderma sp. T. harzianum has also been used in Nigeria to control basal stem rot diseases of tomato caused by Sclerotium (Corticum rolfsii) (Wokocha et. al., 1986).

The use of cassava peels to suppress Pythium disease is one of the cheapest method which may leave a clean and unpolluted environment. Suppression of Pythium

wet rot of tomato was enhanced by increasing the time between soil amendments witl cassava peels and planting. If disease control by this method can be fully developed intc field experiment of sustainable agriculture in Nigeria and else where. Cassava peels compost is an economically and ecologically sound alternative to pesticide. However, further investigation is still needed in this direction towards biological control of the plant diseases.

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Table 1 Effect of Cassava Peels on on germination and damping - off by pythium aphanidermatum on tomato

Medi	Week 1 Av. sedling per pot Av. of 4 rep	No. of Collapsed seedlin per pot Av. of 4 rep	Week 2 Av. seedling per	No. of collapsed seedling
Amendment for 0 days	25	5	21	9
Amendment for 4	23	7	22	8
Amendment for 8	25	5	24	6
Amendment for 12	26	4	25	5
Amendment for 16	27	3	26	4
Amendment for 20	28	2	27	3
Amendment for 24	30	28		
Amendment for 28	30	28		
Control 11phythium only	21	9	18	12
Control 1germination test	30	30		
S.E.	1.25	1.10		
LSD 5%	4.32	3.66		