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Storage Rot of Some Yams (*Dioscorea Spp*) In Keffi and Environs, Nasarawa State, Nigeria.

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ABSTRACT
A study was carried out on the storage rot of yams Dioscorea spp in Keffi and environs, Nasarawa State. The Dioscorea spp examined included Dioscorea rotundata (white yam), D.cayenesis (yellow yam) and D.alata (water yam). Five(5) towns, Kana,Kofa Gwari, Laminga, Garaku and Kokona in Keffi Local Government Area, Nasarawa State, Nigeria were covered. The study areas were visited six times in three months for collection of rotted yams. The symptoms of the diseases were described and their associated organisms isolated and identified. The diseases include dry rot, soft rot and wet rot, which accounted for 54.2%, 36.1% and 9.6% of post-harvest diseases of yams respectively. Out of the 90 yam samples examined 83 yam samples had fungi isolates. The fungi isolated included Aspergillus niger, Aspergillus flavus, Rhizopus stolonifer, Sclerotium rolfsii, Fusarium oxysporum, Rhizoctonia spp. The fungal isolates had the following percentage frequencies of occurrences respectively: 38.6%, 19.3%, 18.1%, 20.0%, 7.2% and 4.8%. There was no significant difference (P>0.05) in the incidence of the different isolates in relation to location.

Keywords*: Storage, rot, yams, fungi isolates, Keffi.*

Introduction

Yams (*Dioscorea* spp) belong to the family Dioscoreceae(IITA,1993).The most cultivated species in Nigeria are *D. rotundata*(white yam), *D. cayenesis*(yellow yam) and *D. alata*(water yam)(Amusa,1999). Underground tubers vary in size and shape averaging 3-8 pounds sometimes reaching 60 pounds or more. Aerial tubers may develop in the axils of the leaves, especially when vines run on the ground. The species occur rather abundantly in tropical and subtropical regions of the world(IITA,1993)

Nutritionally, yams are mainly carbohydrate food, but contain about 1-2% dietary protein, which is high compared with other tropical root crops(Coursey,1967;Ekefan *et al.*,1999).Yams are therefore, able to provide a good proportion of protein requirement of man when consumed in large quantities(Coursey,1967;Odurukwe,1980)
In Nigeria, it is eaten as boiled yam, yam pottage, fried yam, roasted yam, pounded yam and as 'amala'(Yoruba).

As important as yam is, its production is constrained by many problems; high cost of production, attack by nematodes, vertebrate pest singly or in combination. These constrains are responsible for field suppression and tuber quality deterioration in storage (Onwueme,1978).Though yam tuber naturally has a periderm microorganisms cannot breach, it is easily wounded by rodents, nematodes and man during weeding, harvesting

and post-harvest handling. Such wounds facilitate the penetration and development of rot microorganism (Noon,1978). The magnitude of these problems have made many people to express fears that yam production in Nigeria may decline substantially in the near future (Orkwor *et al.*,1998).

The study was therefore carried out to provide basic information on storage rot of yams in Keffi by carrying out disease survey, determine the microorganism/s responsible for this spoilage and assess the frequency of occurrence of these microorganisms in relation to location.

Materials and Methods

The study was conducted in the Plant science and Biotechnology Unit laboratory of the Department of Biological Sciences, Nasarawa State University, Keffi. While the survey work was carried out in some selected towns in Keffi & Nasarawa local government areas, Nasarawa state. These included: Kana, Kofa Gwari, Laminga, Garaku and Kokona. These towns were part of the Southern Guinea savannah region of Nigeria with a tropical hinter land climate (Iloeje, 1981). Three yam varieties, white yam, yellow yam, water yam were common in this local government Area. In each of the selected towns regular yam tuber retailers were visited two times in each month for diseases. The average of the sample from the two times visit in each month represented a replication, hence in 3 months, there were 6 replicates in each location. On each day of visit three tubers of rotten yams of each variety were randomly picked and sampled for the incidence of disease types. Sampling was done on the presence or absence of disease. Wire mesh was used to protect the yam brought and stored in the plant science laboratory from direct attack by insects and rodents (Eze, 1984)

Isolation of Fungal Pathogen

The isolation technique was similar to that used by Onyike and Maduewesi (1985).Small sections of yam tissues containing the advancing margin of rot and adjoining healthy tissue were surface sterilized by immersion in 0.1% mercuric chloride solution for 1-2 minutes and rinsed three times in sterile distilled water. The peeled and sliced periderm of the rotted yams were plated on Potato dextrose agar (PDA) and incubated at 27± 2ºC for 7 days. The fungi that grew were sub-cultured on Potato dextrose agar (PDA) and the rot fungi were isolated and later identified .Fungi identification was carried out according to Domsch *et al.*,1980; Samson *et al.*,1984 and Rippon, 1958.

Pathogenicity Test

To establish which of the microbial isolates caused rot, 2cm long cylindrical covers was removed from the middle portion of a healthy sterilized tubers. The tubers were first of all washed with 2% sodium hypochlorite and allowed to dry. Discs, 5mm in diameter of two-day old fungal cultures of each isolate were inoculated, fungi first, into

the holes made on the tubers with cork borer. The covers of the yam were replaced after 5mm pieces had been cut off to compensate for the thickeness of the fungal culture.

Results

The species of fungi isolated and identified from the yam samples were *Aspergillus niger, Aspergillus flavus, Rhizopus stolonifer,Sclerotium rolfsii,Fusarium oxysporium, Rhizoctonia* spp. Their frequencies of occurrence were 38.6%, 19.3%, 18.1%, 20.0%, 7.2%, 4.8% respectively (Table 1). Three species of yam were examined. These species of yam are common in this locality. They include; *Dioscorea rotundata* (white yam), *D. cayenesis* (yellow yam) and *D. alata* (water yam). The survey revealed the prevalence of three major post-harvest diseases of yams. These include; dry rot, soft rot and wet rot. This accounted for 54.2%, 36.1%, 9.6% respectively Table 2. The incidence of fungi species in the five different localities is presented in Table 3. Laminga had the highest incidence of fungi (18), while Kana area had the lowest (15). The frequencies of occurrence of fungi species are independent of different localities in Keffi Local Government Area (Table 4). The percentage infection of yam tubers artificially inoculated with fungi isolated from diseased tubers is presented in table 5.Five of the six isolates artificially inoculated on the yam tubers were found to induce rot. *A.niger* produced 100% rot on the inoculated tubers while A.*flavus, Sclerotium rolfsii* produced 80% on the inoculated tubers. *Rhizoctonia sp* failed to induce rot in the tuber.

Table 1: Frequency of occurrence of fungi isolates in different yam species.

Yam spp	*Aspergillus niger*	*A Flavus*	*Rhizopus stolonifer*	*Sclerotium rolfsii*	*Fusarium oxysporum*	*Rhizoctina sp*
Dioscorea rotundata	15	5	5	3	2	2
D. alata	8	6	5	4	1	1
D. cayenesis	9	5	5	3	3	1
Percent total	38.60%	19.30%	18.10%	20.00%	7.20%	4.80%

Table 2: Frequency of occurrence of the different disease conditions.

Disease condition	Frequency of occurrence	% occurrence
Dry rot	45	54.2
Soft rot	30	36.1
Wet rot	8	9.6
Total	83	100

Table 3: Incidence of fungi species in different keffi Local Government Area.

Town	Total No. of yam Examined	No of fungi species	No without fungi species
Kana	18	15{16.7}*	3{3.3}*
Kofa Gwari	18	17{18.9}*	1{1.1}*
Laminga	18	18{20.0}*	0{0}*
Garaku	18	16{17.8}*	2{2.2}*
Kokona	18	17{18.9}*	1{1.1}*
Total		83	7

* Figures in parenthesis are percentages

Table 4: Chi-square on the relationship between fungal isolates and different towns in Keffi Local Government Area

Town	No of fungi species	No without fungi species	Total
Kana	15(15)*	3(3)*	18
Kofa Gwari	17(15)*	1(3)*	18
Laminga	18(15)*	0(3)*	18
Garaku	16(15)*	2(3)*	18
Kokona	17(15)*	1(3)*	18
Total	83	7	90

*Numbers in parenthesis are expected frequencies

There was no significant difference (P >0.05) in the incidence of the different isolates in relation to location.

Table 5: Percentage infection of yam tubers artificially inoculated with fungi isolated from diseased tubers.

Fungi isolate	No of tubers inoculated	% infection after 5 days
Aspergillus niger	5	100
Aspergillus flavus	5	80
Rhizopus stolonifer	5	40
Sclerotium rolfsii	5	80
Fusarium oxysporum	5	100
Rhizoctonia sp	5	0

Discussion

This survey has revealed that a wide range of fungi are responsible for the storage rot of yams in Keffi & environs, Nasarawa State,Nigeria. These include; *Aspergillus niger,Aspergillus flavus,Rhizopus stolonifer, Sclerotium rolfsii,Fusarium oxysporum* and *Rhizocina* sp.These fungal species isolated and identified in this study corroborate those isolated and reported earlier Okoro and Nwankiti, 2004.

The investigation also showed that there are three types of storage rot of yams in the area ; dry rot, soft rot and wet rot. These diseases have been reported in other states of the federation (Amusa and Baiyewa ,1999).These rots experienced may be as a result of poor handling before, during and after harvest (Morris, 1977).

During storage, the tubers are subject to losses of up to 50% of the fresh matter. Here, the losses due to microbial attack play a predominant role. The fungal pathogens penetrate through wounds in the tubers and infect the inner tubers tissue. Such wounds are caused by insects, nematodes and poor handling before, during and after harvest (Morris,1977). There is no significant difference on the percentage incidence of the disease conditions in all the localities since the towns adjoin each

other as such, have barely little variation in weather and climatic factors, though with little variation in the soil types, ranging from loamy to sandy loam.

The presence of the above mentioned diseases is of economic importance. Some fungal pathogens produce mycotoxins in their infected products. Mycotoxins are hazardous to human and animal health (WHO,1979). *Fusarium* species produce *Fusarium* toxins such as Trichothecenes,diacetoxyscirpenol, nivalenol and zearalenone, these cause skin diseases, gastroenteritis, rectal hemorrhage, vomiting and several other disease (Krogh,1988). *Aspergillus* spp such as *Aspergillus flavus* and *Aspergillus parasiticus* produce aflatoxins (B1,B2,G1,G2) of which aflatoxin B1 is highly carcinogenic causing hepatoma (WHO,1983).

Yams should be handled with care to avoid mechanical injuries which may pave way for the entry of pathogens. Measures should be carried out through genetic engineering to improve on the storage capacity of yams.

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