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Evaluation of Rot Resistant Trait in Wild Yam for Improved Production and Storability of Yam in Southern Nigeria

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Abstract

This study was conducted at the Central Laboratory services of National Root Crops Research Institute Umudike, Abia State to evaluate the genetic rot resistance in wild yam (*D. sinicacifola)* for improve production and storability. It is a laboratory experiment designed to isolate and identify the rot causing organism in yam. To study the phytochemical of wild yam as a prelube to determine its activities against rot causing organism. Roten yams, collected from different locations, were subjected to fungal isolation analysis was carried out to isolate fungi. The 3 samples were analyzed as indicated in table 3. The following fungi were isolated *aspergillus spp, penicillium spp, fusarium spp, botyodiptodias, Rhizopus,* yeasts, *cladosporum spp*, and mucor in the 3 samples analyzed *Aspergillus spp, penicillium spp, fusarium spp Botyodiptodia* and yeast were present in the 3 samples while Rhizopus was negative in the first sample but appeared positive in the other 2 samples. Also *cladosporum spp* was absent in first and second samples and present in the third sample. The mucor was present in the sample 1 and 2 but absent in the third sample. For the pathogenicity the following fungi appeared positive in the 3 samples. They include *Aspergillus, Penicillium* spp, Fusarium spp, and *Botydiptodias*. Rhizopus was absent in the samples one and three but remain present in the second sample. Yeasts, *cladosporum spp* and mucor were totally absent in the 3 samples. Table 1 shows the phytochemical composition of the wild yam and the domestic yam. The wild yam consists of the following antinutritional constituents, tannin 1.78%, Alakaloid 2.18%, Phanol 0.36%, phytrate 0.68%, Ozalate Nil, HCN 21.6mg/kg and flavonoid 1.13% in the domestic yams, D.alata, Tannin stool at 0.08%, Alakaloid 0.08%, phenols is nil, phytrate 0.01%, Ozalate 0.04%, HCN 10.8mg/kg and flavonoid remained at 10.8% in D.cayanensis, Tannin 0.03%, Alakaloid 0.14%, phenol nil, phystrate 0.01%,Oxalate 0.05%, HCN 19.9% and flavonoid 19.9%. In *the D. rotundata,*. Tannin 0.02%, Alakaloid 0.10%, phenols nil, phytrate 0.01% oxalate nil, HCN 18.9% and flavonoid 18.9%.

Keywords: Evaluation, Rot Resistant, Wild Yam, Production, Nigeria

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Introduction

Yam is a member of the genus *diocorea* and produce tubers, bulbils or rhizomes that are of economic importance especially as food for man. They are monocots and belong to the family *dascoreacace* (Ayensu, 1972). Yam is one of the comparatively few words of West African origin to have entered European languages. It is believed to be derived from mande nian or the Temne enyame. This was adapted into Portuguese as ynhame thence into Spanish as name, French igname and English yam (Ayensu and Coursey, 1972). (A.U. Osagie, 1992) reported that the most important species, *Dioscorea alata, Dioscorea cayenesis*, *Dioscorea rotundata* and *Dioscorea trifida* originated in southern Asia, west Africa (*D. Cayenesis* and *D. rotundata*), and tropical America respectively. (Onwueme, 1978) confirmed that tuber can remain in the ground until needed, harvested tubers are most often stored in yam barn where they are stacked and tied uniformly to heights. 7 into 2m. Loss in flavor and qualify of the tubers occurs on storage. Most yams are marketed as fresh produce. Yams are also preserved as dried flasks or flour. The cultivation of yam particularly in West Africa is surrounded by considerable rituals. At each stage of the production process, rituals and traditional religious practices are performed for the success of the crop. It is noteworthy that no other crop in Africa is associated with a greater amount of social and cultural activity than the yam.

Osagie, (1992) confirmed that tubers under good storage condition retains their edibility and marketability by preventing large moisture losses, spoilage by pathogens, attack by insects and animals and sprout growth. It should also prevent large accumulation of sugars, which leads to unpleasant sweet taste. Storage condition should aim to prolong the dormancy period and delay sprouting. (E.W. Martin and M.H. Gaskins, 1968) accepted that sapogenin bearing, Dioscorea species are relatively free from attacks of pests and diseases. Sapogenin-bearing *dioscorea* species yield the most, widely used precursors for synthesis of steroidal drugs. Although the plants are drought tolerant, supplemental irrigation during dry weather is advisable, especially immediately after planting. Tubers may be harvested when they are 3 or 4 years old. Propagation from seeds is considered the most reliable method, however, although more expensive and less reliable, asexual propagation may be used profitably under some circumstances.

However, preservation has always met with difficulties because of rot or increased metabolic activities at the onset of sprouting (Ugochukwu, *et al*, 1977). Prof. C. Iloba in the 1996 work of K.R. Green and D.A Florini confirmed that losses due to fungal damage are difficult to quantify, although it is known that farmers start to utilize tubers immediately after harvest in order to avoid the problem of biodeterioration. Prof. Lloba listed eleven pathogens that were routinely isolated from symptoms of soft rot on diseased tubers but argued that establishing the role of these fungi in tuber biodeterioration would be an important step towards control. It was emphasized that the distinction between field and storage problems is artificial, since systemic infection could commence in the field and continue in storage, particularly for pathogens such as Fusarium, *Sotryodiplodia* and *Colletotrichum*.

Materials and Methods

The analyses were conducted in 2011 at the central laboratory services unit of NRCRI Umudike. The phytochemical analysis was carried out as follows. Tannin and phenols were determined by the Folin-Dennis colorimetric method (Kirk and Sauyer, 1991) while flavonoid and alkaloid were determined by the precipitation grammetic method (Harborne 1973). Hydrocyanic acid (HCN) was determined by the alkaline picrate colorimetric method (Balagopetan, *et al.*, 1988) while phytate and oxalate were determined according to the method described by Onwuka, (2000). Isolation of fungi was done by the method described by Fandle and Oso, (1998) while characterization and identification of the isolates was based on existing taxa in Barnett and Hunters, (1987). Illustrated genera of imperfect fungi. Pathogenicity test was done following the methods of Okigbo and Ikediegwu, (2000).

Results and Discussion

In table 1, it show that the phytochemical composition of the anti-nutritional constituents in the wild yam has a higher percentage of the constituents than in the domestic yam spp. except in Phenol which was 0.36% and in the domestic yam spp it was nil in all the domestic yam spp. It also show that the anti-nutritional factor oxalate was present in the two domestic yams like in *D. alata* and *D. cayanenesis* while in wild yam there was less percentage of Flavonoid and higher percentage in all the domestic yams. In table 2, it show the presence of fungi isolated from the 3 samples collected from different locations. In the 3 samples collected, *Aspergilus spp, Penicillium spp, Fusrium spp, Botyodiptodias* and yeasts were identified as being common in the 3 samples. In the first sample there was absence of Rhizopus, but present in samples 2 and 3. *Cladosporum* was absent in the first and second samples but present in the third sample. The Mucor was present in 1 and 2 samples but remained absent in the third sample. It highly indicated that the isolated fungi that are common in all the samples remain the main causer of yam spp rot while Rhizopus, *Cladosponuim* and Mucor were less effective to the rot of the yam spp.

In Table 3, the causal diseases of rot in yam spp was identified as follows, *Aspergillus, Penicillium spp, Fusarium* spp and Botyodiptodias show high degree of pathogen infestation. Primarily, Rhizopus was less effective. It effect depends on the location of collection of sample. Yeasts, *Cladosporum spp* and Mucor were not effective in the decay of the yam spp. they were totally absent in the causal effect of the rot

Conclusion and Recommendations

The laboratory analysis indicate the presence of diverse phytochemicals of varying concentrations, phenols, tannin, phytales, alkaloids, cyanogenic glycosides (HCN) and flavonoids. There concentrations in the wild yam is shown in table 1a while the relative concentration of the phytochemicals in the normal domestic yams are shown in table 1b. The results indicates that the concentration were higher in the wild yam than the domestic yam. The eight fungi species were isolated from the diseased yam samples obtained from three different locations. Their respective distribution as shown in table II, the eight fungi isolate were subjected to pathogenicity test and four species, *Aspergillus, Penicillium, Fusarium* and *botryodiplodia* were found to be completely pathogenic causing disease in health yam tubers as shown in Table 3. Rhizopus was slightly pathogenic causing slight disease condition in just one of the three tested samples.

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Tables

Table 1: Phytochemical Composition of anti-nutritional constituents of wild yam

Percentage	**%Age**	**%Age**	**%Age**	**%Age**	**%Age**	**HCN**	**%Age**
Sample	Tannin	Alakaloid	Phenols	Phytrate	Oxalate	Mg/Kg	Flavonoid
Wild Yam	1.78	2.18	0.36	0.68	NIL	21.6	1.13

Table 2: Phytochemical Composition of anti-nutritional constituents of domestic yam spp

Percentage	**%Age**	**%Age**	**%Age**	**%Age**	**%Age**	**HCN**	**%Age**
Sample	Tannin	Alakaloid	Phenols	Phytrate	Oxalate	Mg/Kg	Flavonoid
D.alata	0.08	0.08	-	0.01	0.04	10.8	10.8
D.cayanensis	0.03	0.14	-	0.01	0.05	19.9	19.9
D.rotundata	0.02	0.10	-	0.01	Nil	18.9	18.9

Source: Udoessien E.I. and E.I Ifont (1992)

Table 3: Fungi isolated from Roten Yams spp collected from different locations

Sample	I	II	III
Aspergillus spp	+ve	+ve	+ve
Penicillium spp	+ve	+ve	+ve
Fusarium spp	+ve	+ve	+ve
Botyodiptodias	+ve	+ve	+ve
Rhizopus	-ve	+ve	+ve
Yeasts	+ve	+ve	+ve
Cladosporum spp	-ve	-ve	+ve
Mucor	+ve	+ve	-ve

+ve = present. -ve= absent

Table 4: The evaluation of pathogen of yam spps

Sample	I	II	III
Aspergillus spp	+ve	+ve	+ve
Penicillium spp	+ve	+ve	+ve
Fusarium spp	+ve	+ve	+ve
Botyodiptodias	+ve	+ve	+ve
Rhizopus	-ve	+ve	-ve
Yeasts	-ve	-ve	-ve
Cladosporum spp	-ve	-ve	-ve
Mucor	-ve	-ve	-ve

+ve = present. -ve= absent