Assessment of Fungi Flora and Proximate Composition of Two Varieties of Groundnut in Rivers State

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Abstract

Study on the fungi flora and proximate composition of two varieties of groundnut in Rivers State was carried out in the department of Plant Science and Biotechnology, Rivers State. Cultural laboratory method was used to evaluate the fungi flora while the method of Association of Official Analytical Chemists (AOAC) was used to determine the proximate nutrient. Fungi screening revealed a total of seven fungal organisms (Rhizopus sp, Aspergillus sp, Gliocladium sp, Paecilomyces, Penicillium, Fusarium sp, Scopulariopsis sp). However, all isolates were present in SAMNUT-21 while SAMNUT-23 recorded all with exceptions of Gliocladium sp and Scopulariopsis sp. Highest incidence (25.3% Fusarium sp) and (31.5% Aspergillus sp) were recorded for SAMNUT-21 and SAMNUT-23 respectively, 8.0% Gliocladium sp and 6.9% Paecilomyces recorded lowest incidence for SAMNUT-21 and SAMNUT-23 respectively. Proximate evaluation showed the availability of moisture, protein, fat, fibre and ash in both varieties of groundnut. Highest values of moisture (16.96±0.02) protein (32.72±0.00) and fat (33.67±0.01) were observed for SAMNUT-23 while SAMNUT-21 recorded highest values (33.60±0.02), (34.04±0.04) and (48.95±0.00) for moisture, protein and fat respectively. Generally, both varieties had appreciable proximate nutrient but are still susceptible to fungi attack.

Keywords: *Fungi Flora, Proximate Composition, Varieties and Groundnut*

INTRODUCTION

Groundnut also known as peanut is botanically known as *Arachis hypogea*, belonging to the Fabaceae plant family. It is an annual plant, producing its fruit below ground but flowers, stems and leaves are produced above ground (Engin *et al.*, 2018). It is a self-pollinating, herbaceous legume crop serving as a good source of feed for livestock, it improves soil through nitrogen fixing bacteria hence increasing productivity of other crops (Vadez *et al.*, 2012).

The plant is highly nutritious and serves as a protein substitute (Martey *et al.*, 2015). It contains 48-50% oil, 25-80% digestible protein, 10-20% carbohydrate and provides about 564kcal of energy (Arya *et al.,* 2016). In addition, it is also a good source of micronutrients. The haulms of groundnuts are used as feed supplements in ruminant production (Konlan *et al.*, 2012) and also in poultry production as it also increases the body weight of broilers (Ribadiya *et al.,* 2015).

Groundnut being one of the mostly and widely grown leguminous plants worldwide (FAOSTAT, 2014) the loss of yield and spoilage are attributed to several organisms such as *Spodoptera litura* (Saleem *et al.,* 2019), *S. hori*, *Cercospora arachidicola*, *cercosporidium personatum* (Hamidou *et al.,* 2014). Aflatoxins produced by *Aspergillius flavus* and *A. parasiticus* causes spoilage (Hamidou *et al.*, 2014*). Puccinia arachidis* was also reported by (Mondal and Badigannavar, 2015) causing rust diseases.

MATERIALS AND METHODS

Collection of Groundnut samples

Freshly harvested groundnuts were collected randomly from farmers in Abua and Ogbakiri located in Abua-Oduah and Emuoha Local Governemnts Areas respectively in Rivers State. The samples were collected in clean black polyethylene bags, labelled accordingly and transported to ADP for proper identification. Groundut samples collected from Ogbakiri were identified as SAMNUT-21 variety while those obtained from Abua were identified as SAMNUT-23. Identified samples were immediately brought to the Department of Plant Science and Biotechnology for further studies

Isolation of Fungi from Groundnut Samples

The tissue segment method of Vasumathi and Ahila (2020) was adopted in cultivation and isolation of fungi. In this method, the infected parts were cut into small pieces immediately after washing the tissues thoroughly with sterile distilled water and in 0.1% mercuric chloride solution used for surface sterilization of plant tissues. The cut parts of the pods were transferred to freshly prepared Sabouraud Dextrose Agar (SDA) plates supplemented with 50mg tetracycline antibiotics to inhibit bacterial growth and incubated for 5-7 days at 22℃ (Douglas and Robinson, 2018; 2019). The control were pods showing no rots or observable disease.

Purification of Fungal Isolates

The SDA plates were observed for fungal growth after incubation. The fungal isolates were isolated and purified using the hyphal tips technique (Thilagam *et al.,*2018) on freshly prepared SDA plates and incubated for 2-5 days. After incubation, the fungal isolates were subcultured on SDA slant and preserved in the refrigerator for further studies.

Identification of Isolates

The fungal isolates were identified using their morphological features such as colony color, shape, texture and size of colony followed by microscopic examination (conidial shape, arrangement of hyphae and type of spore) of their wet mounts prepared with lactophenol cotton blue (Robinson *et al.,* 2020) and reference made to fungal identification manual (Sarah *et al.,* 2016).

Determination of fungal percentage incidence

The method of Chuku *et al.* (2022) was used for the evaluation of fungal percentage incidence with aid of the formula below:

Percentage incidence = X/Y x 100/1

Where:

Y= Total number of all identified organisms in a variety

X= Total number of each organism in a variety

RESULTS AND DISCUSSION

Table 1: Incidence of fungi in Ogbakiri Groundnut Farm Sample SAMNUT-21 (UGA-2)

Fungal isolates	Ogbakiri Farm **SAMNUT-21 (UGA-2)**	**Abua Farm SAMNUT-23 (ICCGV-1596894GA-2)**
	% incidence	**% incidence**
Rhizopus sp	20.7	16.4
Aspergillus sp	11.5	31.5
Gliocladium sp	8.0	-
Paecilomyces	10.4	6.9
Penicillium	11.5	19.2
Fusarium sp	25.3	26.0
Scopulariopsis sp	12.6	-

Table 2: Proximate composition of groundnut samples before treatment with plant extracts

SAMPLE ID	**MOISTURE**	**PROTEIN**	**FAT**	**FIBRE**	**ASH**
DS 23	13.31±0.26	32.72±0.00	33.67±0.01	10.10±0.01	4.28±0.03
DS 21	7.13±0.01	34.04±0.04	25.83±0.02	8.92±0.03	4.37±0.02
FS 23	16.96±0.02	22.87±0.02	10.81±0.02	5.24±0.02	2.36±0.14
FS 21	33.60±0.02	22.52±0.01	48.95±0.00	4.68±0.02	2.31±0.02

DS 23 – DRY SAMNUT-23, DS 21 – DRY SAMNUT-21, FS 23 – FRESH SAMNUT-23, FS 21 – FRESH SAMNUT-21

Results of the incidence of fungi in Ogbakiri and Abua groundnut farm for SAMNUT-21 (UGA-2) and SAMNUT-23 (ICCGV-1596894GA-2) is presented in Table 1. Results showed that seven fungal genera belonging to *Rhizopus*, *Aspergillus*, *Gliocladium*, *Paecilomyces*, *Penicillium*, *Fusarium* and *Scopulariopsis* were isolated from the Ogbakiri farm while five genera such as *Rhizopus*, *Aspergillus*, *Paecilomyces*, *Penicillium* and *Fusarium* were isolated from the Abua farm. Both farms do not cultivate similar groundnut varieties. More so, amongst these fungal genera, *Fusarium* sp had the highest incidence (25.3%) followed by *Rhizopus* sp (20.7%) while

Gliocladium sp (8.0%) had the least incidence in the groundnut samples. Unlike the incidence of fungi in Ogbakiri farm, in Abua farm, *Aspergillus* sp (31.5%) had the highest incidence followed by *Fusarium* sp (26.0%) while *Paecilomyces* sp (6.9%) had the least incidence in the farms.

The fungi isolated from this study are *Rhizopus sp,Aspergillus sp, Penicillium, Paecilomyces, Fusarium sp, Gliocladium sp, Scopulariopsis sp* from both groundnut varieties and most of the organisms isolated have been isolated in previous studies. Abuga (2014) also reported *Aspergillius spp, Penicillium spp, Mucor spp, Rhizopus spp, Fusarium spp* were present. In a study conducted by Ezekiel *et al.,* (2008) and Aliyu and Kutama (2010), the presence of the same fungal isolates was revealed.

This study revealed the presence of fungi in the groundnut varieties to be consistent with the findings of Xing *et al.,* (2016). The high incidence of fungal abundance can be attributed to various abiotic factors, which agrees with the findings of Tally *et al.,* (2002), who reported consistent trend for fungi abundance to decrease as temperature increases. Also the fungal isolates found in both varieties shows that groundnut might be susceptible to fungal attack especially to *Rhizopus spp* and *Aspergillius spp* which agrees with the findings of Salau *et al.,* (2017), that reported groundnut are highly susceptible to *Aspergillus spp.* contamination. These fungi produce secondary metabolites known as patulin which can lead to neurological, immunological and gastrointestinal disorders (Pal *et. al.,* 2017).

The result on proximate composition of both fresh and dry SAMNUT 21 and 23 presented in Table 2 Showed the availability of moisture, protein, fat, fibre and ash. Fresh samples of SAMNUT 21 and 23 recorded higher moisture contents (33.60$\pm$0.02 and 16.96$\pm$0.02 respectively) compared to those documented for the dry. However, the dry samples of both varieties of groundnut recorded higher protein, fibre and ash than those recorded for the fresh samples. Fat content assessment showed higher values for dry SAMNUT 23 (33.6$\pm$0.01) and fresh SAMNUT 21 (48.95$\pm$0.00).

The results for proximate composition of groundnut before storage revealed that dried groundnut is rich in protein and fat but has low ash, fiber and moisture contents while fresh groundnut has high fat and moisture content, considerable protein content and low fiber and ash contents. The results for proximate composition of the groundnut samples revealed that there was significant difference in the percentage composition of groundnut for moisture content, crude protein, crude fat, crude fiber, total ash and carbohydrate.

In line with these findings, Aliyu *et al*. (2020) reported that groundnut is an important source of edible oil and the seeds contain high quality edible oil (50%), easily digestible protein (25%) and carbohydrates (20%). Ahmed *et al*. (2020) also reported that the "nuts" are high in oil content (40% - 50%) and protein content (25% - 32%), and also a good source of essential vitamins and minerals. This is supported by the findings of Dele *et al*. (2019) who carried out a study on forage yield and nutritive quality of two groundnuts (*Arachis hypogaea* L) varieties as influenced by fertilizer types.

Also, in a study on nutritional and functional characterization of undecorticated Groundnut (*Arachis hypogaea* L.) seeds from Bosso market, Minna, Nigeria, Mustapha *et al*. (2015) reported that groundnut seeds samples contained 40.10 to 42.13 % fat, 24.48 to 26.37 % crude protein, 4.24 to 6.30 % carbohydrate, 3.02 to 5.08 % moisture, 17.32 to 22.70 % crude fibre and 1.51 to 2.33 %

ash. These values agree with those reported in this study and highlight the nutritional importance of groundnut.

Usually, the moisture content of raw groundnut seed is significantly high compared to the toasted and sundried groundnut since it was not exposed to any heat. In this study, the moisture contents of the groundnut seeds were lower when compared to those reported by Ibeabuchi (2014) on the proximate and functional properties of raw and fermented bottle gourd seed (*Lagenaria sicerari*). The implication of low moisture content is that it would enhance storage stability of the groundnut by preventing mold growth and also suitability and adaptability for further use in food formulation.

CONCLUSION

Both groundnut varieties possess vital proximate nutrients including moisture, fibre ash, protein and carbohydrate. However, both varieties were prone to fungal contamination. Strict hygienic measures should be adopted to prevent the contamination of groundnut.

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