ASSESSMENT OF FUNGI ASSOCIATED WITH THE DETERIORATION OF SOME FRUITS SOLD IN WUKARI TARABA STATE, NIGERIA.

Supported by tetfund

Brown, S .T. C., Bighas, Manasseh Musa and Ogodo, Alloysius Chibuike
Department of Microbiology, Faculty of Pure and Applied sciences, Federal University,P.M.B.1020 Wukari,Taraba State Nigeria.
Corresponding Authors: Brown, Samuel Tamuno Iyowuna Cockeye.
Email. S.brown@fuwukari.edu.ng

Received: September 14, 2023 **Accepted:** November 28, 2023

Abstract: Fruits such as mango, sweetmelon, watermelon, banana and cucumber etc. are very important in human and animal nutrition as they provide sources of vitamin, and other essential nutrients. This study aims at the assessment of fungi associated with the deterioration of some fruits sold in Wukari, Nigeria. A total of sixty (60) fruit samples comprising twelve (12) each of mango, sweetmelon, watermelon, banana and cucumber were randomly selected from twelve locations in Wukari town and markets to determine the fungal load and the type of fungi present in the samples using standard Microbiological techniques. The results revealed that the fungi load varied across the samples ranging from 1.10 x 10^5 sfu/g and 3.0 x 10^5sfu/g. The fungi isolated from the various spoiled fruits were .*Aspergillus niger, Aspergillus flavus, Aspergillus fumigatus, Mucor puriformis, Fusarium proliferatum,Penicillium glabrum, Penicillium citrinum, Saccharomyces cerevisiae and Geotrichum candidum*. The percentage occurrence of the isolates on the samples showed that *Aspergillus niger* (56.70%), *Saccharomyces cerevisiae* (50%), *Fusarium proliferatum* (50%), *Aspergillus flavus* (43.33%), *Penicillum citrinum* (38.33%) while *Mucor puriformis*, *Penicillium glabrum* and *Geotrichum candidum* were the least at (31.70%) each. The occurrences of the isolates based on sampling points indicated that Federal University Wukari Up-gate Mini Market was the least at (5.61%), followed by Saint Mary Wukari (9.64%), Takum Junction Wukari (9.64%), Wukari Yam Market (9.64%), DSK Foundation (8.70%), Ibi Roundabout (8.70%), Old Market (8.70%), New Market (7.60%), Songai junction (7.60%), Rafinkada (7.20%) and Doruwa (6.62%) while samples from General Hospital Roundabout had the highest percentage of fungi isolates (10.20%) respectively. The occurrences of the isolates based on the type of fruit shows that sweetmelon was highly deteriorated at (32.42%), followed by cucumber at (23.82%), watermelon at (21.14%), banana (12.88%) and the least was mango at (9.75%).The presence of the isolates is of public health significance since they could lead to aflatoxicosis, hence the need for proper handling and storage of ready-to-eat-fruits in Wukari to reduce the level of fungal contamination.

Key words: Deterioration, Fruits, Fungi, Samples and Wukari

Introduction

The 'fruit' is the part of a flowering plant that contains the seed. Angiosperm, which includes the ovary from which a fruit is generated, is another name for flowering plants (Huldrych *et al*., 2023). Humans and animals rely on fruits as part of their nutrition and as sources of nutrients for growth and development. "Fruits" are simply plants that have seed (s) wrapped in a fleshy edible structure that is typically sweet or sometimes sour and eaten in the raw form (Schlegel 2003). Examples of such plants include watermelons, oranges, apples, strawberries, and so on (Rejman *et al*., 2002).

For the past decades, there has been a significant global increase in the consumption of fruits and its products (Barth *et al.*, 2009). Fruits play a crucial role in human nutrition and wellbeing by delivering the necessary growth factors, such as vitamins and critical minerals in human daily diet. Fruits constitute are commercially and nutritionally significant and indispensable food commodity which are known to lower the incidence of vitamin deficiency (Onyemata and Ibrahim, 2018). Fruits are known to maintain overall body health because of the presence of phytochemicals which are reported to prevent certain diseases like cancer, type 2 diabetes, cardiovascular disease, and stroke (National center for Biotechnology 2010).

The nutritional values of mango fruits incudes 25mg potassium, 0.2mg vitamin B-6, 24g sugar and 76 percent daily value of vitamin C and the nutritional value of banana fruits are 3g of fiber, 450mg of potassium, 28g carbohydrate ,15g sugar which provides the body with low glycemic index and so also sweetmelon and water melon contains 8g of sugar, 0.8g of dietary fiber, saturated fats 0g,sodium 18mg, vitamin C 30%, iron 1% and magnesium 2% (Harvard 2023).

The relatively short shelf-life time brought on by pathogen attacks is one of the limiting variables that have an impact on the fruits and their product value (Al-Hindi *et al.*, 2011). It was estimated that about 20-25% of the harvested fruit and vegetables got decayed by pathogens during post-harvest handling even in developed countries resulting from inadequate storage and transportation infrastructure especially in developing countries including Nigeria (Kumar *et al.*, 2018). Fruit are contaminated by fungi during the growing season, harvest, handling, transit, post-harvest storage, and marketing circumstances, or even after the consumer has purchased it (Al-Hindi *et al.*, 2011). In addition, fungi, bacteria, physiological variables, and environmental factors are significant contributors to fruit deterioration. These are characterized by an unfavorable change in texture, flavor, and color (Lorenzo *et al.*, 2017).

Fruits are rich in nutrients and water, which are necessary for the growth and reproduction of fungi.

Nevertheless as fruits are acidic in nature, fungi are the major cause of fruit deterioration (Udoh *et al.*, 2015). For instance *Aspergillus niger* and *Candida tropicalis* were found to be responsible for the deterioration of orange fruits (Akinro *et al.*, 2015) while *Fusarium* sp. and *Rhizopus stolonifer* are reported to be responsible for the soft rot of tomato and pineapple (Mailafia *et al.*, 2017).When these fungi species infest fruits, they release mycotoxins, which are toxic chemicals that spread quickly throughout the fruit and can lead to food intoxication in human and post- harvest loses. Moreover, an earlier report asserts that, 20% of fruits are lost due to spoilage by Fungi which can be toxigenic or pathogenic (Eni *et al.*, 2010 and Thiyam *et al.*, 2013).

Factors such as dust, water from irrigation or natural sources ,contaminated soil, nature of fruits, PH, amount of moisture, nutrient composition of fruit as well as biological make- up of the fruits contributes to the presence, type and rate of deteriorations of fruits by fungi (Magnolli *et al.*, 2003).Hence, there is need to ascertain the type of fungi species associated with the deterioration of fruits. Therefore, these study is aimed at assessing the fungi associated with the spoilage of mango, sweetmelon, watermelon, banana and cucumber fruits in sold in Wukari ,Nigeria.

Materials and Methods

Description of the Study Area:

The study was conducted in Wukari and it 'environs located in southern senatorial district of Taraba State. It covers an estimated landmass of 4308 km^2 and a population of 241,546 during the 2006 census and geographical coordinates of $7^0$51N$9^0$47E and also the area is characterized by two seasons namely wet and dry seasons. The wet season lasts between April and early October with a unimodal peak of rainfall in August (Nigeria Population Commission 2006). Wukari town lies near Benue State and it is commonly regarded as the headquarters of Kwararafa kingdom with the Jukuns as dominant ethnic group .The major occupation of the inhabitant is farming ranging from peasant to commercial farming of cereals, rice farming, corn, Yam, Beni seed, Bambara nut. Fruits are largely cultivated and sold in many parts of Taraba State including Wukari (Ogodo *et al*., 2015).

Sample Collection

A total of sixty (60) fruit samples comprising twelve (12) each of deteriorated mango, sweet melon, watermelon, banana, and cucumber were randomly collected from the sellers at Federal University up-gate mini market, New market, Old market, Songai, Ibi Round About, DSK Foundation junction, Rafinkada market, Dorowa market, General Hospital junction, Saint Mary's Catholic Church Junction, Yam market, and Takum Junction.

The samples were collected in sterile polythene bags to avoid further deterioration and then transported to the Biological Science Laboratory, Federal University Wukari for assessment of fungi contaminants.

Isolation and Identification of spoilage fungi from spoiled fruits

1. Enumeration of fungi from the spoiled fruit samples

One gram (1.0g) from twelve (12) of each of spoiled mango, sweetmelon ,watermelon ,banana and cucumber samples were carefully crushed in a sterile conical flask having 9mL of distilled water which formed a 10^{-1} solution and then serially diluted using ten- fold dilution as described by Koch (1883) and 1.0mL from 10^{-5} dilution was inoculated into petri dish and then homogenized with 20 aliquot of freshly prepared Saboraoud Dextrose Agar and incubated at 28^{o}C for 48 hrs.

2. The isolation of fungi

The plates in one above were examined for fungi colonies and were counted using plate counters. The colonies were calculated and represented as spore forming unit per gram (sfu/g).The distinct fungi colonies were subcultured on fresh media by spot inoculation for mold, streaking for yeast and stabbing on freshly prepared slants.

3. Identification of fungi isolates

The pure fungi isolates were identified by standard laboratory procedure which include macroscopy (color: black, yellow, whitish, brownish, etc, type of growth: radial, spread, fast, slow etc., reverse: yellow, brown, black etc) and microscopy (septate, non-septate, spore and non-spore etc) or on the basis of cultural and morphological characteristics with reference to Barnett *et al*., (2000).

4. Pathogenicity test of the fungal isolates

Sixty (60) healthy fruits which are mango, sweetmelon, watermelon, banana and cucumber were aseptically washed and rinsed with sterile distilled water and their surfaces were disinfected with 70% ethanol. Sterile cork borers were used to bore holes in each of the healthy fruit samples. Each of the pure fungi isolate was inoculated on to the healthy fruits after which cores of the fruits were replaced. The holes on the fruits were sealed with sterile petroleum jelly to reduce contamination. As a control, sixty healthy fruits were wounded with cork borer without inoculates. Both the inoculated and the control were placed in sterile polythene bags (one in each bag). Each was moistened with wet balls of absorbent cotton wool to provide a good environment. The fruits were later incubated at room temperature for five days and observation was made to check deterioration by measuring the length of deterioration in millimeters (mm). The fungi were isolated again from the fruits and compared with the original isolates.

2.7 Statistical analysis

Data obtained from this research work were systematized using ANOVA and simple descriptive statistical tools such as tables and line graphs, average and percentages.

Results

Table 1: The fungal load of (sfu/g) of the various spoiled fruit samples

S/N	SAMPLE LOCATION	MANGO	SWEET MELON	WATER MELON	BANANA	CUCUMBER
1	WIR	2.0×10^5	2.0×10^5	3.0×10^5	3.0×10^5	2.0×10^5
2	WNM	1.0×10^5	2.0×10^5	1.0×10^5	2.0×10^5	2.0×10^5
3	WOM	2.0×10^5	2.0×10^5	2.0×10^5	2.0×10^5	3.0×10^5
4	WTJ	2.0×10^5	2.0×10^5	2.0×10^5	2.0×10^5	2.0×10^5
5	WYM	3.0×10^5	2.0×10^5	3.0×10^5	1.0×10^5	2.0×10^5
6	DKS	2.0×10^5	2.0×10^5	1.0×10^5	2.0×10^5	2.0×10^5
7	WSM	2.0×10^5	3.0×10^5	2.0×10^5	1.0×10^5	2.0×10^5
8	FUW	3.0×10^5	1.0×10^5	1.0×10^5	1.0×10^5	1.0×10^5
9	GHM	2.0×10^5	2.0×10^5	2.0×10^5	1.0×10^5	2.0×10^5
10	DM	2.0×10^5	2.0×10^5	2.0×10^5	2.0×10^5	2.0×10^5
11	RM	3.0×10^5	2.0×10^5	2.0×10^5	3.0×10^5	2.0×10^5
12	SM	2.0×10^5	2.0×10^5	2.0×10^5	2.0×10^5	2.0×10^5

WIR=Wukari-Ibi-Roundabout; WNM=Wukari New Market; WOM=Wukari Old Market; WTJ=Wukari Takum Junction; WYM=Wukari Yam Market; DSK=Wukari DSK Foundation; =WSM=Wukari Songai Market; FUW=Federal University Wukari; GHM; General Hospital Market; DM=Dorowa Market; RK=Rafin Kada Market; SM=Saint Mary

Table 1depicts the fungal load of the various spoiled fruit samples. The results demonstrated that overall count ranged from $1.0x10^5$ sfu/ g to 3.0×10^5 sfu/g from the twelve locations.

The fungi isolated and identified from the spoiled fruits sold in Wukari markets are *Aspergillus niger*, *Aspergillus flavus*, *Aspergillus fumigatus*, *Saccharomyces cerevisiae*, *Mucor piriformis*, *Fusarium proliferates*,*Penicillium glabrum* , *Penicillium citrinum* and *Geotrichum candidum* .

TABLE 2: Occurrence of Fungi Isolates in Various Spoiled Fruit Samples

Sample code	*Aspergillus niger*	*Aspergillus flavus*	*Aspergillus fumigatus*	*Saccharomyces cerevisiae*	*Fusarium proliferatum*	*Mucor piriformis*	*Penicillum citrinum*	*Penicillum glabrum*
WIRM 1	+	-	+	-	+	-	+	+
WIRSM 2	-	+	-	-	+	+	-	+
WIRWM 3	-	-	+	-	-	-	+	-
WIRB 4	-	-	+	-	-	+	+	-
WIRC 5	+	+	-	+	-	-	-	-
WNMM 1	-	+	+	+	-	-	-	-
WNMSM 2	-	-	-	+	-	-	+	-
WNMWM 3	-	+	+	+	-	+	-	-
WNMB 4	+	-	-	-	+	+	-	-
WNMC 5	-	+	+	-	-	-	+	-
WOMM 1	+	+	-	-	-	-	+	-
WOMSM 2	+	-	+	-	+	-	-	-
WOMWM 3	+	+	-	+	+	+	+	-
WOMB 4	+	+	+	-	+	-	-	-
WOMC 5	-	-	-	-	+	+	-	-
WTJM 1	+	-	-	-	+	-	-	+
WTJSM 2	-	-	-	-	-	+	+	+
WTJWM 3	+	+	+	+	-	-	-	-
WTJB 4	+	+	-	-	-	-	+	-
WTJC 5	+	+	+	+	+	-	+	-
WYMM 1	+	+	+	-	-	+	+	-
WYMSM 2	-	-	-	-	+	+	+	-
WYMWM 3	-	-	+	+	+	-	+	+
WYMB 4	-	-	+	+	+	-	-	-
WYMC 5	+	+	-	-	-	-	+	-
WDSKM 1	+	-	+	-	-	-	-	+
WDSKSM 2	-	+	-	+	-	-	-	+
WDSKWM 3	+	-	-	-	-	-	-	+
WDSKB 4	+	+	+	-	+	-	+	+
WDSKC 5	-	-	+	-	+	-	-	+
WSM 1	+	+	+	-	-	-	+	-
WSSM 2	+	-	-	-	+	-	-	-
WSWM 3	+	-	-	+	-	-	-	+

WSB 4	+	-	-	-	+	+	+	-
WSC 5	+	-	-	-	-	+	-	-
WFUM 1	-	-	-	-	+	+	+	+
WFUSM 2	-	-	-	-	-	-	-	+
WFUWM 3	+	-	-	+	-	+	-	-
WFUB 4	-	-	-	-	-	-	-	+
WFUC 5	-	+	-	-	-	-	-	+
GHM 1	+	+	+	-	+	+	+	-
GHSM 2	-	+	+	+	-	-	-	-
GHWM 3	+	+	-	+	-	-	-	-
GHB 4	-	-	+	+	-	-	-	+
GHC 5	+	+	-	-	+	+	-	+
DMM 1	-	-	-	-	+	-	-	-
DMSM 2	-	-	-	-	+	-	-	+
DMWM 3	+	-	-	-	+	-	+	-
DMB 4	+	-	-	+	+	-	-	-
DMC 5	-	+	-	+	+	+	-	-
RMM 1	+	+	-	-	-	-	-	-
RMSM 2	-	-	-	-	+	-	+	-
RMWM 3	+	+	-	+	+	-	-	-
RMB 4	-	-	+	-	+	+	-	-
RMC 5	+	-	-	-	+	+	-	-
SMM 1	-	+	+	+	-	-	-	-
SMSM 2	+	-	+	+	+	+	+	-
SMWM 3	+	-	-	-	-	-	+	-
SMB 4	+	-	+	+	+	-	-	-
SMC 5	+	+	-	-	-	-	-	-

TABLE 3: PERCENTAGE OCCURRENCE OF THE FUNGI ISOLATES FROM THE SPOILED FRUIT SAMPLES

S/N	Isolates	Number Examined	Number Positive	Percentage
1	*Aspergillus niger*	60	34	56.70
2	*Aspergillus flavus*	60	26	43.33
3	*Aspergillus fumigatus*	60	20	33.33
4	*Saccharomyces cerevisiea*	60	30	50
5	*Fusarium proliferatum*	60	30	50
6	*Mucor piriformis*	60	19	31.70
7	*Penicillum citrinum*	60	23	38.33
8	*Penicillum glabrum*	60	19	31.70
9	*Geotrichum candidum*	60	19	31.70
	TOTAL		**220**	

Table 3. shows percentage occurrences of each fungus isolate in various spoiled fruit samples from Twelve (12) different locations *Aspergillus niger(56.70%), Aspergillus flavus(43.33%), Aspergillus fumigatus(33.33%), Saccharomyces cerevisiae(50%), Mucor piriformis(31.70%), Fusarium proliferatum(50%),Penicillium glabrum(31.70%) , Penicillium citrinum(38.33%) Geotrichum candidum (31.70%).*

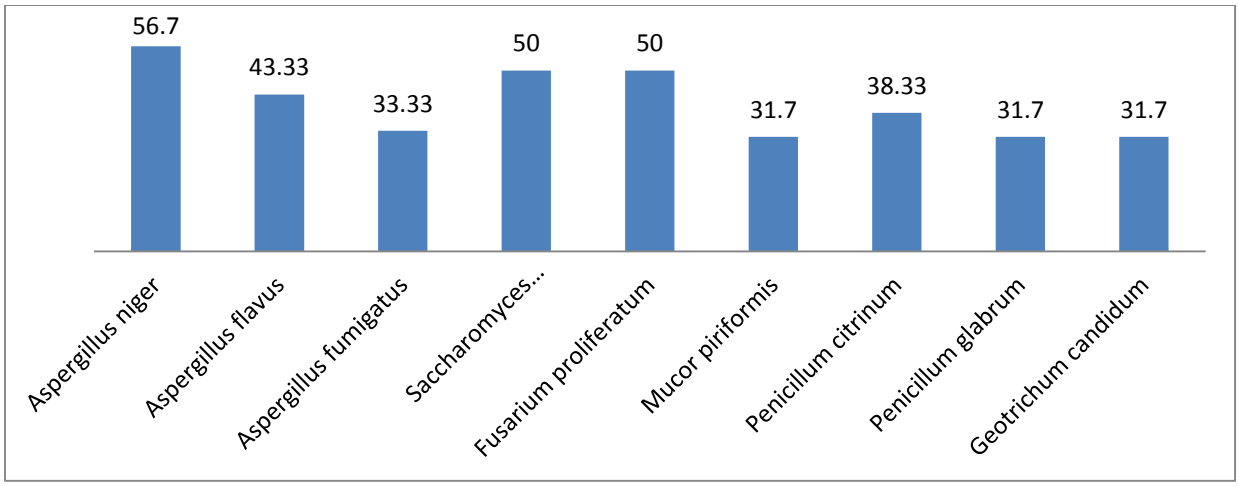

Fig 1: A Bar Chart Representation of the Percentage Occurrence of Each Fungus Isolate From the Samples

Table 4. Percentage Occurrence of the Fungi Isolates in Respect to Sampling Locations

Location	Aspergillus nier	Aspergillus flavus	Aspergillus fumigatus	Saccharomyces cerevisiae	Fusarium proliferatum	Mucor piriformis	Penicillum citrinum	Penicillum glabrum	Total	% Occurrence
WDM	2	1	0	2	5	1	1	1	13	**6.62**
DSK M	3	2	3	1	2	0	1	5	17	**8.70**
FUM	1	1	0	1	1	2	1	4	11	**5.61**
GH M	3	4	3	3	2	2	1	2	20	**10.20**
WIRM	2	2	3	1	2	2	3	2	17	**8.70**
New M	1	3	3	3	1	2	2	0	15	**7.60**
WOM	3	3	2	1	4	2	2	0	17	**8.70**
WSM	5	1	1	1	2	2	2	1	15	**7.60**
SMM	4	3	2	2	2	1	3	2	19	**9.69**
RFKM	3	2	1	1	4	2	1	0	14	**7.20**
WTJM	4	3	2	2	2	1	3	2	19	**9.69**
WYM	2	2	3	2	3	2	4	1	19	**9.69**
TOTAL	33	27	23	20	30	19	24	20	196	
% (Isolates)	**17**	**14**	**12**	**10**	**15**	**10**	**12**	**10**		

Table 4 .Presented the frequency and percentage occurrence of the isolates from each sampling location. The results shows that the percentage occurrence was highest at General Hospital Wukari market site (10.20%) followed by Saint Marys Market, Wukari Takum Junction and Wukari Yam Market sites at (9.69%) each ,followed by Wukari Ibi Round About, DSK Foundation Market and Wukari old Market sites at (8.70%) each followed by New Market site and Songai Market at (7.60%) each, followed by Rafinkada Market site(7.20%) and Wukari Doruwa Market site at (6.62%) and the least was Federal University Mini Up-gate site at (5.61%).

TABLE 5: AVERAGE PATHOGENICITY IN RESPECT TO HEALTHY FRUIT SAMPLES

FRUIT SAMPLES	AVERAGE PATHOGENICITY (mm)	%
Mango	33.25	18.31
Sweet melon	482.5	26.60
Watermelon	39.15	21.56
Banana	21.70	11.95
Cucumber	39.25	21.60
Total	181.60	

Table 5 present the percentage pathogenicity of the five fruits examined and sweetmelon is the most infected at 26.60% followed by cucumber at 21.60% and watermelon at 21.56% followed by mango 18.31% and the least was banana.

Discussion

Fruit production usually suffer fungi losses right from the time of planting, harvest, storage even up to the time it gets to the final consumers (Chukwuka *et al*., 2010).The attack of the fruit spoilage fungi has led to short life span of fruits with corresponding shortage, economic and health challenge as reported by Barth *et al*., (2013).Various yeast and mould have been confirmed as the causative agents of spoilage of Grapes, mango, guava, apple, papaya etc (Alhaji *et al* ., 2020).

The current study evaluated the fungi responsible for the deterioration of mango, sweetmelon, watermelon, banana and cucumber fruits in Wukari, Nigeria. The fungal count ranged from 1.0×10^5 sfu/g to 3.0×10^5 sfu/g, which agreed with (Ogodo *et al.*, 2020*)* research and was higher than what Onuorah and Orji (2015) found in their study on "fungi associated with the spoilage of some fruits sold in Awka, Nigeria," which found a fungal count in the range of 1.3×10^3 to 2.0×10^3. This might be the conditions in Wukari that enable fruit spoilage fungi to multiply rapidly.

The fungi isolated and identified from the spoiled fruits sold in Wukari markets were *Aspergillus niger*, *Aspergillus flavus*, *Aspergillus fumigatus*, *Saccharomyces cerevisiae*, *Mucor piriformis*, *Fusarium proliferates*,*Penicillium glabrum*, *Penicillium citrinum* and *Geotrichum candidum.* Compared to other isolates, *Aspergillus niger* occurs the most frequently. This finding is consistent with research from Ogodo *et al*., (2020) and Ibrahim *et al*., (2011) who found that *Aspergillus niger* is one of the main fungi species responsible for producing volatile chemicals in some deteriorated fruits. Similar to this, *Aspergillus niger* was identified from ruined fruits by Baker (2006), who reported that it was pathogenic on mango, sweet melon, watermelon, banana, and cucumber and was therefore the cause of the spoiling. From deteriorated tomato fruits, Ogodo *et al*., (2020), Wogu, and Ofuase (2014) isolated Aspergillus and Fusarium species. The current study supports the conclusions of Sani, *et al*. (2018) who identified *Aspergillus niger*, *Rhizopus stolonifera*, *Aspergillus flavus*, *Mucor spp*., and *Penicillium spp*. from tomato fruits as the organisms in charge of their spoilage. This study also supports the findings of Ghosh (2009), Onuorah, and Orji (2015).

In the current investigation, the fungi responsible for the rotting of various fruits were isolated to be *Penicillium species* and *Mucor species*. Other studies have sporadically claimed that these microbes are responsible for the spoilage of particular fruits. However, *Geotrichum candidum* and Saccharomyces cerevisiae are common environmental fungi that are present in several fruits and fruit products, including mango, sweet melon, water melon, banana, and cucumber. It is recognized that certain *Rhodotorula* strains can make people sick. On the other hand, *Mucor species* are typically discovered in deteriorated fruit and as saprophytes according to Interdisciplinary perspective of infectious diseases (2012).

Most fungi species do not thrive in temperatures beyond 37^{o}C, hence majority of *Mucor species* have not yet been reported to infect humans. Some of the species can be opportunistic and spread quickly, leading to zygomycosis, a necrotizing infection. As a result, the presence and identification of *mucor species* from majority of the locations could be attributed to the fruits' storage conditions, while *Geotrichum candidum*, *Saccharomyces cerevisiae*, and other similar species could be caused by contaminants in the soil where the fruits were grown, stored, as well as by the handling techniques and the buyers' transportation methods (Mailafia 2017).

Aspergillus niger showed the largest percentage of incidence (56.70%) in the samples of deteriorated fruit, whereas *Mucor piriformis*, *Penicillium glabrum and Geotrichum candidum* had the lowest percentages of prevalence (31.70%) each. More fungi may be present in the spoiled fruits as a result of overcrowding, inadequate storage facilities, and unclean handling and selling procedures.

The fruits under study showed the highest percentage of *Aspergillus niger* (56.70%) and the lowest percentages of *Mucor piriformis*, *Penicillium glabrum* and *Geotrichum candidum* (31.70%) each. This finding is consistent with earlier research by Ibrahim, *et al*. (2011) and Onuorah and Orji (2015), who found that *Aspergillus niger* was most frequently present in several of the fruits they examined and came to the conclusion that it might be a significant contaminant contributing to fruit deterioration, sweetmelon was the most deteriorated at (26.60%) and banana was least affected at (11.95%), the percentage occurrence of fungal isolates were highest at General Hospital Market (10.20%) and least at Federal University mini Market at (5.61%).

Conclusions

This study has shown that the fungi responsible for the spoilage of mango, sweetmelon, watermelon, banana and cucumber sold in Wukari metropolis are *Aspergillus niger*, *Aspergillus flavus*, *Aspergillus fumigatus*, *Saccharomyces cerevisiae*, *Mucor piriformis*, *Fusarium proliferatum*,*Penicillium glabrum*, *Penicillium citrinum* and *Geotrichum candidum* with *Aspergillus niger* as the most frequently isolated at (56.70%) while *Mucor piriformis*, *Penicillium glabrum* and *Geotrichum candidum* at (31.70%) were the least. So also, sweetmelon was the most deteriorated at (26.60%) and banana was least affected at (11.95%), the percentage occurrence of fungal isolates were highest at General Hospital Market (10.20%) and least at Federal University mini Market at (5.61%).

Most of these fungi are also associated with toxin production, which when consumed has harmful effects on both humans and animals. Therefore, it is necessary to implement strict methods for good quality control during the fruits' harvest, postharvest, transportation, and sales in order to prevent any potential health hazard that may result from the ingestion of spoiled fruit.

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