

Post harvest fungi associated with contamination of Cabbage (*brassica oleracea*) and Lettuce (*lactuca sativa*) in Kano Metropolis, Nigeria

*²Shuaibu NH, ¹Fatima SG, ¹Binta SB and ²Jamila MH

¹Department of Biological Sciences, College of Arts and Sciences, Kano

²Department of Biological Sciences, Sa'adatu Rimi College of Education, Kano

*Corresponding E- mail: kutamasak@yahoo.com; Phone: +2347067371893

Accepted 23 December 2014

Abstract

Fungi associated with the contamination of cabbage and lettuce in Kano metropolis were surveyed for six months with the object of isolating and identifying fungi associated with spoilage and deterioration of cabbage and lettuce and to determine the relative abundance of each isolate. The surface of each of the spoiled cabbage and lettuce leaves was washed with 1% hypochlorite and rinsed in several changes of distilled water. The samples were then separately plated on PDA plate and SDA media and incubated at room temperature for 6 days. A total of (42) fungal isolates were obtained from all the vegetables. These isolates were identified as *Mucor racemosus*, *Aspergillus flavus*, *Rhizopus stolonifer*, *Penicillium*, *Neurospora crassa*, and *Altaria brassica*. From these findings, it was discovered that cabbage and lettuce harbors a lot of fungi which can be pathogenic and this is as a result of poor storage. Therefore, cabbage and lettuce should be properly washed before use or the spoiled portion be removed completely.

Keywords: cabbage, lettuce, fungal contamination, Kano metropolis

INTRODUCTION

Cabbage (*Bassica oleracea*) is a leafy green biennial grown as annual vegetable for its densely leaved heads cabbage such as boceali cauliflower and brusels. Cabbage (*Brassica oleraceae* B. oleracea var capitata, var tuba and var-sabanda is a member of the brassica genus and the brassi caceae mustard family (Gibson and Author, 2012).

Cabbage is a leafy agree biennial grown as annual vegetable for its densely learned heads cabbage heads generally range from 1 to 8 pounds (0.5 + 04kg) and can be green purple and white (5mooth-leafed and crincked seen more rarely. (Green, 2006). Cabbages have thick alternating leave to highly dissect; some varieties have a waxy bloom on the leaves (Chatell, 2002). There are several cultivars of cabbage each including many varieties. Savoy-characterized by crunchy or only leaves mild flavours and tender texture (Ingram and chnrism 2000). Green- light to dark green, slightly pointed heads, this is most commonly grown cultivar. Red-smooth pale green leaves (veigh, 2008).

Cabbage is a good source of beta-carotene, vitamins C and fiber. In addition to its usual purpose as an edible vegetable cabbage has been used historically as medicinal herbs. Its medicines include treatments for rheumatism, sore throat, abscesses, it also cool body parts affected by fever mashed cabbage and cabbage juice have been used policies to remove boils cure pneumonia, appendicitis ulcers. (Hatfield and gabrielle, 2004).

Cabbage is also used for making of coles laws and wrapping of food. Cabbage consumption varies around the world.

Similarly, Lettuce is mostly grown as leafy vegetable Lettuce was first consumed by the ancient Egyptians who used to grow it for its items and its seeds were used to produce oil. They later turned it from weed to an eatable vegetable (integrated taxonomic information system 2011). Lettuce is often used as salads although it is also seen in other kinds of food such as soups and sandwiches and wraps lettuce is mostly consumed raw but sometimes in earth cooked. Lactuca

sativa is a plant of aster or sunflower family asthraceae. Lettuce is a hardy annual. It is easily cultivated. It has broad been leaves and green in colour (Zohary *et al.*, 2012). Lettuce is a good source of vitamin A and potassium as well as a minor source for several other vitamins and nutrients (Koraj *et al.*, 2005). Lettuce has also gathered religious and medicinal significance. It has been consumed by humans over centuries (Ryder and Williams 2003).

However, it has been noted that vegetables are prone to fungal attack in the field, during harvesting and during transportation and marketing (Kutama *et al.*, 2007; 2008,

MATERIALS AND METHODS

Samples Collection

For the purpose of this research, commonly sold lettuce and cabbage plants were collected from three markets where vegetables are commonly sold in Kano metropolis. The collections were done from Rimi market, S/Gari market and Hadejia road (Yan Kaba market). The collections were brought to biology laboratory for screening of fungal pathogens associated with such vegetables.

Culture Media

Two media were used Potato Dextrose Agar (PDA) as general culture medium and Saboraud Dextrose agar (SDA) as medium for the isolation of pathogenic fungi (Kutama *et al.*, 2007, 2013).

Isolation and Identification of fungal pathogens

The surfaces of the various leaves were cut into pieces with sterilized razor blade, surface sterilized in 1% hypochlorite for 2 minutes then placed gently on Potato Dextrose Agar plate (PDA) using spread techniques as described by Ebenzer and Seshi (2012), Kutama *et al.* (2012). The inoculated plates were incubated at room temperature for four days. After the appearance of a mixed growth, each colony was sub cultured in a fresh SDA in order to obtain a pure culture. Identification and classification the various isolates were based on macroscopic and microscopic examination (Kutama and Aliyu, 2007; Kutama *et al.*, 2011).

RESULTS

Cabbage

A total of (42) fungal isolates were obtained from this type of vegetable. These isolates were grouped into taxonomic genera namely *Mucor racemosa*, *Aspergillus flavus*, *Rhizopus stolonifer*, *Penicillium spp.*, *Neurospora crassa*, and *Alternaria brassica*.

Tables 1 show the frequency of occurrence of fungal pathogens on cabbage purchased from Rimi market, kano metropolis. A total of 15 isolates were obtained which includes *Mucor racemosa*, *Aspergillus flavus* and *Alternaria spp* with *Mucor* being the most frequently occurring with 50% relative abundance.

Similarly, in table 2: it shows the frequency of occurrence of identified on cabbage purchase from bata. 8 no of isolate were obtained these include *Mucor*, *Aspergillus Flavus spp* *Rhizopus* and *Althernaria Mucor* (37.5%) *Aspergillus* (25%) *alternaria* (25%) and *Rhizopus* (12.5) having the least frequency. These have the highest contamination.

Also, in table shows frequency occurrence where *Rhizopus* has the highest frequency (5%), *alternaria* and *neuspora* has the same frequencies of (25%) respectively .

Lettuce

On the other hand, lettuce plant 7, isolates were identified on lettuce purchased in Rimi market. These isolates were *Mucor* (14.21%) *Alternaria* (14.21%) *Penicillium* (28.5%) and *Rhizopus* with the highest frequency (42.8%) table 25 shows the frequency of fungal genera on lettuce purchased from Bata. The isolates includes *mucor racemosa spp* (42.8%) *Neurospora* (28.5%) and lastly *Rhizopus* also with (28.5%).

The last tables contained 4 isolates which contains *Rhizopus racemosa* with the highest frequency (75%) and *alternaria brassica* (25%).

Table 1. Frequency on occurrence of identified fungi on Cabbage obtained from Rimi market, Kano Metropolis

Identified fungal isolate	Identified	Frequency of occurrence
<i>Mucor racemosus</i>	3	50%
<i>Aspergillus flavus</i>	2	33.3%
<i>Alternaria brassica</i>	1	16.7%
Mean	2	
LSD (0.05)	1.012	

Tables 2. Frequency of occurrence of identified fungal isolates on *Cabbage* from S/Gari market, Kano Metropolis

Identify genera	No of isolates	Frequency
<i>Mucor racemosus</i>	3	37%
<i>Aspergillus flavus</i>	2	25%
<i>Alternaria brassica</i>	2	25%
<i>Rhizopus stolonifer</i>	2	12.5%
Total	8	100%

Tables 3. Frequency of occurrence of identified fungal general on *Cabbage* Obtained from Yan-kaba market, Kano Metropolis

Identify genera	No of isolates	Frequency
<i>Rhizopus stolonifer</i>	2	50%
<i>Alternaria brassica</i>	1	25%
<i>Neuspora crassa</i>	1	25%
Mean		
LDS (0.05)		

LETTUCE

Table 4. Frequency of occurrence of identified fungal genera on Lettuce from Rimi Market, Kano Metropolis

Identify genera	No of isolates	Frequency
<i>Mucor racemosus</i>	1	14.21
<i>Alternaria brassica</i>	1	14.21
<i>Penicillium</i>	2	28.5
<i>Rhizopus stolonifer</i>	3	42.8
Mean	7	100%
LSD (0.05)		

Table 5. Frequency of occurrence identified genera on *Lettuce* purchase from S/gari market, Kano Metropolis

Identified genera	No of isolates	Frequency%
<i>Mucor racemosus spp</i>	3	42.8%
<i>Neurospora crassa</i>	2	28.5
<i>Rhizopus stolonifer</i>	2	28.5
Mean	7	100%
LSD (0.05)		

Table 6. Frequency of occurrence of identified genera on *Lettuce* purchase from Yankaba Hadejia road, Kano Metropolis

Identified genera	No of isolates	Frequency
<i>Rhizopus stolonifer</i>	3	75%
<i>Alternaria brassica</i>	1	25%
Total	4	100

**Plate 1.** *Mucor spp*, *Penicclium*



Plate 2. *Neurospora*



Plate 3. *Rhizopus spp*

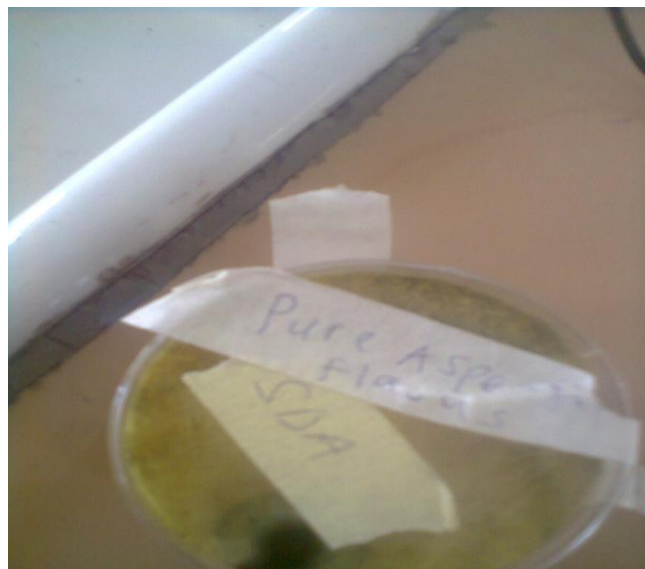


Plate 4. *Aspergillus flavus*

DISCUSSION

The study has determined the various fungal pathogens associated with cabbage and lettuce vegetables as well as their grouping. A total of 41 isolates were recovered from the two common vegetables. This study has therefore shown that there are a number of fungal pathogens: vegetables that can cause disease in humans if consumed directly. Among the fungal species identified in this study, the most frequently occurring genera were *Mucor racemosus* which was found in both cabbage plant Rimi Market (50%) cabbage obtained from BATA has the highest Number of isolate (8) also in lettuce plant mucor in S/Gari has the highest frequency of 42.8%. This has collaborated with the report of Ebenzer and Seshi(2012) who reported that there are several fungal pathogens on cabbage and lettuce vegetables. They discovered this on the study they made on the Mycoflora of cabbage and lettuce from peri urban farms in the city of Accra-Ghana. Also the great damage conferred to vegetables and fruits after harvest by pathogenic fungi could be attributed partly to environmental conditions prevailing in the storage system. Singh (2001) had shown that high temperature favors the growth of these pathogenic fungi while hot and humid weather confers a most conducive atmosphere for the growth of pathogenic fungi on fruits and vegetables.

RECOMMENDATIONS

Since these vegetables spoil easily by the activity of fungal pathogens there is need to educate the growers to store these vegetables properly in clean, cool and dry environment with less humidity as failure to this, paves way for fungal pathogens. Also damaged ones should be removed immediately to avoid further infection of the healthy ones. Government should also empower them with storage facilities washing these vegetables thoroughly and severely before consumption to avoid diseases.

References

- Alexopoulos CJ(1996). Introductory Mycology. John Wiley and Sons, Inc. Pp. 869.
- Aliyu BS, Kutama AS(2007). Isolation and identification of fungal flora associated with groundnut in different storage facilities. *Sci. World J.* 2(2): 34-36.
- Aliyu BS, Kutama AS(2007). Isolation and identification of fungal flora associated with groundnut in different storage facilities. *Sci. World J.* 2(2): 34-36.
- Bennett JW(2010). "An Overview of the Genus *Aspergillus*". *Aspergillus: Molecular Biology and Genomics*. Caister Academic Press.
- Hassan KY, Farouk SM, Kutama AS, Umar ML(2011). Survey of seed-borne mycoflora of some local sorghum (*Sorghum bicolor* L.) cultivars and their responses to Apron plus fungicide. *Afr. J. General Agric.* 7(2): 49-56.
- Kutama AS, Aliyu BS(2008). Fungal contamination of local Groundnut Varieties in Northern Nigeria. *Int. J. Biosci.* 3(2):39-43.
- Kutama AS, Aliyu BS, Mohammed I(2007). Fungal pathogens associated with Tomato wicker Storage Baskets. *Sci. World J.* 2(1): 23-26.
- Kutama AS, Aliyu BS, Mohammed I(2007). Fungal pathogens associated with Tomato wicker Storage Baskets. *Sci. World J.* 2(1): 23-26
- Kutama AS, Bashir M, Mani MA(2012). Seed-borne mycoflora of local and improved wheat (*Triticum sativum* L.) cultivars in Kano, Nigeria. *Bayero J. Pure and Appl. Sci.* 5(2) :101-103.
- Kutama AS, Bashir M, Mani MA(2012). Seed-borne mycoflora of local and improved wheat (*Triticum sativum* L.) cultivars in Kano, Nigeria. *Bayero J. Pure and Appl. Sci.* 5(2): 101-103.
- Kutama AS, Sabo AA, Kiyawa SA, Rabiu MK(2008). Isolation and Identification of Post-Harvest Pathogenic Fungi Associated with Fresh Edible fruits sold in Yanlemo Market, Kumbotso LG.A., Kano state, Nigeria. *Biol. Environ. Sci. J. Tropics.* 5(4): 252-255.