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Isolation and Identification of Fungi Associated with Postharvest Decay of *Lycopersicum esculentum* M. sold in Abakaliki, Nigeria

Dimphna, Nneka Ezikanyi
Department of Biological Sciences, Faculty of Science, Ebonyi State University, Abakaliki, Ebonyi, Nigeria.

Abstract: *The fruit of Lycopersicum esculentum M. (tomato) is among important vegetable crop widely grown around the world. Their large water content and soft endocarp make them susceptible to spoilage by fungi. The spoiled, rotten, often broken ones are usually preferred by low income earners because of their cheap prices. Isolation and identification of fungi associated with rotten tomatoes were carried out, to determine fungi involved in tomato spoilage. Hundred rotten tomatoes fruit were procured from five markets; Meat market, Kpirikpiri market, Afia ofuu, Preseco and Ukwu akpu markets in Abakaliki. Thin slice sections of the rotten fruits were obtained using a sterile knife, sections were homogenized using a stirring rod, serial dilutions of 10^2 were obtained. Two ml were inoculated onto PDA media and incubation was carried out at 27 ^oC for five days. Result indicated five species of fungi; Penicillium, Aspergillus, Fusarium, Cladosporium and Rhizopus. Aspergillus, Penicillium and Fusarium were more dominant. Strains of some of these fungi species are known to produce toxins and could cause severe food poisoning.*

Keywords: *Tomato, fungi , rotten, illhealth*

I. Introduction

The *Lycopersicon esculentum* M. (tomato) is an important vegetable crop across the world, originated in West South America (Kimura and Sinha, 2008). The fruits of tomato are popular throughout the world and are used in all kind of stews, soups and also eaten raw in salads. Ripe tomato fruits have high nutritive values, being a good source of vitamin A, B, C and minerals (Elsayed and Edrees, 2014). Because of the importance of tomato as food, it has been bred to improve productivity, fruit quality, and resistance to biotic and a biotic stresses (Kimura and Sinha, 2008). Tomato has been widely used not only as food, but also as research material. Tomato is a major vegetable crop that has achieved tremendous popularity over the last century. It is grown in every country of the world-in outdoor fields, greenhouses and net houses (Bihn and Gravani, 2006).

Tomato plants can grow up to 10 feet tall, but most species are less than three feet tall on average (Yoltao 1985). Tomato plants are perennial, have a weak stem that often sprawls over the ground and vines over other plants (Sravanthi and Gangadhar, 2015**).** Fruit of tomato are diverse in size and shape, ranging from small and round to large and variable shapes (Brewer *et al*., 2006). The size of tomato varies depending on the plant species. Cherry tomato plants produce small, cherry-sized tomatoes (Yoltao, 1985). Tomato fruits contain high amount of carbohydrates, fats, organic acids, water, minerals, vitamins and pigments. Tomato fruits are used in garnishing various cooked food in Nigerian dishes as well as dishes in many other parts of the world. It is estimated that ripe tomato fruits contain approximately 94 % of water, 4.3 % carbohydrates, 1 % protein, 0.1 % fat, 0.6 % fibre and vitamins. Antioxidant phytochemicals such as the carotene and lycopene are contained in tomatoes (Wogu and Ofuase, 2014; Sravanthi and Gangadhar, 2015**).** They are good sources of natural antioxidants which include carotenoids, vitamins, phenolic compounds, flavonoids, dietary glutathione, and endogenous metabolites and have been shown to eliminate free radicals, (Sravanthi and Gangadhar, 2015; Pitchaon *et al*., 2007).

Naturally, Fruits and vegetables carry epiphytic micro flora. During growth, harvest, transportation and further processing and handling the produce can be further contaminated with non pathogenic and pathogenic organisms from soil, human or animal sources (Beuchart, 1995). Outbreaks of food borne illnesses have been recorded in Europe, Japan, United States, Canada and Turkey (Gosh, 2009). Pathogenic fungi, such as *Altternaria, Aspergillus, Fusarium, Mucor sp., Penicillium, Rhizopus, and Trichoderma* have been implicated in some crop spoilage (Beuchat, 1995). Fungi contamination of many agricultural products, including tomatoes starts in the fields (Aran *et al*., 1987). Both the biological and physical damages during the harvest and transportation phases, coupled with large amount of water and soft endocarp makes tomatoes more susceptible to spoilage by fungi (Asan and Ekmeki, 2002: Onuoral and Orji, 2015). Few studies on fungi associated with tomato spoilage are available in Nigeria (Wogu and Ofuase, 2014**;** Wokoma, 2008; Eni *et al* 2010: Bashir *et al*.,2016). The present study isolates and identifies fungi species associated with rooten tomatoes in five markets in Abakaliki, Nigeria

II. Materials and Methods

Samples Collection

A total of hundred tomatoes fruit (20 in each market) were procured from five markets in Abakaliki; Meat, Kpirikpiri, Afia ofuu, Preseco and Ukwu akpu markets. They were transported to Department of Biological Sciences laboratory for fungal isolation. Tomatoes fruit were collected using hand gloves into sterile polythene bags. All the glass wares used for the experiment were properly washed, dried and sterilized in the oven at 160 ^{0}C for one hour. The entire working surfaces were also disinfected with ethanol to reduce contaminants. Potato dextrose agar (PDA) were prepared and poured aseptically into petri dishes and chloramphenicol added. Thin slice sections of the rotten parts were obtained using a sterile knife, sections were homogenized using a stirring rod, serial dilutions of 10^2 were obtained. Two ml were taken and inoculated onto PDA and incubation was carried out at 27 ^{o}C for five days. The colonies that developed were counted and subcultured repeatedly on PDA to obtain pure cultures. Thin smears of the mycelia were made on a glass slide with sterile inoculating needle and stained with a drop of lactophenol cotton blue solution. Identification was made using photomicrographs of fungi in books and journals.

III. Results and Discussion

A total of 793 fungi isolate was recorded, they were *Aspergillus* 300 (38.8 %), *Penicillium* 144 (17.2 %), *Fusarium* 212 (26.9 %), *Cladosporium* 63 (7.6 %) and *Rhizopus* 74 (9.5 %) in decereasing order of dominance (Table 1). All identified fungi occurred in all rotten tomatoes procured from five markets in Abakaliki, though with varied frequency. Rotten tomatoes from Kpirikpiri (209) and Meat (189) markets had the highest number of fungi isolates compared to Presco (152), Ukwuakpu (132) and Afia offuu market (111) (Fig. 1). *Aspergillus*, *Penicillium* and *Fusarium* dominated in rotten tomatoes than *Cladosporium* and *Rhizopus*. In a similar study carried out on fungi associated with the spoilage of post-harvest tomato fruits sold in major markets in Awka, Nigeria, *Aspergillus niger*, *Rhizopus stolonifer*, *Fusarium oxysporum*, *Saccharomyces cerevisiae*, *Alternaria alternata*, *Penicillium digitatum* and *Geotrichum candidum* were identified (Onuorah and Orji, 2015). Ugwu *et al.* (2014) discovered absence of microorganisms in fresh healthy tomatoes but in spoilt tomatoes, they discovered 6 species of fungi; *Candida tropicalis*, *Penicillium notatum*, *Aspergillus niger*, *Fusarium oxysporum*, *Absidia corynbifera*, *Rhizopus stonolifer* and 4 species of bacteria; *Escherichia coli*, *Klebsiella* spp., *Salmonella* spp. and *Pseudomonas aeruginosa*.

Bashir *et al*. (2016), identified two bacteria species ; *Staphylococcus aureus* and *Bacillus* and two fungi species; *Aspergillus flavus* and *Rhizopus stolonifer* in tomatoes. In the present work *Aspergillus* dominated over other fungi species. Abel-Mallek *et al*.,1995 also reported preponderant of *Aspergillus niger* in healthy tomato fruits collected from markets in Assiut, Egypt. Several studies have also reported that *Aspergillus* spp. are associated with spoilage of tomatoes, apricot, orange, lemon,peach, apple, kiwi, mango etc. (Rashad *et al.*, 2011). Onuorah and Orji, 2015 showed that *Aspergillus* had the highest decay diameter among other fungi associated with tomatoes spoilage.

Studies have shown that *Aspergillus* produce aflatoxins. Aflatoxins are associated with some diseases in livestocks and humans throughout the world. *Aspergillus flavus* is the main producer of the well known carcinogenic aflatoxins and its presence in food is of huge concern in terms of food safety , they are toxic at low concentrations (Rodriques *et al*., 2007). The dominance of *Aspegillus* in rotten tomatoes could pose a serious health risk especially when the tomatoes are not well cooked. Healthy tomatoes fruit should be preferred as they seldom contain microbes (Ugwu *et al.*, 2014)

Penicillium spp. were found next to *Aspergillus* in abundance. Mbajiuka and Enya (2014) found abundant presence of *Penicillium nalgiovense*, *Penicillium notatum* and *Penicillim expansium* among other fungi species involved in deterioration of tomatoes fruit. *Penicillium* and *Fusarium* are among the most important genera of mycotoxigenic fungi (Zain, 2011). The mycotoxins are of greatest agro-economic importance, some molds are capable of producing more than one mycotoxin and some mycotoxins are produced by more than one fungal species (Zain, 2011).

Table 1: Prevalent of fungi isolates in rotten tomato fruits

Fungi species	Number of isolates	% frequency
Aspergillus	300	38.8
Penicillium	144	17.2
Fusarium	212	26.9
Cladosporium	63	7.6
Rhizopus	74	9.5
Total	793	100

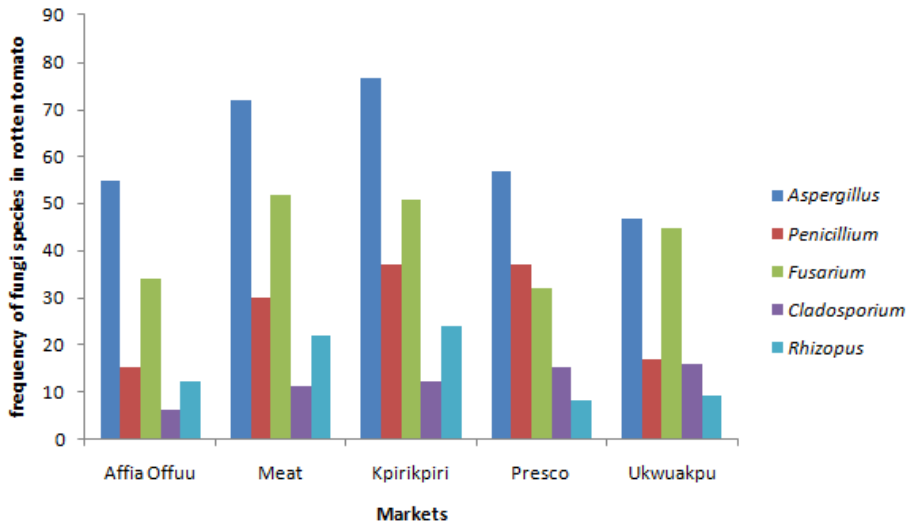

Fig.1: Prevalent of fungi isolates in rotten tomatoes procured from five markets in Abakaliki

IV. Conclusions

The present work identified preponderant of *Aspergillus*, *Penicillium* and *Fusarium* in rotten tomatoes sold in five different markets in Abakaliki. These organisms and others identified are mycotoxigenic fungi. Their abundant presence in rotten tomatoes could lead to severe food poisoning.

References

[1]. Abdel-Mallek, A. Y., Hemida, S.K. and Bagy, M.M. K.(1995). Studies on fungi associated with tomato fruits and effectiveness of some commercial fungicides against three pathogens. Mycopathologia 130: 109-116.

[2]. Aran, N. Alperden,I. and Topal,O. (1987). Mould contamination problem in tomato paste and risk analysis system in the critical control place. *Journal of food Industry* 2(3): 43-47.

[3]. Asan, A. and Ekmeki, S. (2002). Contribution to the colonial and morphological characteristics of some Aspergillus species isolated from soil. *Journal of Faculty of Science* 25:121-139

[4]. Beuchart, L.R. (1995). Pathogenic Microorganisms Associated with fresh produce. *Journal of Food Production* 50(2): 204-216.

[5]. Bashir, O. B., Habib, U., Odunayo, O.J., Opeyemi, A.S.,Alafe, A.H. and Owode, T.M.(2006). Microorganisms causing post harvest tomato fruit decay in Nigeria. *Journal of Entomology and Zoology Studies* 4(1): 374-377.

[6]. Bihn, E.A. and Gravani, R.B. (2006). Role of good Agricultural practices in fruit and Vegetable safety. In: Microbiology of fresh Produce (Edited by K.R. Mathews). ASM press, Washington D.C. 328pp.

[7]. Eni, A.O., Ibokunoluwa, O., Oranusi, U.(2010). Microbial quality of fruits and vegetables. *African Journal of Food Science* 4(5): 291-296.

[8]. Gosh, A. (2009). Identification of Microorganism responsible for spoilage of tomato (*Lycopersicum esculentum*) fruit. *Journal of Phytology* 1(6):414-416.

[9]. Ibrahim, A.D.,K., Musa, K., Sani, A., Aliero,A.A., Yusuf, B.S. (2011). Microorganisms associated with the production of volatile compounds in spoilt tomatoes. *Research in Biotechnology*.2: 82-89

[10]. Kimura, S. and Sinha, N. (2008). Tomato (*Solanum lycopersicum*): A model fruit Bearing crop. *CSH Protoc*. Doi: 10.1101/pdb.emo 105

[11]. Mbajiuka, S.C. and Enya, E. (2004). Isolation of Microrganisms associated with deterioration of Tomato (*Lycopersicum esculentum*) and Pawpaw(Carica papaya) fruits. *International journal of Current Microbiology and Applied Sciences* 3:501-512

[12]. Onuorah, S. and Orji, M.U. (2015). Fungi Associated with the Spoilage of Post-harvest Tomato Fruits Sold in Major Markets in Awka, Nigeria. *Universal Journal of Microbiology Research* 3(2): 11-16

[13]. Pitchaon M., Maitree S. and Rungnaphar P.(2007). Assessment of phenolic content and free radical-scavenging capacity of some Thai indigenous plants. *Food Chemistry* 100:1409-1418.

[14]. Rashad, R.A., Ahmed, R.A. and Saleh, A.M. (2011). Isolation and identification od some fruit spoilage fungi:screening of plant cell wall degrading enzymes. *African Journal of Microbiology* 5(4):443-448.

[15]. Rodriquez P.,Soares C.,Kozakiewicz, Z.,Paterson R.R.M., Lima, N. and Venancio A. (2017). Identification and Characterization of Aspergillus flavus and toxins. *Communicating Current Research and Educational topics and trends in Applied Microbiology* 527-534.

[16]. Sravanthi, J., Gangadhar, S. R. (2015). Phytochemical and antioxidant composition in *Lycopersicum esculentum. Journal of Medicinal Plants Studies* 3(4): 107-110

[17]. Ugwu, C. O., Chukwuezi, F.O. and Ozougwu V. C.O.(2014). Microbial Agents of tomato spoilage in Onitsha metropolis. Advances in Biological Research 8(2):87-93.

[18]. Wogu, M.D, Ofuase, O.(2014). Microorganisms responsible for the spoilage of tomato fruits, *Lycopersicum esculentum*, sold in markets in Benin City, southern Nigeria. *Scholars Academic Journal of Bioscience* 2(7): 459-466

[19]. Wokoma E.C.W.(2008). Preliminary report on disease of tomatoes in Choba, Rivers State. *J. Appl. Sci.Environ*. 12(3):178-121.

[20]. Yaltao, T. (1985). Physiology of mature tomatoes and harvest. Proceedings of the last Congress Raising and Evaluating of Tomatoes Technology,(CRETT'85). *British Journal of Botany* 4(3):23-33

[21]. Zain, M.E. (2011). Impact of mycotoxins on humans and animals. *Journal of Saudi Chemical Society* 15: 129-144.