Studies on the Fungi and Phytochemical Potential of Tomatoes (*Solunium Lycopersicum L.*) in Port Harcourt

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ABSTRACT

Tomato contains large amount of water which makes it more susceptible to spoilage by fungi. The fungi responsible for the tomatoes spoilage, produce mycotoxins that are detrimental to human health. The sample from Mile 1 market had highest colony count of Mucur spp. The phytochemical study of the tomato extracts both revealed that phenol had the highest occurrence 30.25±1.35 & 22.2±1.60 and tannin lowest 2.83±0.73& 0.24±0.12. Bioactive compounds stored in plant possess biological and antibacterial activities that can be used as an alternative medicine for the treatment of bacterial infections in man. These compounds have been reported to bestow resistance in opposition to microbial pathogens and this could be accountable for the exhibition of antibacterial activity by both extracts in this present study.

INTRODUCTION

Tomato is a widely consumed fruit eaten in both raw and processed forms (Moneruzzaman, 2008). It has the botanical name *Lycopersicum esculentum* and belongs to the plant family *solanaceae*. It is rich in vitamins including vitamin A and vitamin C, carbohydrates, proteins, fats, fibres and potassium (Talvas *et al,* 2009). It is rich in lycopene which has many beneficial health effects. It contains large amount of water which makes it more susceptible to spoilage by the action of microorganisms (Bai *et al,* 2006). Tomatoes have serious challenges to their existence. These include changes in climate conditions, pests, inadequate rainfall and microorganisms particularly fungi. Spoilage of tomatoes are those adverse changes in the quality of tomatoes that are brought about by the action of predominantly biological and physical factors. There may be changes in taste, smell, appearance or texture of the fruits. Ghosh; 2009, reported that fungi were the source of spoilage of most of the tomato samples accessed than bacteria. Fungi affecting tomatoes include *Aspergillus phoenicis, Absidia spp, Trichoderma spp, Alternaria alternata, Fusarium oxysporum, Fusarium moniliformis, Aspergilli us niger, Mucor spp, Rhizopus stolonifer, Penicillium spp, Geotrichum spp and Phytophthora spp* (Etebu *et al,* 2013). Fungal spoilage of tomatoes has been recognized as a source of potential health hazard to humans and animals due to the fact that they produce mycotoxins which are capable of causing mycotoxicoses in man following ingestion or inhalation (S. Baker, 2006). The mycotoxins are not limited to their areas of infections. Since tomatoes contain large amount of fluid, these mycotoxins diffuse rapidly throughout them, contaminating all parts and making the fruits unfit for

consumption. The importance of tomato in the food industry and its nutritional benefits cannot be overemphasized. Routine microbiological examination of tomatoes is very crucial as it contributes to a large extent to economic development. Tomatoes are consumed either raw or cooked worldwide.

MATERIALS AND METHODS

Tomato samples were purchased from Mile 1 market, Port Harcourt, Rivers State, Nigeria. They were transported to the microbiology laboratory of Rivers State University, Port Harcourt in sterile polythene bags for fungal isolation. The samples were left for 5 days for spoilage to occur. The spoilt tomatoes, was used for this study.

Materials Sterilization

Sterilization of conical flask, slides, Petri dishes and all the equipment needed for the experiment was carried out in the laboratory. The glass wares were sterilized in the oven at 120°C for an hour after washing with soap, while other equipment were surface sterilized with 70% ethanol to reduce microbial contamination (Okogbule et al, 2021). Inoculating loops and scalpels were sterilized by dipping for 20 seconds in 70% ethanol and heated to red hot. The mycological medium used was Sabouraud Dextrose Agar prepared in a conical flask using the standard method. The mouth of the task was plugged with non-absorbent cotton wool and wrapped with aluminium foil. The conical flask containing the mycological medium was autoclaved at 121° C and pressure of 1.1kgcm-3 for 15 minutes. The molten agar was allowed to cool to about 40° C and dispensed into petri dishes at 15mls per plate and allowed to further cool and solidify.

Isolation of Fungi

A threefold serial dilution was used in accordance to the method of Mehrot & Aggarwal (2003) where 1g of the spoilt tomatoes samples were transferred into the first test tube.

Characterization and Identification of the Isolates

Microscopic examination of fungal isolaties was carried out by the needle method

(Cheesebrough, 2000). The fungal spores were properly teased apart to ensure proper visibility. The well spread spores were stained with cotton blue in lacto phenol and examined microscopically using both the low and high power objective. The fungi were identified based on their spore and colonial morphology, mycelia structure and other associated structures using the keys of (Barnett & Hunter, 1998).

RESULTS AND DISCUSSION

Fungal Isolates From

Mile 1 Market

Fungal isolates Macroscopic

Examination

Microscopic

Examination

Probable organism Colony count

Isolate A Fluffy white

Cottony colony and

Growth rate rapid.

Septate hyphae

Bearing

Sporangiospores

Mucur spp.

PHYTOCHEMICAL COMPOSITION

Tomato Extracts From Mile 1 Market

Tannin 2.83±0.73 Phytate 2.60±0.20

Phenol 30.25±1.35

Flavonoid 11.8±0.90

Terpernoid 18.2±0.70 5.

Oxalate 70±0.80

Alkaloids 15.05±0.350

Moisture 75.65±5.25.

P-value

Tannin 0.0037

Phytate 0.4166

Phenol 0.0026

Flavonoid 0.3125

Terpernoid 0.8154

Oxalate 0.3015

Alkaloids 0.7451

Moisture 0.0705

Fungi Isolation

The fungi associated with the spoilage of tomato fruits sold in Mile 1 Markets, Port Harcourt, Rivers State, Nigeria were studied and the result revealed the presence of a teeming population of fungi load of colony count Mucur spp and Candida spp.

Phytochemical Screening.

The phytochemical study of the tomato extracts revealed the presence of different bioactive compounds such as alkaloids, terpenoids, flavonoids, phenols, and tannins. Bioactive compounds stored in plant possess biological and antibacterial activities that can be used as an alternative medicine for the treatment of bacterial infections in man (Doughari et al, 2009).

These compounds have been reported to bestow resistance in opposition to microbial pathogens and this could be accountable for the exhibition of antibacterial activity by both extracts in this present study (Anibijuwon et al, 2009). Also, secondary metabolites like terpenoids have been reported to have anti inflammatory, antimalarial, antibacterial, and antiviral activities and reported to inhibit cholesterol synthesis (Mahato et al, 1997). Alkaloids are believed to have a broad range of pharmacological potentials like anti-malarial, anti-asthma, and anti-cancer properties (Odebiyi and Sofowora, 1978).

Total Phenolic Content

Content Phenolic compounds are important secondary metabolites that possess various biological activities, most importantly antioxidant activity associated with reduced cancer risk (Manach et al., 2005). Total phenolic compounds, correspond to the mean response of all major phenolic compounds present in fruits and vegetables (George et al., 2005). Overall, the total phenol content was comparable to that reported by Kavitha et al. (2014). However, lower phenol values were also reported by Tinyane *et al*. (2013) which might be due to genotype differences, agricultural practices, or environmental conditions. Further quantitative studies of individual phenolic compounds are needed to confirm the contribution of each phenolic compound to total phenol content.

Flavonoids are important plant secondary metabolites that possess strong antioxidant activity due to their ability to scavenge reactive oxygen species and thus decrease oxidative stress (Pourcel *et al*., 2006; Koh *et al.*, 2009). The varietal differences in individual samples, as well as total, flavonoid content are presented in all the samples.

CONCLUSION

Fungal spoilage of tomatoes is attributable to the high water content, environmental conditions, state of handling, state of storage facilities, the fungal load of the handlers and the quality of the tomatoes. These fungi isolated in this study are sources of potent mycotoxins which are detrimental to health. The phytochemical screening showed that the aqueous extracts prepared from the fruits of S. lycopersicum L. revealed the presence of phenols, tannins and flavonoids. The presence of a variety of secondary metabolites in S. lycopersicum L. fruits contributes to the biological and pharmacological effects associated with the consumption of this plant.

RECOMMENDATIONS

Good quality control measures must therefore be employed by the farmers, marketers and consumers during the harvesting, transportation, handling and processing of the fruits. Frequent inspection of the fruits for sale by food inspectors is also recommended. These will go a long way in preventing the consumption of contaminated tomato fruits thereby reducing the health hazards posed by the mycotoxins produced by these fungi isolated in this study.

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