

Isolation and Identification of Fungi Associated With Tomato (*Lycopersicon Esculentum M.*) ROT

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Abstract

Tomato (*Lycopersicon esculentum*) is the most popular vegetable worldwide. They have high spoilage rate because of their high moisture content. Many pathogenic fungi are the subject of intense study because they cause disease symptoms that have negative effect on the yield and quality of tomato fruits; they produce mycotoxins that are detrimental to human health. Isolation and identification of fungal organisms causing rot of tomato purchased from Anyigba main market was carried out. Sabouraud Dextrose Agar was used and four fungal species were isolated; *Aspergillus spp*, *Penicillium spp*, *Rhizopus spp* and *Fusarium spp*. The most frequent being *Aspergillus spp* (38.89%) and the lowest was *Fusarium spp* (5.56%). The pathogenicity test carried out implicated these organisms in the spoilage of healthy tomato fruits. Proper handling and adequate storage facilities must therefore be employed to prolong the shelf life of tomato fruits.

Keywords: Tomato; Fungi; Isolation; Identification; Rot; Pathogenicity test.

1. Introduction

Tomato (*Lycopersicon esculentum M.*) belongs to the family *Solanaceae* is one of the most widely grown and extensively consumed vegetable in the world. In the Nigerian Savanna, fresh tomato is the most valuable vegetable crop. It accounts for about 18% of the average daily consumption of vegetables in Nigeria. Tomatoes may be pear-shaped, elongated, flattened and heart shaped. They are edible, fleshy and reddish when ripe and vary in their acid composition, with white and yellow ones being less acidic. Tomatoes can be used as savoury or flavouring in soups and cooked foods or can be eaten as fruits. It is used in many dishes, salads, sauces and drinks and can also be dried and ground into pancakes [1]. Tomato fruits are mostly harvested and transported in manners that expose them to microbial infections; they are usually harvested and transported with locally made baskets which are prone to fungal contaminants. They are usually displayed on benches and in baskets for prospective customers in the open market until sold, thereby exposing them to further microbial infections beside those associated with its surface and those from adjacent infected fruits [2]. Fungi are the most important and prevalent pathogens, infecting a wide range of fruits and causing destructive and economically important losses of the fruits during storage, transportation and marketing [3]. These study aims at identifying fungal causing tomato rot from Anyigba Main Market, Kogi State, Nigeria.

2. Materials and Methods

Fresh tomato samples were purchased from Anyigba main market in Kogi State, Nigeria. They were rinsed with sterile distilled water and transported to the Microbiology laboratory, Kogi State University in sterile polythene bags for fungal isolation. The samples were left for seven (7) days for spoilage to occur. These spoilt tomatoes were then used for the study. One gram (1 g) of each of the spoilt tomatoes was carefully cut with the aid of a sterile scalpel, ten-fold serial dilutions of the sample were thereafter carried out in serially marked test tubes for a serial dilution process and then removed and an appropriate dilution factor was obtained from the isolation of distinct colonies and enriched in sterile Sabouraud dextrose agar media for seventy two (72) hours. The 10^{-3} diluent was used for incubation. Following sample preparation, an aliquot (1ml) from the tube with the highest dilution factor (10^{-3}) was inoculated onto the already prepared SDA media with 1ml of chloramphenicol to inhibit bacteria growth using the spread plate method. This procedure was repeated for the subsequent plates, and was left to gel prior to incubation in an inverted position in the incubator at $25^{\circ}\text{C} \pm 2$ for 72 hours. The colonies that developed were then counted and enumerated in colony forming unit per ml (cfu/ml). They were later subculture before identification and characterization. Pathogenicity test was done using the procedures of Baiyewu, *et al.* [2] with ten (10) healthy tomatoes inoculated and another ten bored that serves as control. The rot diameters were measured after the seventh day of inoculation.

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3. Results and Discussion

In this investigation, the fungi *Aspergillus* spp, *Penicillium* spp, *Rhizopus* spp and *Fusarium* spp were isolated. The precise identification of these pathogens is central of an appropriate disease management strategy. Table 1 shows that isolated *Aspergillus* spp is one of the major fungi responsible for the production of volatile compounds in spoiled tomato. Baker [4], reported that they are pathogenic on tomato fruits. Akinmusire [5] reported that *Rhizopus* spp were associated with tomato spoilage. Wogu and Ofuase [6] isolated *Aspergillus*, *Penicillium*, *Fusarium* from spoiled tomato fruits.

Extending the shelf life of tomato fruits by controlling its ripening when it is to be transported over a long distance can be employed. Appropriate temperature and relative humidity should be employed in tomato fruit storage. Earlier workers have suggested 30-35°C and 50-80% relative humidity for its storage. Mechanically injured and fungal infected fruits should not be package with healthy fruits, so as to prevent mass deterioration of tomato fruits. Hayatu [7], reported that the high number of fungal colonies isolated on tomato could be due to physical damage, and harvesting puncture, which could occur during harvesting and poor handling, which serve as portal of entry for microbes. The result from Table 2 shows that all the isolates grow best aerobically as there were reductions in their occurrence at anaerobic condition. However, *Fusarium* spp showed no growth anaerobically; this may be due to the fact that *Fusarium* spp were obligate anaerobes. This shows that the oxygen concentration in a particular environment also contribute to the spoilage organisms to be present in the tomato fruits.

The results of the pathogenicity tests show that these fungal isolates were capable of causing disease if the right conditions were given. An observation worthy of note was given to a tomato species that has resistibility to fungal spoilage; the Roma tomato. Roma tomato was able to maintain a healthy condition even when other species of the fruit has deteriorated due to fungal spoilage (Plate 1). Morphological and microscopic characteristics were compared with initial cultures after re-isolation and were found to be the same. The control (with bored whole and no isolate inoculated) shows no symptoms of rot at the third day of examination. The ability of the fungal isolate to cause disease in healthy tomato fruits was due to the fact that the pathogens are able to utilize the nutrients of the fruits as a substrate for growth and development [8]. This was shown in Table 3 where the rot diameter of each fungi isolate after 7 days was carefully measured.

Plate-1. Tomato fruits after the third day of fungal activity

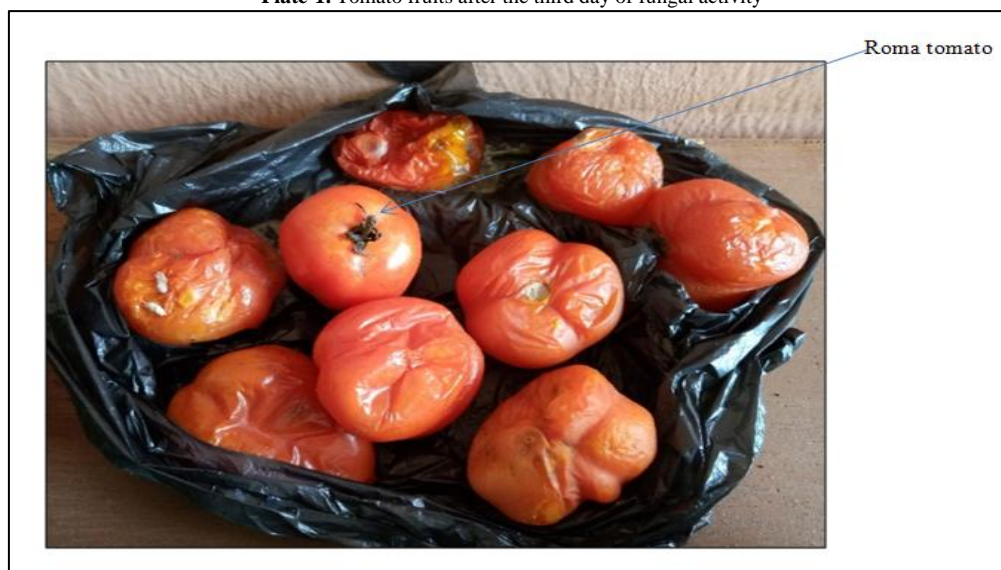


Table-1. Occurrence Rate of Fungal Isolates

Fungal Isolates	Number of Occurrence	Rate of Occurrence (%)
<i>Aspergillus</i> spp.	28	38.89
<i>Penicillium</i> spp.	24	33.33
<i>Rhizopus</i> spp.	16	22.22
<i>Fusarium</i> spp.	4	5.56
TOTAL	72	100

Table-2. Occurrence Rate of Fungal Isolates by Spoilage Pattern

Isolates	AEROBIC		ANAEROBIC	
	Isolate	Frequency (%)	Isolate	Frequency (%)
<i>Aspergillus</i> spp.	20	41.67	8	33.33
<i>Penicillium</i> spp.	13	27.08	11	45.83
<i>Rhizopus</i> spp.	11	22.92	5	20.83
<i>Fusarium</i> spp.	4	8.33	0	0
TOTAL	48	100	24	99.99

Table-3. The Rot Diameter of Fungal Isolates

Isolate	Rot diameter (mm)
<i>Aspergillus spp</i>	20.0
<i>Penicillium spp</i>	8.2
<i>Rhizopus spp</i>	14.6
<i>Fusarium spp</i>	12.5

4. Conclusion

Many studies have been carried out with respect to occurrence, casual organisms, severity, losses and pathogenicity. The present study implicated four fungal pathogens (*Aspergillus*, *Penicillium*, *Rhizopus* and *Fusarium*) in the spoilage of tomato fruit. Tomato fruits were prone to fungal infection. This study also shows the high occurrence of *Aspergillus* spp in Anyigba metropolis compare to other fungal contaminants. Control measures must be employed by vegetative growers, marketers and consumers at the time of harvesting, transportation, handling, storage and processing of tomato fruits to reduce these contaminants.

5. Recommendation

It is recommended that tomato fruits production should be handled with extreme care. Only recommended chemicals are used at recommended dosage for its production and avoid the use of water flooded with untreated sewage for irrigation. The resistant tomato species; "Roma tomato" (Plate 1) should be given more attention to detect the genetic trait that lead to its resistibility, its productivity should also be on the increase. Individuals who prefer to consume spoilt tomato fruits because it is very cheap should also desist as this may serve as a cheap source of diseases too. Washing the tomato with clean water before consumption will also reduce the bacterial load.

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