



REGULAR ARTICLE

# IDENTIFICATION OF MICROORGANISMS RESPONSIBLE FOR SPOILAGE OF TOMATO (*LYCOPERSICON ESCULENTUM*) FRUIT

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## SUMMARY

Tomato contains large amount of water which makes them more susceptible to spoilage by the action of various microorganisms. This makes the storage of this vegetable difficult and its transportation too. Tomato is a prevalent vegetable used both in raw form as salad, for garnishing various food items and added for taste in various cooked items. Thus it forms a major ingredient of food both in Asia as well as European countries. Further tomato is rich source of vitamins especially Vitamin A as it contains its precursor  $\beta$ -carotene which is very essential for vision. It is also a rich source of minerals which makes it an essential component of food. This study was done to find out the organisms which make tomato more susceptible to spoilage. Out of the 30 Rose Bengal agar plates which were inoculated and incubated vigorous growth of fungi was observed in 26 plates with moderate growth on other 4 plates. Also 30 other plates of Nutrient agar were inoculated with the sample and very scanty growth of bacterial colonies was observed in 3-4 plates and mostly occupied by fungal colonies. Thus it was found that fungi were the source of spoilage in most of the samples rather than bacteria. Further morphological studies were done to know the fungal member responsible for the spoilage. Among the fungi, it was found that *Aspergillus niger* and *Fusarium* were found in most of the spoiled samples with a few samples containing *Penicillium* too with *A. niger* dominating all the plates. Since all these are fungi, it can be related to the severity of the intake of spoiled tomato are developing countries like India where people hardly discard the spoiled foods as spores are relatively heat-resistant and do not perish and spread easily. Also the outcome can be dangerous since these fungi are the source of highly potent mycotoxins which can cause severe food poisoning resulting in fatal outcome.

**Keywords:** Spoilage, Fungi, Tomato, Mycotoxins, *Aspergillus*.

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## 1. Introduction

Tomato (*Lycopersicon esculentum*) has long been used as food both in cooked as well as raw form. The deep red colouration of ripened tomato fruit is due to the presence of lycopene, a form of  $\beta$ - carotenoid pigment which forms

the precursor of Vitamin A and hence is of great nutritional value. It is a rich source of water and its composition includes 95%. Today with an increased number of ailments of vision, these fruits rich in carotenoid pigment forms of

prime importance to minimize the problems related to vision. Also tomato forms a major food component because of its wide distribution and application in a number of food stuffs be it Asian our European dish. Tomato finds a wide arena of cultivation with highest in China followed by USA, Turkey, India and Egypt. In USA, California accounts as largest tomato producer. But there is a huge loss of tomato across the globe due to microbial spoilage. Since it is composed mostly of water, microbes grow best using it as its substrate. This research was designed to know of the microbes majorly responsible for the deterioration of the tomatoes. Also we highlight the consequences which might result due to the intake of contaminated or spoiled tomatoes.

## Materials and Methods

### Collection of samples

Spoiled samples of tomatoes were collected from three different sources in sterile polythene bags and brought to laboratory.

### Plating in different Media

Total 60 plates were prepared: 30 Nutrient Agar media for bacteria and 30 of Himedia Rose Bengal Agar media supplemented with the antibiotic Chloramphenicol for fungi isolation. 10 plates of each of the three sources of tomato were plated by serial dilution method and  $10^{-6}$  dilution was used for bacterial plating in Nutrient Agar Medium while  $10^{-4}$  was used for fungal plating in Rose Bengal Agar medium, respectively. The plates were incubated at the ambient temperature: 48 hours for bacterial plates and 4-5 days for fungal plates.

### Isolation and identification

After the incubation, the colonies of organisms were observed for colony morphology and then observed for morphological studies. Also the colonies were subjected for microscopic studies for proper identification. Fungal colonies were studied by Lactophenol Cotton Blue Mount (LPCB) and characterized thereafter.

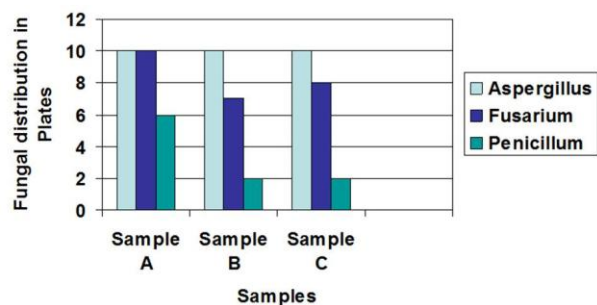
## Results and Discussion

All the three spoiled tomato samples collected from three different samples were found to be severely infected with fungi with *Aspergillus niger*. and *Fusarium* sp. to be predominantly present in all the spoiled samples with some plates containing *Penicillium* as well (Table 1). The Nutrient Agar plates were having scanty growth of bacteria and predominately occupied by the above two major fungi.

Table 1: Fungal growth in Rose Bengal Agar Plates

Sample	Sl. No	<i>A. niger</i>	<i>Fusarium sp</i>	<i>Penicillium sp.</i>
A	1	Y	Y	Y
	2	Y	Y	Y
	3	Y	Y	N
	4	Y	Y	Y
	5	Y	Y	Y
	6	Y	Y	Y
	7	Y	Y	N
	8	Y	Y	Y
	9	Y	Y	N
	10	Y	Y	N
B	11	Y	Y	N
	12	Y	N	N
	13	Y	N	N
	14	Y	Y	N
	15	Y	Y	N
	16	Y	Y	N
	17	Y	N	Y
	18	Y	Y	Y
	19	Y	Y	N
	20	Y	Y	N
C	21	Y	Y	N
	22	Y	Y	N
	23	Y	N	N
	24	Y	Y	N
	25	Y	N	N
	26	Y	Y	N
	27	Y	Y	N
	28	Y	Y	Y
	29	Y	Y	Y
	30	Y	Y	N

Note: Y-Present, N-Absent



The Nutrient agar plates were predominantly occupied by fungi and very scanty growth of bacterial in 3-4 plates. Hence we can conclude that fungi with *Aspergillus niger*, *Fusarium* and *Penicillium* to be the major cause of damage to the tomato fruit. Further, these fungi are a source of potent mycotoxins which exhibits a wide spectrum of diseases which can even be fatal. *A. niger* is a source of ochratoxin while *Fusarium* produces Trichothecenes. Both these toxins have detrimental effect in humans which can even be fatal. Ochratoxin is considered to be a potent carcinogen and suspected of playing a role in the etiology of esophageal cancer and Balkan endemic nephrotoxicity. Hence spoiled tomatoes should not be consumed under any circumstances and should not be fed to cattles as well.

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