Mycopath (2008) 6(1&2)**:** 67-69

Brief Article

Mycoflora associated with tomato during the process of marketing

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Abstract

Major fungal species associated with spoil of tomato fruit are favored by high humidity which exists in wooden crates. The fungal species *Aspergillus niger, Aspergillus flavus, Rhizopus stoloni, Aspergillus fumigatus* and *Fusarium oxysporum* with 100, 100, 36, 36 and 18% prevalence respectively. These fungi were isolated from tomato fruit samples of the market. Loss statistics are primarily concerned with the quantity loss multiplied with the market factor. The lowest severity of losses in terms of produce weight whereas the economic losses against produce weight are related with demand and supply factor. Weight losses with respect to distance gradient indicated lowest for Lahore 0.15% and the highest severity recorded was of Karachi i.e. 2.07%.

Key words: *Lycopersicon esculentum*, marketing constraints, post harvest, storage fungi, tomato.

Introduction

Complexities in post harvest handling and marketing system in developing countries is due to poor storage facilities coupled with improper packaging and transportation. Naturally, fresh produce needs low temperature and high humidity during storage and transportation. Low temperature decreases physiological, biochemical and microbiological activities, which are the causes of quality deterioration (Kader *et al*., 1989). Seasonal post harvest losses of fruits and vegetables are high in the tropics due to environmental heat and moisture levels (MAEP, 1999).

Tomato (*Lycopersicon esculentum* Mill.) a member of the *Solanaceae* family is famous for its application in drug, fruit, flowering, ornamental and horticulture sectors. Botanically this fruit is known as berry. (Salunkhe, 2005). It is an integral part of food base mediums and culinary purposes. Tomato production is an important source of income for smallholder farmers. While domestic tomato production has intensified across the country in recent years, it still does not meet the high demand, so tomatoes are imported from neighboring countries especially India.

There is a high production of tomato fruits during the harvest time, but post harvest processing and preservation techniques are inefficient. Therefore, fruits spoil very early because of lack of appropriate systems of preservation and processing (Francois, 1995). Among the microbes infecting tomato fruit, fungal plant pathogens can cause extensive post harvest loss of fruit. Due to poor storage conditions resistance of fruit and vegetables to natural disease usually declines, leading to infection by pathogens (Tefera *et al*., 2007). The present study was designed to investigate the status of fungi associated with tomato with reference to consumer satisfaction for quality.

Materials and Methods

Tomato samples were collected from whole seller, retailer and consumers vegetable markets of Lahore. Market visits were conducted at fortnight interval from the months December 2007 to June 2008. In to main market 100 crate set was considered as basic investigation unit. From each unit sample set was composed. Specimens collected were processed for identification and single spore culture of the fungi associated with specimen. Single spore cultures of isolated fungi from the infected fruits of tomato were produced on fresh malt extract agar (MEA) identified by using the Leitz Laboralux at 100X. Different microscopic features like mycelial colony, conidial formation size and shape. The colonies of fungi were identified with the help of the key developed by Samon *et al*. (2002); Rapper and Fennel (1965).

The fungi isolated from infected specimens were maintained at -4 °C.

The degree of external damage was assessed on visual basis. Type of damages were classified as:

Fruit texture without any signs of fungal infection or mechanical injury.

- Fruit texture with visual signs of mechanical injury.
- Fruit texture with visual signs of fungal infection.
- Fruit texture coupled with signs of fungal infection or mechanical injury.

A 0-5 rating visual rating scale was developed to identify intensity of damage for respective fruit category. Fruits were dipped in a solution of 1% sodium hypochlorite for 2 min, rinsed with tap water, and air-dried before wounding. One hundred healthy tomatoes (Dragan and Tomaž, 2006) were randomly selected and their skin was ruptured with the help of heat sterilized needle was in a laminar flow. With the use of forceps fungal inoculum was inserted into the ruptured portion of the tomatoes up to the depth of 0.5 centimeter. The ruptured skin was again placed on its original place and the wounded portion was covered by wax coating using commercial wax. These inoculated tomatoes were kept at room temperature (25 °C) under 100kw by fluorescent tube (40 Watt). After 72 hours initiation of fungal growth was recorded and pictorially documented.

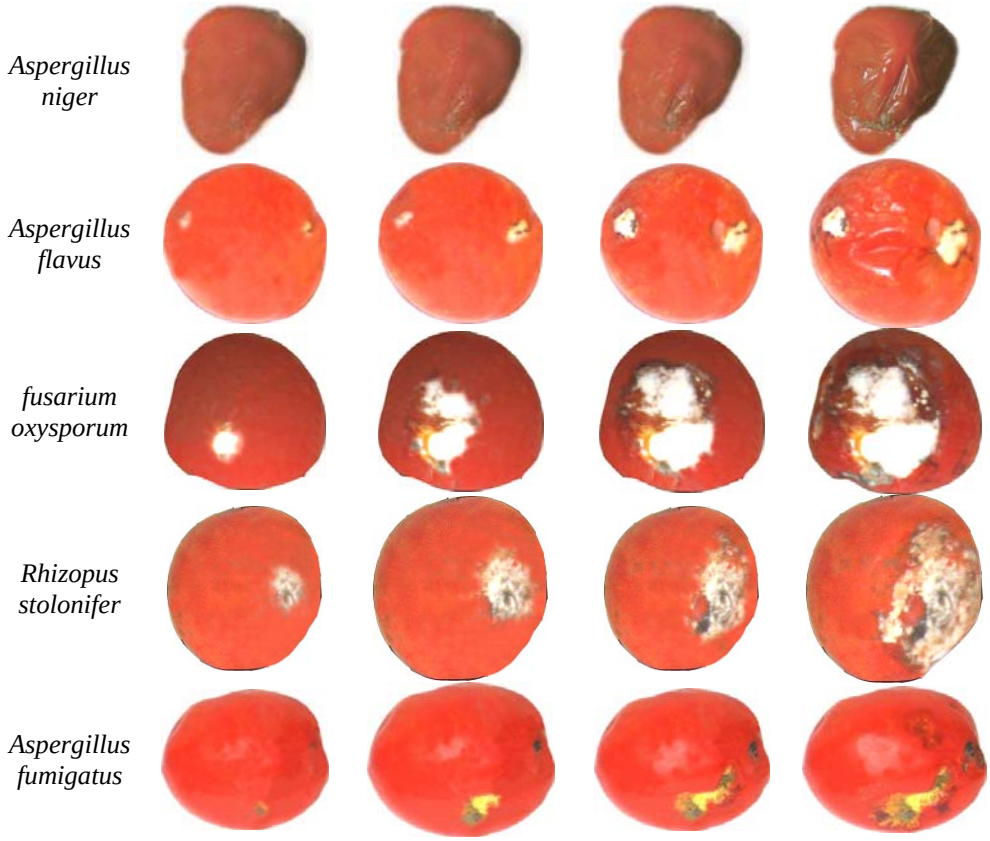

Plate. 1: Fruit decay process of fungi isolated from field.

Table. 1: Fungi associated with tomato isolated from tomato sampled from Lahore vegetable market at various time intervals.

Months	*Aspergillus niger*	*Aspergillus flavus*	*fusarium oxysporum*	*Rhizopus stoloni*	*Aspergillus fumigatus*
December	+	+	-	-	+
January	+	+	-	-	-
February	+	+	-	+	+
May	+	+	-	-	-
June	+	+	+	-	+
July	+	+	-	+	+

Results and Discussion

Fungal species recovered from tomato were *Aspergillus niger, Aspergillus flavus, Fusarium oxysporum, Aspergillus fumigatus* and *Rhizopus stolonifer* (Plate 1). The stakeholders of vegetable trade i.e farmers, dealers and retailers failed to get attractive profit over it. The selling value of commodity is declined because of improper handling and post harvest chain practices. Significance of seasonal grading of agricultural commodities followed by processing and post harvest system. This system is primarily focused on statutory coverage of the marketing system to provide legal protection to the consumer and other stake holders Field scouting on fungal infestation intensity found was linked with the season during peak winter months November, December and January when average day and night temperature was 27.4 °C, 21.6 °C, 19.8 °C and 11.6 °C, 6.8 °C, 5.9 °C respectively. Daylight documented in the months of December, January, February, May, June and July was 10, 11, 12, 14, 15 and 14 hours respectively, holds a major position in fungal infestation.

Fruit deterioration was primarily due to atmospheric water condensation that lowered down the temperature inside packing and thin water film covered surface area of the fruit. The fungal constraints issue rises after the decline of peak winter. The fungal species *Aspergillus niger, Aspergillus flavus, Rhizopus stoloni Aspergillus fumigatus* and *Fusarium oxysporum* with 100, 100, 36, 36 and 18% prevalence respectively, were isolated from tomato fruit samples of the market (Table 1). During transportation fruit passes through ripening, which is a complex phenomenon. It involves maturation, color change, production of ethylene, tissue softening, and change in respiration rate, fruit membrane thickness and permeability. Therefore packing of mechanically injured or fungal infested fruit increases probability of lot deterioration (De Lucia and Assennato) Efforts were also made to develop relationship between fungal infection and distance from the market.

Lahore vegetable markets have countrywide catchments of tomato and some times from India and china to meat the requirement of the metropolitan city. Therefore a changing patteren of fungal infestation is linked with the distance and period was observed.

This complexity is particularly critical in the case of perishable agricultural commodities where the traversal time of the products through the supply chain and the opportunities. to use inventory as a buffer against demand and transportation variability are severely limited. Loss statistics are primarily concerned with the quantity loss multiplied with the market factor. Most of the people were unaware of the loss factor parameter inquired. According to them loss means less income than the expenses made on crop production and transportation.

References

Agarwal S, Venketeshwer RA, 2000. Tomato lycopene and its role in human health and chronic diseases. *CMAJ*., **163**: 739-44.

De Lucia M, Assennato D, 1994. Agricultural engineering in development. Post-harvest operations and management of foodgrains. FAO Agricultural Service Bulletin No. 93.

Dragan Ž, Tomaž P, 2006. Comparative study of quality changes in tomato cv. 'Malike' (*Lycopersicon esculentum* Mill.) whilst stored at different temperatures. *Acta. Agric. Slovenica*, **87**: 235-243.

Francois M, 1995. Transformer les fruits tropicaux. Collection le Point sur les Technologies GRET – Ministe`re de la Coope´ration Franc_aise – CTA – ACCT; Paris, p. 226.

Giovanelli G, Lavelli V, Peri C, Nobili S, 1999. Variation in ripening. *J. Sci. Food Agric*., **79**: 1583-1588.

Giovannoni J, 2001. Molecular biology of fruit maturation and ripening. Ann. Rev. *Plant Physiol. Plant Mol. Biol.*, **52**: 725-749.

Kader AA, Zagory D, Kerbel EL, 1989. Modified atmosphere packaging of fruits and vegetables. *CRC Rev. Food Sci. Nut*., **28**: 1-30.

MAEP, 1999. Rapport sur strate´gie de croissance du secteur rural: Analyse e´conomique des options strate´giques et des sources de croissance, Lome´ TOGO, p. 47. Rodriguez JH, Cousin MA, Nelson.

Rapper KB, Fennel DI, 1965. The genus Aspergillus. The Williams & Wilkinf Co. Baltimore, pp 150-152

Salunkhe DK, Jadhav SJ, Yu MH, 2005. Quality and nutritional composition of tomato fruit as influenced by certain biochemical and physiological changes. *J. Plant Foods Human Nut*., **24**: 85-113.

Samson RA, Hoekstra ES, Lund F, Filtenborgo O, Frisvad JC, 2002. Methods for detection, Isolation and characterization of food-borne fungi. In: Samson RA, Hoekstra ES, Frisvad JC, Filtenborgo O, (Eds) Introduction food and air borne fungi. Central bureau Voor Schimmecu-teures, utrechet, pp 283-297.

Terry LA, Joyce DC, 2004. Elicitors of induced disease resistance in postharvest horticultural crops: a brief review. *Postharvest Biol. Technol*., **32**: 1–13.

Tefera A, Seyoum T, Woldetsadik K, 2007. Effect of disinfection, packaging, and storage environment on the shelf life of mango. *Biosyst. Engineer*., **96**: 1537-1550.