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POST HARVEST PEAR FRUITS ASSOCIATED WITH SPOILAGE FUNGI AND THEIR FREQUENCY OF OCCURRENCES IN APMC FRUIT MARKET VASHI, NAVI MUMBAI

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ABSTRACT

Pear (*Pyrus communis* L.) is the most significant fruit which is widely cultivated in abroad and also in India. There are few reports of the wholesaler regarding spoilage of this useful fruit in the market storage conditions. Post harvest decay of pear due to fungal pathogens in the different store houses in APMC Fruit market of Vashi, Navi Mumbai, was investigated by inspecting at regular intervals. Rotting and decay of the pears were observed regularly. Isolation of associated fungi from Pear fruits was carried out on Czapek's Dox Agar medium. Pear rot was high in the store houses as well as in market condition. Total 12 fungal pathogens were isolated from decayed fruits viz. *Alternaria alternata, Colletotrichum acutatum, Venturia inaequalis, Monilinia fructicola, Botrytis cinerea, Aspergillus fumigates A. flavus, Sclerotina fructigena, Rhizopus stolonifer, Mucor piriformis, Penicillium digitatum* and *Penicillium expansum*. Among these *Penicillium expansum* showed the highest rate of occurrence (90%) whereas *Botrytis cinerea* (30%) showed the lowest rate of frequency. Pear fruit spoilage was most severe under humid environment and was enhanced by wounds on fruit surfaces. Pathogenicity test were carried out and revealed that all twelve isolates proved pathogenic when artificially inoculated into healthy pear fruits.

KEYWORDS: Pear fruits, postharvest, isolation, fungal pathogens, Pathogenicity, spoilage.

INTRODUCTION

It has been accepted that fruits are commercially and nutritionally important food product. Fruits play an essential role in human nutrition by supplying the necessary growth factors such as vitamins, antioxidants and minerals in human daily diet and that can help to keep a

good health. Besides this, fruit scab and post harvest diseases are also significant and cause serious losses. Pear fruits contain high level of sugar, minerals and nutrient elements and their low pH value make them sensitive for fungal attack and are being rotten.[18] Consumption of fruit and vegetable products has dramatically increased by more than 30% during the past few decades.[11] Fungi not only cause rot to a number of fruits but also reduce their market value.[10] The post harvest fruits are mainly contaminated with fungi during the transportation and storage condition.

Pear (*Pyrus communis* L.) is the pomaceous fruit belonging from family Rosaceae. It is one of the most widely cultivated tree fruit of genus *Pyrus* that are used by humans. Post harvested pears are attack by numerous microbes, among which fungi and bacteria cause considerable loss in yield and spoil the fruits and market quality. Some important fungal pathogens are found on pear viz. *Alternaria alternata, Colletotrichum acutatum, Venturia inaequalis, Monilinia fructicola, Botrytis cinerea, Aspergillus fumigates A. flavus, Sclerotina fructigena, Rhizopus stolonifer, Mucor piriformis, Penicillium digitatum* and *Penicillium expansum.* Among these pathogens *Penicillium expansum* was found to be dominant in the store houses of local and central fruit markets of various places of Maharashtra, particularly in Navi Mumbai (APMC Fruit Market, Vashi) in packing boxes noted different damages of pear. It is estimated that about 20-25% of the harvested fruits are decayed by pathogens during post-harvest handling even in developed countries.[4] Spoilage of *Carica papaya, Citrus sinensis, Ananas comosus and Lycopersicon esculentum* due to fungi were investigated by Akinmusire, (2011). The principle of spread of fungal infection in fruits supports that a single infected pear fruit can be the source of infection to other pear fruits during storage and in transport. [13] Keeping in view the above points, an attempt has been done to study fungi responsible for post harvest decaying of pear fruit. This research was, therefore, embarked upon to identify the postharvest fungal organisms associated with pear fruits sold in APMC Fruit market of Vashi, Navi Mumbai.

MATERIALS AND METHODS

Pear fruit Samples were collected from different store houses of APMC Fruit market of Vashi, Navi Mumbai. All infected fruits were inspected for rotted areas and were stored in clean polyethylene bags. The healthy samples were also stored separately. All the samples were brought to the Research Laboratory, Department of Botany, K.V. Pendharkar College, Dombivli (E)-421203 (M.S.), India for further investigations. The fungal organisms

associated with diseased fruits were isolated according to the method described by Aneza, (2003). Small pieces of the diseased fruits were surface sterilized with 0.01% $HgCl_2$ solution and were repeatedly washed with sterile distilled water. These pieces were then transferred to Czapek's Dox Agar medium in petri plates. After inoculation, the petriplates were incubated at 27 ± 2^0C for 7 days and regular observation was carried out. The isolates were sub cultured to get pure culture in the slants and kept for further experimental purposes. Isolated fungal pathogens were identified by microscopic methods.[1, 16] Morphological characteristics of the fungi such as hyphae (septation), reproductive structure (sporangia/conidia) in chain or single; the type of spore, etc were observed and recorded.

For pathogenicity test, (Koch's Postulation) a loopful of fungal mat was inoculated aseptically to healthy pear by making small incision. The inoculated fruit was kept wrapping with polyethylene bags. The symptom development of the spoilage was observed periodically. Re-isolations were made from fruits showing rot symptoms and identifications carried out. Frequencies of occurrence of the fungal organism associated with the post harvest decay of fruits were calculated by the following formula as per Van der Plank (1963-75).

$$F = \frac{\text{Total number of infected fruits}}{\text{Total number of fruits}} \times 100$$

Where, F = Frequency

RESULTS AND DISCUSSION

Twelve (12) different fungal pathogens were isolated from infected post harvest fruits of pear which were collected from different store houses of APMC Fruit market of Vashi, Navi Mumbai, from time to time. The fungi were identified as *Alternaria alternata, Colletotrichum acutatum, Venturia inaequalis, Monilinia fructicola, Botrytis cinerea, Aspergillus fumigates A. flavus, Sclerotina fructigena, Rhizopus stolonifer, Mucor piriformis, Penicillium digitatum* and *Penicillium expansum.* The frequency percentage of occurrence showed in (Table 1). The spoilage frequency of occurrence rate was highest in case of *Penicillium expansum* (90%) followed by *Aspergillus fumigates* and *Aspergillu flavus* (70%), *Mucor piriformis* (60%), *Colletotrichum acutatum* and *Monilinia fructicola* (50%). The percentage of occurrence in case of *Venturia inaequalis, Alternaria alternata, Sclerotina fructigena* and *Rhizopus stolonifer* were accounted as 40% each. The lowest percentage of occurrence was observed in case of *Botrytis cinerea* (30%). Thus, it can be concluded that the *Penicillium expansum,*

Aspergillus fumigates and *Aspergillu flavus* were more responsible for fruit decaying in store houses as well as in the fruit market than the others.

Pathogenicity test revealed that the associated fungal organisms were responsible for causing rot of pear fruits (Table 2). All the fungal organism isolates were found to be pathogenic on all fruits. The rot symptoms obtained were similar to those observed previously on the fruits when subjected to identification procedures by examining their morphological, colonial and cellular characteristics. The moulds seen were the same as those of the isolated fungi of fresh fruits which were subject to spoilage. The fruits changed colour slightly after infection and became soft. The pathogenicity test showed that each infected fruit gave the initial organism that caused the spoilage of the fruit.

Association of fungal organisms with the post harvest decay of pear fruits and spoilage pattern as a result of post harvest infection. Different fungal organisms shows different symptoms on the fruits with respect to their association with the collected fruit samples of pears. Similar results were also reported by Akintobi, *et al.*,(2011) a total of nine fungi isolate were obtained. Of all the samples studied (ripe and unripe Pawpaw fruits), five species of fungi were found to be associated with the fruits decay.

The fungi associated with postharvest spoilage of pear were identified in this study as *Alternaria alternata, Colletotrichum acutatum, Venturia inaequalis, Monilinia fructicola, Botrytis cinerea, Aspergillus fumigates A. flavus, Sclerotina fructigena, Rhizopus stolonifer, Mucor piriformis, Penicillium digitatum* and *Penicillium expansum.* These organisms are commonly implicated in the postharvest spoilage of many fruits and vegetables and have been reported severally.[12,6,5,14,8] Generally, contamination of agricultural produce is a function of many factors including infestation in the field prior to harvest, handling during harvesting and methods of packaging and distribution of produce to the market. The variation in fungal loads of pear observed in this study can be attributed to the differences in the level of sanitation in handling and of the market environments. Wounds are known to be the major pre-disposing factor of fruits and vegetables to microbial attack both in transit and in storage.

Proof of pathogenicity is the single most reliable criterion used in implicating associated fungal organisms in the causal processes of disease development. All the fungal organism isolates were proved pathogenic on inoculated pear fruits in this study. This finding is consistent with the reports of[15,7,17] that *Fusarium* and *Aspergillus* species are notorious

causal agents of rot in many fruits and vegetables including watermelon, carrot and guava. As a further proof of its virulence, among the 12 fungal organisms isolated in this study, only *P. expansum* was found dominant and showing (90%) prevalence. Shiju Mathew (2010) had reported *Pestalotia psidii, Rhizopus stolonifer, Aspergillus niger, Penicillium expansum, Rhizoctonia solani* and *Fusarium* sp. in postharvest diseases of guava fruits.

In conclusion, it is important to point out that pear fruits are sensitive to physical damage. Efforts should be made, therefore, during harvesting and handling to minimize wounding. This way, the shelf life of pear fruits can be prolonged a little more and so, make them more available at least during the season. In addition, store houses should be maintained to minimize the load of inoculums that may be carried from the field into storage. This will reduce the incidence of postharvest spoilage of the fruit.

Table 1: Frequency (%) of Occurrence of Fungal Pathogens Isolated from the Infected Pear Fruits.

Fruit sample	Total number of samples	Infected fruits	Fungal Pathogens	Frequency (%)
Pyrus communis L.	10	04	*Alternaria alternata*	40
	10	05	*Colletotrichum acutatum*	50
	10	04	*Venturia inaequalis*	40
	10	05	*Monilinia fructicola*	50
	10	03	*Botrytis cinerea*	30
	10	07	*Aspergillus fumigates*	70
	10	07	*Aspergillus flavus*	70
	10	04	*Sclerotina fructigena*	40
	10	04	*Rhizopus stolonifer*	40
	10	06	*Mucor piriformis*	60
	10	06	*Penicillium digitatum*	60
	10	09	*Penicillium expansum*	90

Table 2: Pathogenicity Test.

Sr. No.	Fungal Pathogens	Fruit inoculated	Pathogenicity Test
1.	*Alternaria alternata*	*Pyrus communis* L.	+
2.	*Colletotrichum acutatum*		+
3.	*Venturia inaequalis*		+
4.	*Monilinia fructicola*		+
5.	*Botrytis cinerea*		+
6.	*Aspergillus fumigates*		+
7.	*Aspergillus flavus*		+
8.	*Sclerotina fructigena*		+
9.	*Rhizopus stolonifer*		+
10.	*Mucor piriformis*		+

11.	*Penicillium digitatum*		+
12.	*Penicillium expansum*		+

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