Vol. XII (3-4), 1975

SOME STUDIES ON THE FUNGI CAUSING FRUIT ROT IN COLD STORAGE AND MARKET

Muhammad Younus and Mukhtar Ahmad*

Diseased specimens of various fruits were collected from market and storage located at Lyallpur. Isolations from these diseased fruits yielded 22 species of fungi. Out of these 12 species of fungi proved to be pathogenic. All fungi grew well on basal medium at 25–30°C. However, the growth declined at 35C°. Least colony growth was observed at 10°C and 15°C and there was no growth at 40°C.

INTRODUCTION

Fruits are great economic importance due to their commercial and nutritional value. The fruits are transporated by the growers for sale in various stores and markets. During the transportation and packing processes the fruits are liable to be attacked by different microorganisms and thus deteriorate in quality and food value, often resulting in complete destruction.

Among various organisms, fungi play an important role in the destruction of the fruits in storage, transit and market (Pole–Evans, *et al.* (1921) ; Adam (1923) ; Kidd and Beaumont (1924) ; and Colhoun (1938). Temperature and humidity play an important role in setting the rot in fruits, since the producers and traders in our country are not fully aware of deterioration in transiting fruits, losses go unchecked.

Gurdaizi (1961) analysed large number of samples of different fruits in Pakistan and isolated 7 species of fungi from apple, 4 species from citrus, 2 species from mango, 3 species from guava, 2 species from pomegranate and one species from peach and plum. He further concluded that all these fungi grew well on Richard's agar medium at a temperature of 25°C.

Limited information is available about the prevelance of fungi, which directly or indirectly causes rotting of fruits in market and during storage in Pakistan. In view of such losses to fruits it was considered necessary to undertake this type of research for finding out the pathogenic fungi and their distribution under different temperature and humidity conditions.

*Department of Plant Pathology, University of Agriculture, Lyallpur.

MATERIALS AND METHODS

Diseased fruits of apple, apricot, pear, peach, plum, citrus, grape, pomegranate and mango were collected from the fruit market and cold storages located at Lyallpur.

Symptoms were recorded and isolations were made from these diseased fruits. Two methods were used for isolations. Firstly the bits of diseased tissues were sterilized with 0.1 percent mercric chloride solution for 1–½ minutes and then placed on potato dextrose agar (PDA) for isolation. Secondly bits of diseased tissues placed directly on PDA without surface sterilization. The culture media used in this study were potato dextrose agar (PDA), Richard's agar (RA), Czepeck's agar (ZA) and basal medium (BMA).

The culture media were sterilized at 120°C at a pressure of 15 pounds per square inch for 15 minutes. The isolates were purified by usual technique.

Mass culture was prepared in conical flasks on basal medium for pathogenicity trials and other experiments. The healthy fruits were surface sterilized with methylated spirit before inculation. In each case an uninoculated control was kept. These were then placed at a temperature 22–25°C for further observation. The fruits were injured with sterilized sharp scalpel and then inoculated. After inoculation they were kept in sterilized desicators at 22-25°C and observations were recorded after 15 days. Only those fungi which proved to be pathogenic were studied at different temperatures on basal medium.

RESULTS AND DISCUSSION

Diseased specimens of different fruits were collected from the fruit market and cold storages located at Lyallpur. Isolations were made from the diseased fruits after treating them with 0.1 percent mercuric chloride for 1 to 1½ minutes. species of fungi belonging to ten genera were isolated. The isolated fungi are given in table No. 1. Out of the isolated fungi, the species of *Aspergillus*, *Penecillium* and *Alternaria* occurred in high frequency.

Pathogenicity trials :

For pathogenicity test a set of five fresh healthy fruits was used. After disinfestation with methylated spirit, the fruits were inculated with the pure culture of each isolate after making artifical injuries with a sterilized sharp scalpel. Uninoculated healthy injured fruits served as check. After

TABLE I. *Fungi occurring on fruits.*

Sr. No.	Name of the fruit	Fungi isolated	Fungi proved to be pathogenic
1.	Apple	*Aspergillus niger, A. fumigatus, Cladosporium herbarum, Alternaria tenuis, A. tenuissima, Helminthosporium tetramera, Mucor racemosus, Penicillium expansum, P. lilacinum*	*Aspergillus niger, Alternaria tenuis, A. tenuissima, Penicillium expansum.*
2.	Apricot	*Aspergillus niger, A. fumigatus, A. flavipes, Rhizopus arrhizus.*	*Aspergillus niger, Rhizopus arrhizus, A. flavipes.*
3.	Peach	*Alternaria humicola, Aspergillus niger, A. fumigatus, Penicillium citrinum.*	*A. niger, A. fumigatus.*
4.	Pear	*Alternaria tenuis, Aspergillus niger, A. luchiensis, Curvularia lunata.*	*Aspergillus niger, Alternaria tenuis, Curvularia lunata.*
5.	Plum	*Rhizopus arrhizus, Aspergillus niger, A. flavus, A. luchtennis, A. fumigatus, Fusidium sp., Mucor racemosus.*	*Rhizopus arrhizus, Aspergillus niger, A. flavus.*
6.	Citrus sp.	*Alternaria tenuis, A. tenuissima, Aspergillus fumigatus, A. niger, Colletotrichum gloeosporioides, Penicillium expansum, P. digitatum, P. italicum, P. lilacinum, Rhizopus oligosporus.*	*A. tenuissima, Aspergillus niger, Colletotrichum gloeosporioides, P. digitatum P. italicum*
7.	Grapes	*Aspergillus flavipes, A. fumigatus, A. niger, Colletotrichum gloeosporioides, Penicillium digitatum.*	*Aspergillus flavipes A. niger, A. fumigatus.*
8.	Pomegranates	*Aspergilus flavipes, A. fumigatus, A. niger, Penicillum italicum.*	*Aspergillus niger, Penicillium italicum*
9.	Mango	*Aspergillus fumigatus, A niger, A. flavipes, Colletotrichum gloeosporioides.*	*Aspergillus fumigatus, A. niger, Colletotrichum gloeosporioides.*

inoculation the fruits were kept in sterilized desiccators at a room temperature of 22-25°C. All the fruits including control were examined after 15 days. Percentage of rot of each fruit was calculated by taking into consideration the intensity of infection in the fruits. The fungi responsible for causing rot in apple were *Aspergillus niger*, *Alternaria tenuis*, *A. tenuissima* and *Penicillium expansum*. Colhoun (1938) and wilkinson (1938) also reported the occurrence of *Penicillium expansum*. However, they also found *Mucor pirtforms* and *Colletotrichum gloeosporioides* causing rot in apples and *Alternaria tenuissima* on apple fruit.

The fungi which proved to be pathogenic to citrus fruits were *Alternaria tenuis*, *A. tenuissima*, *Asperillus niger*, *A. fumigatus*, *Penicillium digitatum* *P. Italicum* and *Colletotrichum gloeosporioides*. Out of these fungi *Aspergillus niger* and *Penicillium italicum* were very serious because these caused rotting of even the uninjured fruits of oranges. Similar results were also reported by pole Evans et al. (1921) in South Africa.

The pathogenicity test proved that *Aspergillus niger* was prominantly responsible for causing rots in various fruits such as peaches, pears, mangoes, grapes, plum, apricot and pomegranate followed by *Aspergillus fumigatus*, *Pedicillium Italicum*, *Rhizopus arrhizus* and *Colletotrichum gloeosporioides*. Srivastava, et al. (1965) also found that *Aspergillus niger* was responsible for rotting in various fruits. However, they showed that the fungus could enter only through wounds thus causing rots only in injured fruits.

Effect of Different Temperatures :

Effect of different temperatures on colony growth of 12 pathogenenic fungi on basal medium was studied. The fungi were planted singly in quardruplicate and were then incubated at 10, 15, 20, 25, 30, 35 40°C. The observations were recorded after 15 days and colony diameter at different temperatures is given in fig, No. 1, 2 and 3.

The results clearly indicate that all the fungi grew well within the range of 25–30°C. However, the growth declined at 35°C. Least colony growth was observed at 10°C and and 15°C and there was no growth at 40°C.

FIG 1

COLONY DIAMETER (MMS) OF FRUIT ROTTING FUNGI AT DIFFERENT TEMPERATURE ON BASAL MEDIUM AFTER 7 DAYS

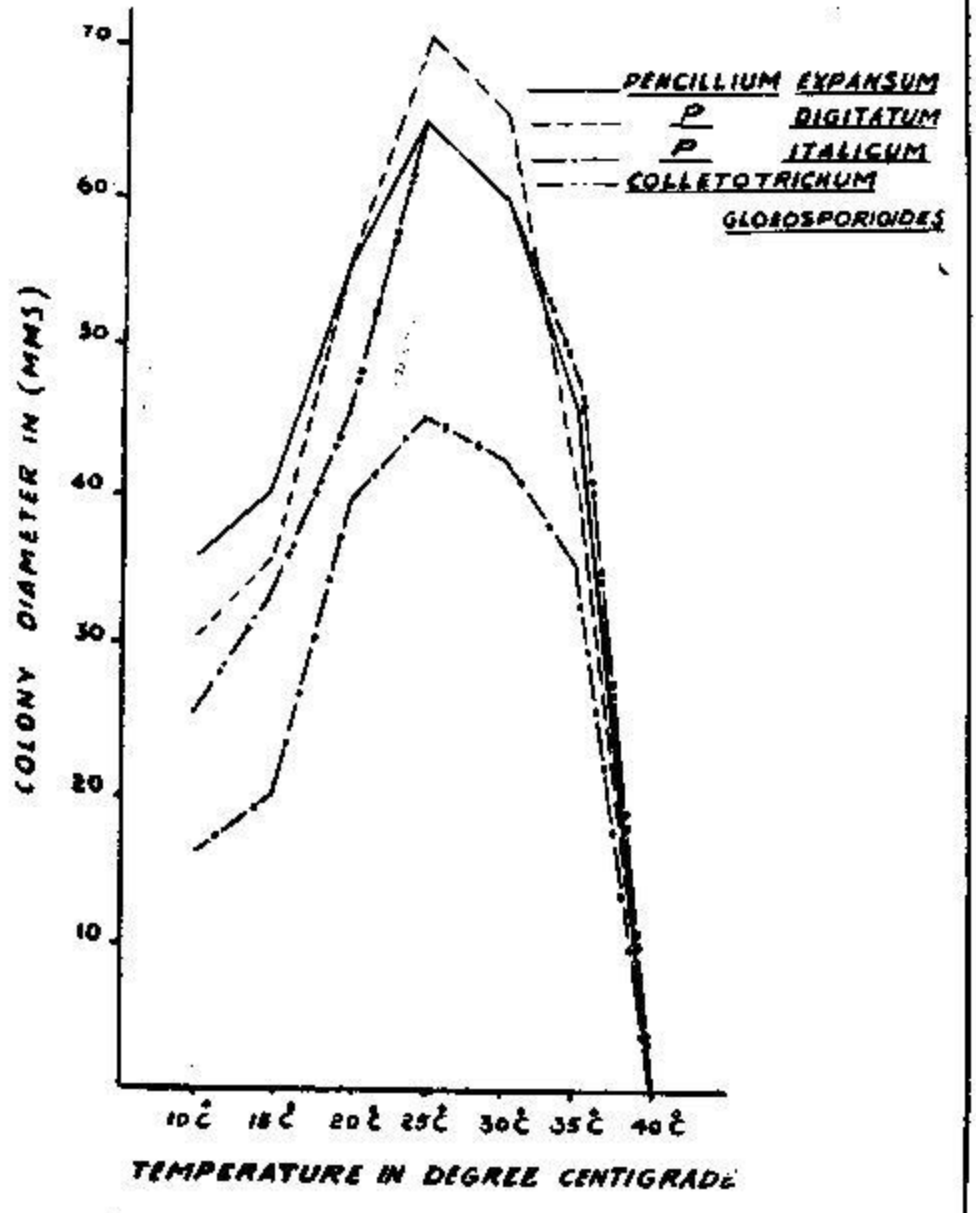


FIG. 2

COLONY DIAMETER (MMS) OF FRUIT ROTTING FUNGI AT DIFFERENT TEMPERATURE ON BASAL MEDIUM AFTER 7 DAYS

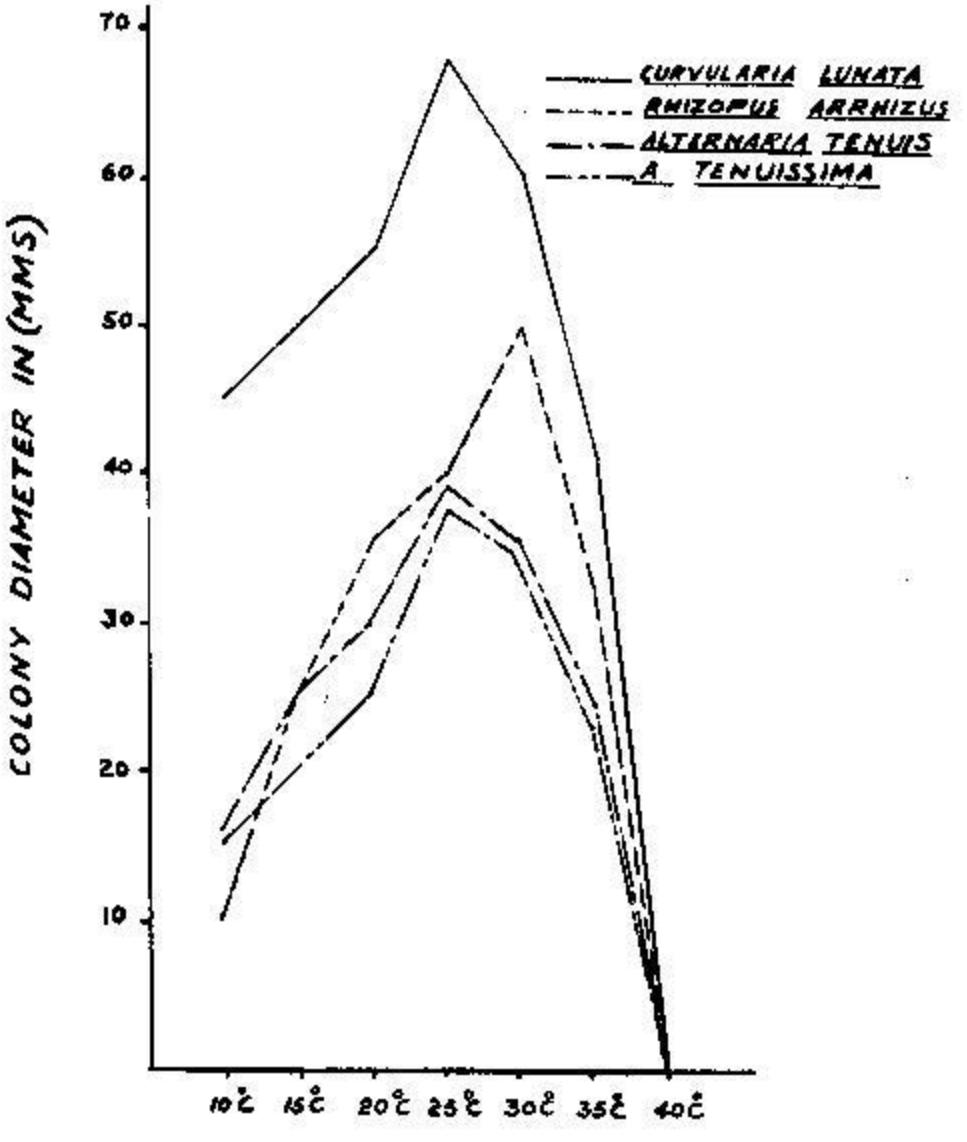
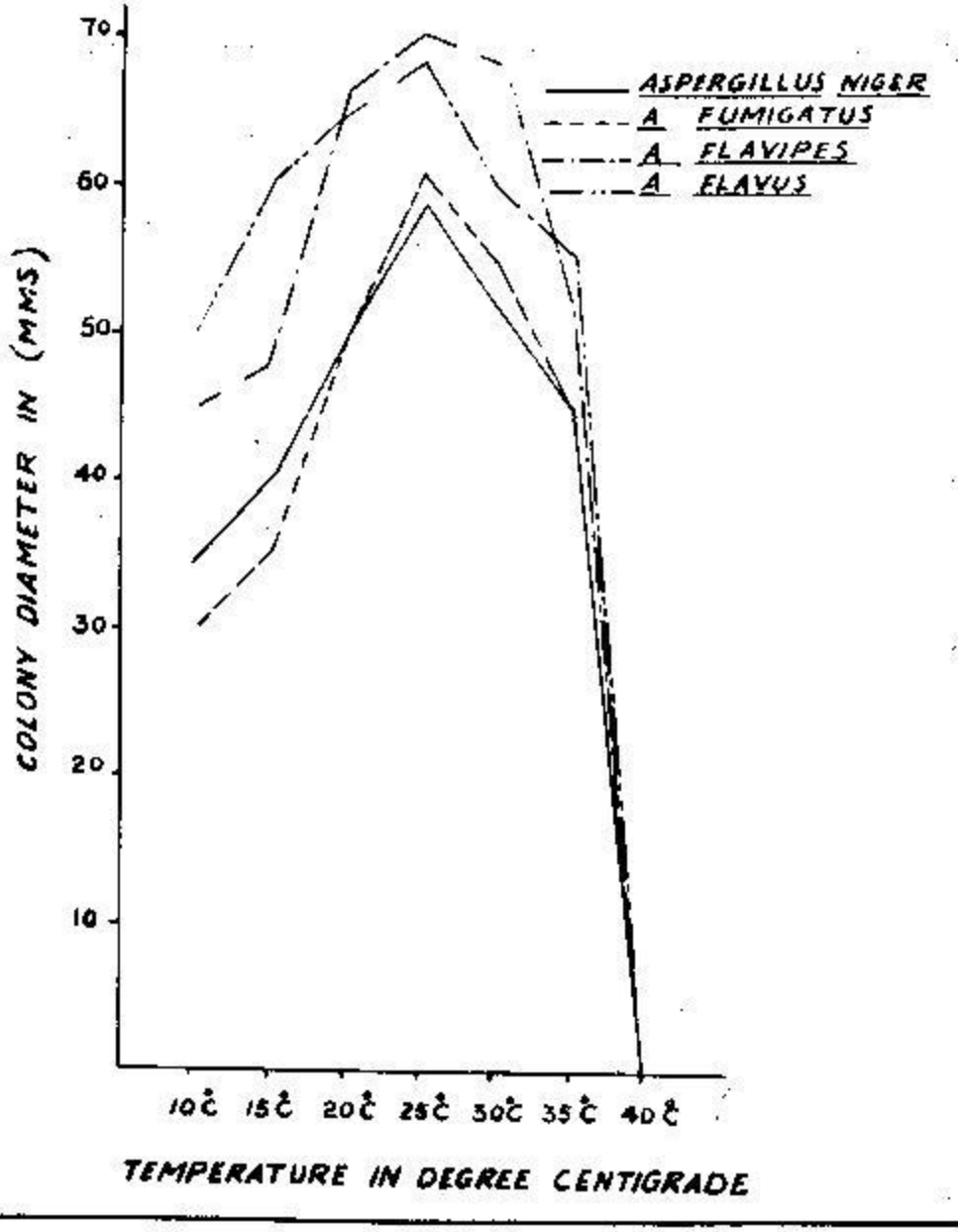


FIG. 3

COLONY DIAMETER (MMS) OF FRUIT ROTTING FUNGI AT DIFFERENT TEMPERATURE ON BASAL MEDIUM AFTER 7 DAYS



LITERATURE CITED

Adam, D.E. 1923. Experiment in citrus fruit storage. Jour. Dept. Agri: Victoria. 21 : 307–317.

Colhoun. T. 1938. Fungi causing rots of apple fruits in Northern Ireland. Ann. Appl. Biol. 26 : 88-99.

Gurdaizi, S.T.H. 1961. Some studies on the diseases of different fruits in storage and market. M.Sc. Thesis. Univ. of the Pb. Lahore.

Kidd, F., and A. Beaumont. 1924. Apple rot fungi in storage. Tran. Brit. Mycol. Soc. 10:98-118.

Pole Evans, I.B. Thomson, R.H. Marry, V.A. Putterill, and G. Hobsen. 1921. Further investigation into the cause of wastage in export citrus fruits. From South Africa. Bull. I:48.

Srivastava, M.P., R.N. Tandon, S.N. Bhargava, and A.K. Ghosh. 1965 Studies on fungal diseases of some tropical fruits III. Some post harvest diseases of mango. Proc. Nat. Acad. Sci. India Sect. B. 35:69-75.

Wilkinsons, E.H. 1938. A note on the prevalence of fungal spots and rots of apples in cold storage of long. Ashton. Rept. Agri. Res. Sta. Bristol : 84-90.