Short Communication

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SOME NEW ADDITIONS TO THE POST-HARVEST FUNGAL DISEASES OF BER *(ZIZYPHUS MAURITIANA)* FROM INDIA AND THEIR INFLUENCE ON ASCORBIC ACID CONTENT.

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Infected fruits yielded 19 fungal pathogens of which *Aspergillus nidulans, A. flavus, Fusarium moniliforme, F. pallidoroseum, Thielaviopsis* state of *Ceratocystis paradoxa, Penicillium crustosum, Phomopsis ziziphina* and *Phoma capitulum* are new records on this fruit from India. It caused drastic decline in ascorbic acid.

Key Words : Ber, post-harvest, ascorbic acid, fungal rots.

Ber (*Zizyphus mauritiana* Lamk.) belonging to the family Rhamnaceae is cultivated all over the country in the arid and semi-arid regions for the fleshy drupes which have a high nutritional value and great commercial potential. The ripe fruits are rich in ascorbic acid, sugars, aminoacids, phosphorus, iron and other minerals.

Survey for post-harvest fungal rots of ber have been conducted from West Bengal, Maharashtra, Rajasthan, Uttar Pradesh and Haryana. However, no survey has been made from J & K state where ber is cultivated on an area of 5710 hectares with an annual production of 10,025 metric tonnes (1994-95). In view of this, an extensive survey was conducted at Jammu in the months of March-June, 1996 at wholesale, retailer and consumer level to determine those post-harvest fungal diseases of ber which have not been recorded so far. Further, their influence on ascorbic acid content of the fruit was also assessed.

Diseased fruits were collected in sterilized polyethylene bags and isolations were made within 24 hours of their collection. Symptoms of the diseases were recorded from both naturally and artificially infected fruits. Pathogenicity was tested by pin prick method (Tomkins and Trout, 1931) and it was considered established only when Koch's postulates were fully satisfied.

Quantitative estimation of ascorbic acid content in healthy and diseased fruits was done titrimetrically by using 2,6-dichlorophenol indophenol as an indicator dye, as suggested by Bessey and King (1933). The amount of ascorbic acid in mg/100g of fruit tissue was calculated by using formula :

$$\frac{A \times I \times V \times 100}{v \times W}$$

where,

A = Quantity of ascorbic acid reacting with 1 ml of Indophenol reagent.
I = Volume of Indophenol solution (in ml) required for the completion of titration with the extract.
V = Total volume of extract (50 ml).
v = Volume of extract for each titration (10 ml).
W = Weight of fruit pulp (5 g).

As many as 19 fungal pathogens *(Aspergillus niger, A. nidulans, A flavus, Fusarium moniliforme, F. pallidoroseum, F. solani, F. equiseti, Cladosporium oxysporum, Alternaria alternata, Botryodiplodia theobromae, Curvularia lunata, Trichothecium roseum, Geotrichum candidum, Colletotrichum gloeosporiodes, Epicoccum nigrum, Phoma capitulum, Phomopsis ziziphina, Penicillium crustosum* and *Thielaviopsis* state of *Ceratocystis paradoxa*) were found to cause post-harvest spoilage of ber. Among these, rots caused by *Aspergillus flavus, A. nidulans, Fusarium moniliforme, F. pallidoroseum, Thielaviopsis* state of *Ceratocystis paradoxa, Penicillium crustosum, Phomopsis ziziphina* and *Phoma capitulum* are new records on ber for India.

1. Black rot : Common in the injured ripe fruits, dark lesions, became more conspicuous as they got covered by dark olive green and finally black crust

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Table I. Changes in ascorbic acid content (mg/100g of the fruit pulp) of inoculated ber fruits after 5 days of inoculation. Healthy fruits (control) - 49.68 mg/100g.

Pathogen	Ascorbic acid content of inoculated fruits	Percentage loss in ascorbic acid
Aspergillus nidulans	2.16	95.65
A. flavus	1.08	97.82
Fusarium moniliforme	6.48	86.95
F. pallidoroseum	2.16	95.65
Thielaviopsis state of *Ceratocystis paradoxa*	1.08	97.82
Penicillium crustosum	18.36	63.04
Phoma capitulum	21.6	56.52
Phomopsis zizphina	2.16	95.65

of the fungus. Within 2-3 days, black rot encompassed the whole fruit and developed few long necked perithecia on the surface identified as *Thielaviopsis* state of *Ceratocystis paradoxa* (E. Butler) C. Moreau.

2. *Brown rot :* Characterised by the production of dark-brown lesions on the fruit surface, with white fluffy mycelium, identified as *Fusarium moniliforme* Sheldon.

3. *Soft rot :* Water soaked spots on the fruit, Under humid conditions, spots early stages increased in size and covered with light peach coloured mycelium identified as *Fusarium pallidoroseum* (Cooke) Sacc.

4. *Aspergillus rot : Aspergillus nidulans* (Eidam) Wint. and *A. flavus* Link were found to produce extensive rot and almost similar symptoms excepting the different colour of the conidial heads. Initially the infected fruits showed sunken, light areas which enlarged within 2-3 days and became covered with tufts of blue spores in case of *A. nidulans* infection and yellowish green mass of spores during *A. flavus* infection.

5. *Phoma rot :* Diseased fruits showed depressed and light brown lesions, produced black minute pycnidia, which oozed out light pink coloured pycnidiospores, identified as *Phoma capitulum* Pawar, Mathur and Thirum.

6. *Penicillium rot :* More common ripe and injured fruits, covered with white mycelial growth, turned bluish green due to production of numerous spores, identified as *Penicillium crustosum* Thom. (IMI 371870).

7. *Phomopsis rot :* Appeared on the fruits in the form of water soaked, circular and dark brown spots under storage conditions. Spots covered with grey mycelial growth, black and hard conidiomata developed. Fungus was identified as *Phomopsis ziziphina* Ponnappa (IMI 371873).

Results presented in Table 1 indicate that ascorbic acid content of ber fruits declined very rapidly from 49.68 mg/100 g (control) to 2.16, 1.08, 6.48, 2.16, 18.36, 21.60, 2.16 and 1.08 mg/ 100g in response to pathogenesis by *Aspergillus nidulans, A. flavus, Fusarium miniliforme, F. pallidoroseum, Penicillium crustosum, Phoma capitulum, Phomopsis ziziphina* and *Thielaviopsis* state of *Ceratocystis paradoxa* respectively. The rapid depletion of ascorbic acid content under pathogenesis may be attributed to the increased respiration rate which may induce rapid oxidation of ascorbic acid. In addition, the decline may also be due to the production of the enzyme ascorbic acid oxidase, either by the fungus itself or by the host-parasite interaction as postulated by Ghosh *et al.* (1965). From this investigation it is concluded that ber fruits are susceptible to many fungi during post-harvest phase and most of them rot the fruit of its rich ascorbic acid content which is a saviour in protecting humans against scurvy, aging and degenerative diseases.

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REFERENCES

Ghosh A K, R N Tandon, S N Bhargava & M P Srivastava 1965 Vitamin C content of guava fruit after fungal infection. *Naturwissenschaften* **52** 478.

Tomkins R G & S A Trout 1931 The use of ammonium salts for the prevention of green mould in citrus. *Jour Pomo Hort Sci* **9** 257-264.