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INCIDENCE OF PENICILLIC ACID IN APPLES

S. NEELAKANTAN[1] G. INDIRA JASMINE[2] R. BALASARASWATHI[3] THEYMOLI BALASUBRAMANIAN[4]

In a survey of foods and feeds for mycotoxins, natural occurrence of penicillic acid was found in a sample of apples which had just started rotting with a patch of green mould growth. The implications of mycotoxin contamination in horticultural produce are discussed.

Penicillic acid is a well known mycotoxin produced in large amounts by the strains of a large number *Penicillium* and *Aspergillus* species. Notable among these are *P. cyclopium*, *P. puberulum*, *P. martensii*, *P palitans* (Wilson etal. 1967) and the various strains of *A. ochraceous* group viz., *A. ochraceous*, *A. sclerotinum* *A. alliaceus*, *A. melleus* and *A. sulphureus* (Ciegler 1972). Natural occurrence of penicillic acid has been reported in yellow and white popcorn (Bullerman 1975), Swiss cheese (Bullerman, 1976) dried been and corn (Thorpe and Johnson, 1974). Ceigler and Kurtzman (1970) have studied the conditions for the production of penicillic acid on different agricultural commodities and observed that the toxigenic strains found on corn could produce substantial amounts of penicillic acid in rice, barley, sorghum and oats. The rate of production depended upon the strain, substrate and incubation temperature.

The combined effects of water activity of the substrate and temperature on the growth of toxigenic species and penicillic acid production have been studied by Northholt et al (1979) in malt agar media, Gouda cheese and poultry feed. Optimum temperature was found to range between 24 and 31°C for *P cyclopium* and *A.ochraceous*. On poultry feed *A. ochraceous* produced the toxin at an a_w as low as 0.88, whereas, the minimum a_w for *P. cyclopium* was found to be 0.97. Penicillic acid is known to be toxic to mammals (Murnagan, 1946) and has also been found to be carcinogenic to rats by subcutaneous injection (Oxford et al. 1942; Dickens and Jones, 1961). Under a Government of India scheme, we had surveyed a large number of foods and feeds available in the Tamil Nadu region for mycotoxins, penicillic acid was detected in one sample of apple and the results are reported in this article.

MATERIAL AND METHODS

The types of fresh produce analysed are shown in Table No 1. These samples

1. Dept. of Food Technology, T.N.A.U CBE-3;
2, 3, and 4, Dept. of Bio chemistry TNAU, CBE.3

were purchased from the local Coimbatore market and a total number of 33 lots of one Kg. each were analysed. These were not premium grade fruits and the apples showed the symptoms of characteristic brown discolouration on the outside. In one sample, rotting had just started with a patch of slight green mould growth on them. The fruits were sliced, mixed and 50 g were extracted with chloroform (200ml). After filtration, the chloro from layer was washed, dried over anhyd. Na_2SO_4 and concentrated under vacuum before spotting on TLC plates. Standard TLC procedures using silica Gel-*G* at a thickness of 0.25 mm were used after activation of the plates at 110.C for one hour. Solvent used for development of the plates (15 acm) was a mixture of toluene-ethyl acetate-90 per cent formic acid (6:3:1) Pure crystalline penicillinic acid obtained from NRRL., U.S.A. was used as stadard, Detection of penicillic acid was made by the blue fluorescent spots with NH_3 fumes under long wave U V. lamp° Rf value, characteristic visual clloured spots produced by the spray reagents p-anisaldehyde (Scott et al, 1970) p-dimethyl amino benzaldehyde and p-tolualdehyde developed by Neelakantan et al,(1978). Confirmation was again obtained by rechromato ghraphy with the standard toxin.

RESULTS AND DISCUSSION

Out of the six samples of apples analysed one sample showed positive presenceof thetoxin. In this sample, the rotting had just set in with a patchof greenmould Usually such samples are graded low by the trade with substantial reduction in the price and they are generally purchased by the poorer sections of the public. The tropical climate of India with high ambient temperatures and high relative humidity is ideal for the growth of moulds. If the damage is severe, people trim the affected portions and in cases where the mould damage is less severe people do not hesitate to consume the produce Since the hazards of mycotoxin ingestion are more dangerous for people of lower nutritional status, there is an urgent need for educating the public of the need to avoid mould contaminated foods.

The survey also included other fruits like grapes, banana, tomato, papaya and orange. Incidence of penicillic acid was not observed in these samples. Thorpe and Jhenson (1974) have reported the analysis of seven samples of apple juice obtained from bruised and rotten apples and twelve samples of commercial apple juice collected from the stores in washington, D.C. area. They did not detect penicillic acid in any of the samples. Possibly, this is the first time that the natural incidence of penicillic acid in apples is being reported. Since the substandard rotting and mouldy produce are priced very low, they may be purchased by unscupulous hoteliers and used, grossly affecting the health of the consumers.

Rotting and moulding of produce generally start with bruising on their surface during havesting and transportation. Bruising exposes the cell sap for

microbial attack. Generally, apples are cold stored and when takenout,moisture condenses on their surface creating a congenial atmosphere for mould deve opment. There are no refregerated trans port or display facilities for horticultural prouduce in our country. This emphasises the need for careful handling and packing during the entire post harvest stages of storage, transportation, wholesale and retail marketting.

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Table-1 Samples of fresh produced analysed under each category

Samples	No. of samples analysed	No. of samples positive for penicillic acid
Apples	8	1
Grapes	3	—
Bananas	5	—
Tomato	7	—
Papaya	9	—
Orange	3	—