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Detection of post-harvest fungal diseases of mango by X-ray scanning non-destructive technology

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Abstract

The detection of *Aspergillus niger* rot, anthracnose and *Rhizopus* rot infection in post-harvest mango fruit was demonstrated by a non-destructive X-ray scanning technique carried out 4 and 5 days post inoculation. It is suggested that such technology for detection of fungal infection may be useful as an imaging-based mango sorting system.

Key words – anthracnose – *Aspergillus niger* rot – *Mangifera indica* – novel technique – *Rhizopus* rot

Introduction

X-ray technology has been applied regularly in industry, hospitals, airport security, etc. Early infestation caused by fruit fly in apple, pear, peach, cherry tomato and orange can be detected by X-ray scanning (Yang et al. 2006). Spongy tissue of mango fruits can be detected by X-ray scanning (Thomas et al. 1993, Janave 2007). However, there are no references of X-ray scanning technology being used to detect fungal infection in post-harvest fruits of mango. Hence, the aim of this research was to demonstrate the detection of fungal infection of mango fruit by X-ray scanning non-destructive technology.

Materials & Methods

Spore suspensions of *Aspergillus niger*, *Colletotrichum gloeosporioides* and *Rhizopus stolonifer* were prepared and inoculated into same sized mango fruits (Kesar variety) using sterilized disposable syringes in aseptic conditions. Healthy mango without inoculation was used as control. Four and 5 days following inoculation, the fruits were scanned by a digital X-ray system. The specifications with which X-ray exposure was taken were kv = 63, mA = 160 and mAs = 13.

Results

Four and 5 days after inoculation, *Aspergillus niger*, *Colletotrichum gloeosporioides* and *Rhizopus stolonifer* fungal infection of mango fruit could be detected by X-ray scanning. Infested fruit showed dark areas in the fungal infected portion, while uninfected fruit showed a uniform light

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grey area (Figs 1–3). After X-ray scanning, when infected fruits were cut, infection was seen clearly.

Discussion

To our knowledge, this is the first reference for detection of post-harvest fungal disease in fruit. X-ray scanning non-destructive technology for detection of fungal infection may be useful as an imaging-based mango sorting system. It may be useful for traders exporting bulk quantities of fruits.

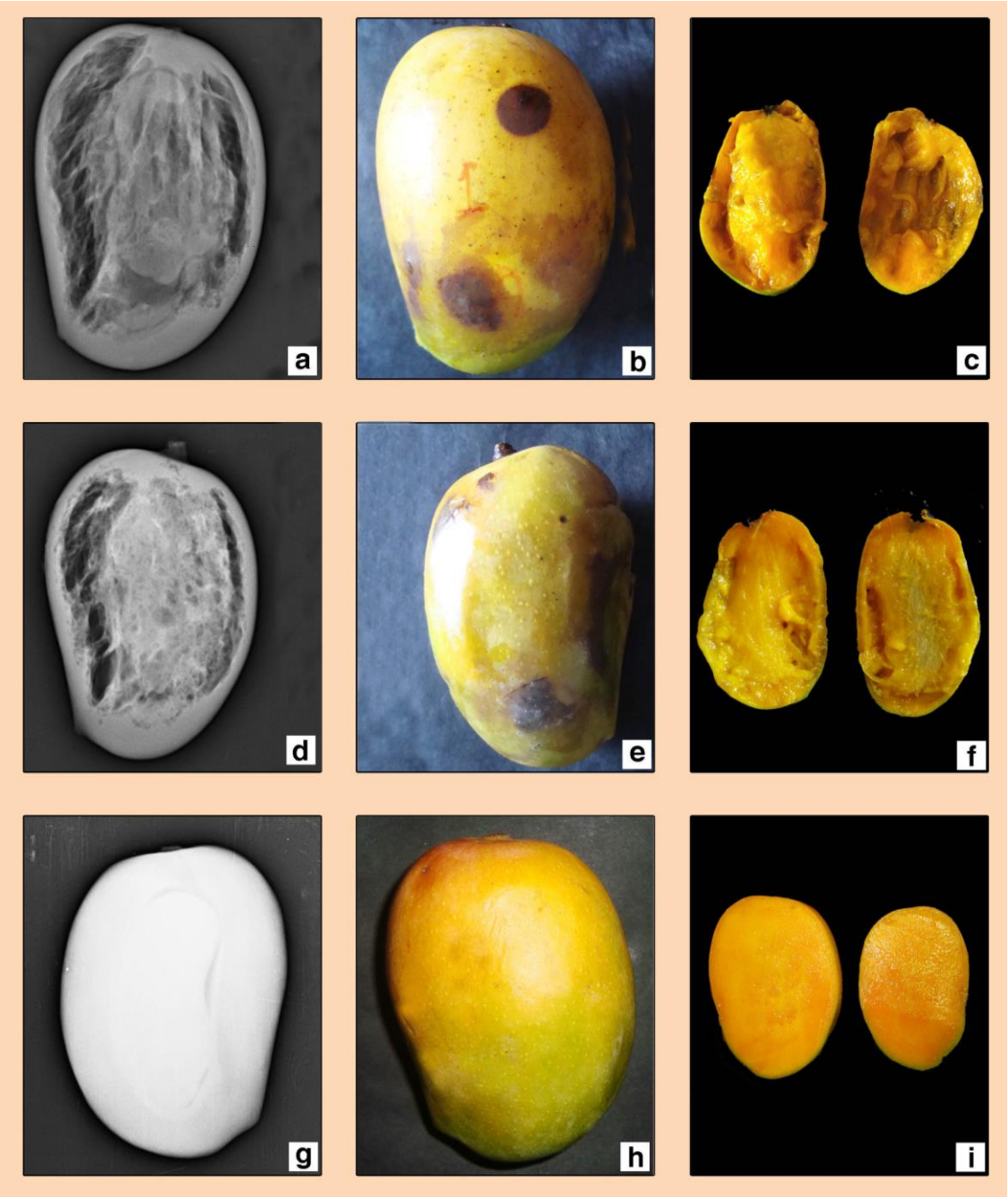

Fig. 1 - X-ray scanning of black mould rot (*Aspergillus niger* rot) of mango fruit. a. X-ray image 4 days post-inoculation, b. uncut fruit 4 days post-inoculation, c. cut fruit 4 days post-inoculation, d. X-ray image 5 days post-inoculation, e. uncut fruit 5 days post-inoculation, f. cut fruit 5 days post-inoculation, g. X-ray image of healthy fruit, h. Healthy uncut mango, i. Healthy cut fruit.

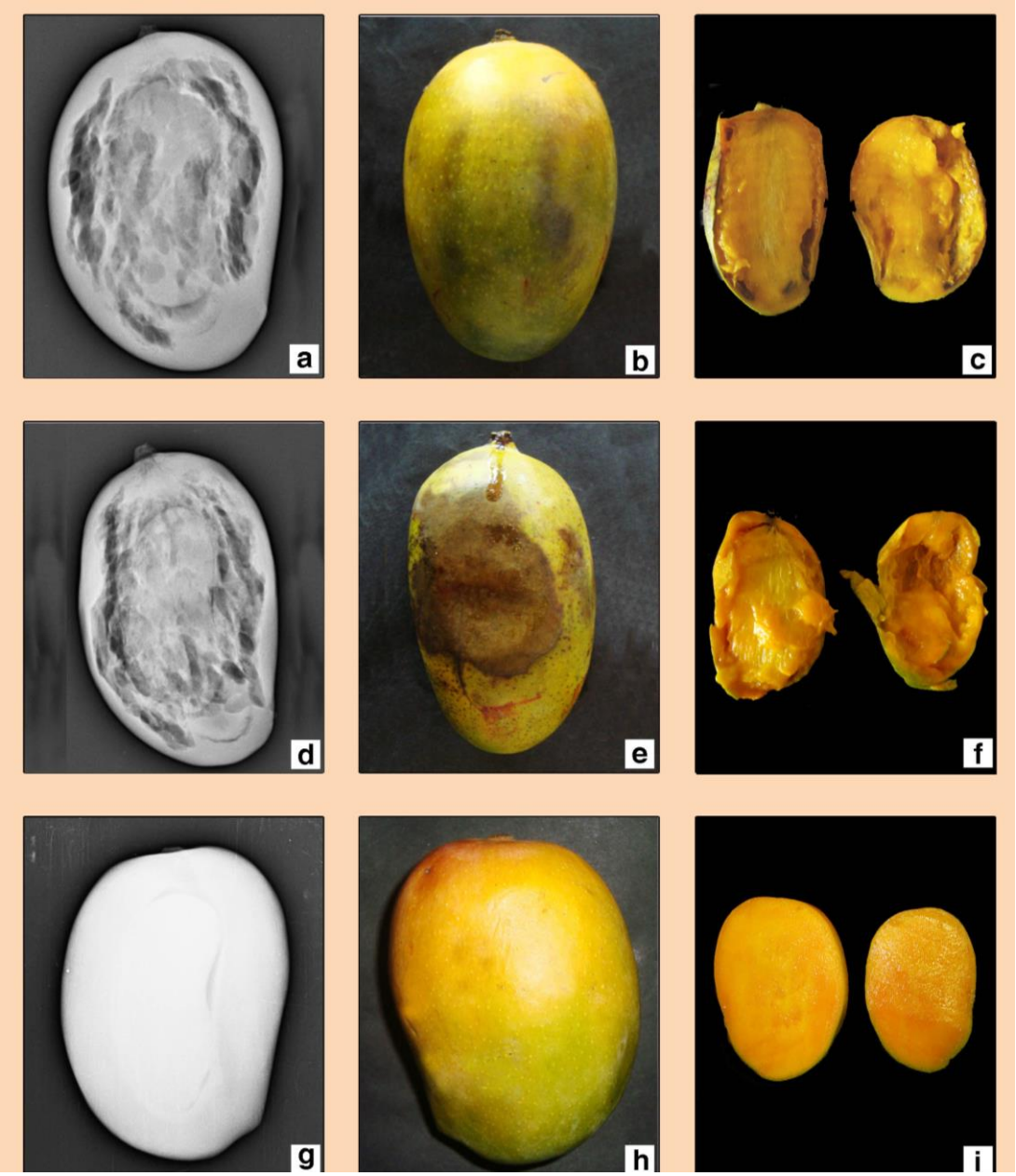

Fig. 2 - X-ray scanning of anthracnose (*Colletotrichum* rot) of mango fruit. a. X-ray image 4 days post-inoculation, b. uncut fruit 4 days post-inoculation, c. cut fruit 4 days post-inoculation, d. X-ray image 5 days post-inoculation, e. uncut fruit 5 days post-inoculation, f. cut fruit 5 days post-inoculation, g. X-ray image of healthy fruit, h. Healthy uncut mango, i. Healthy cut fruit.

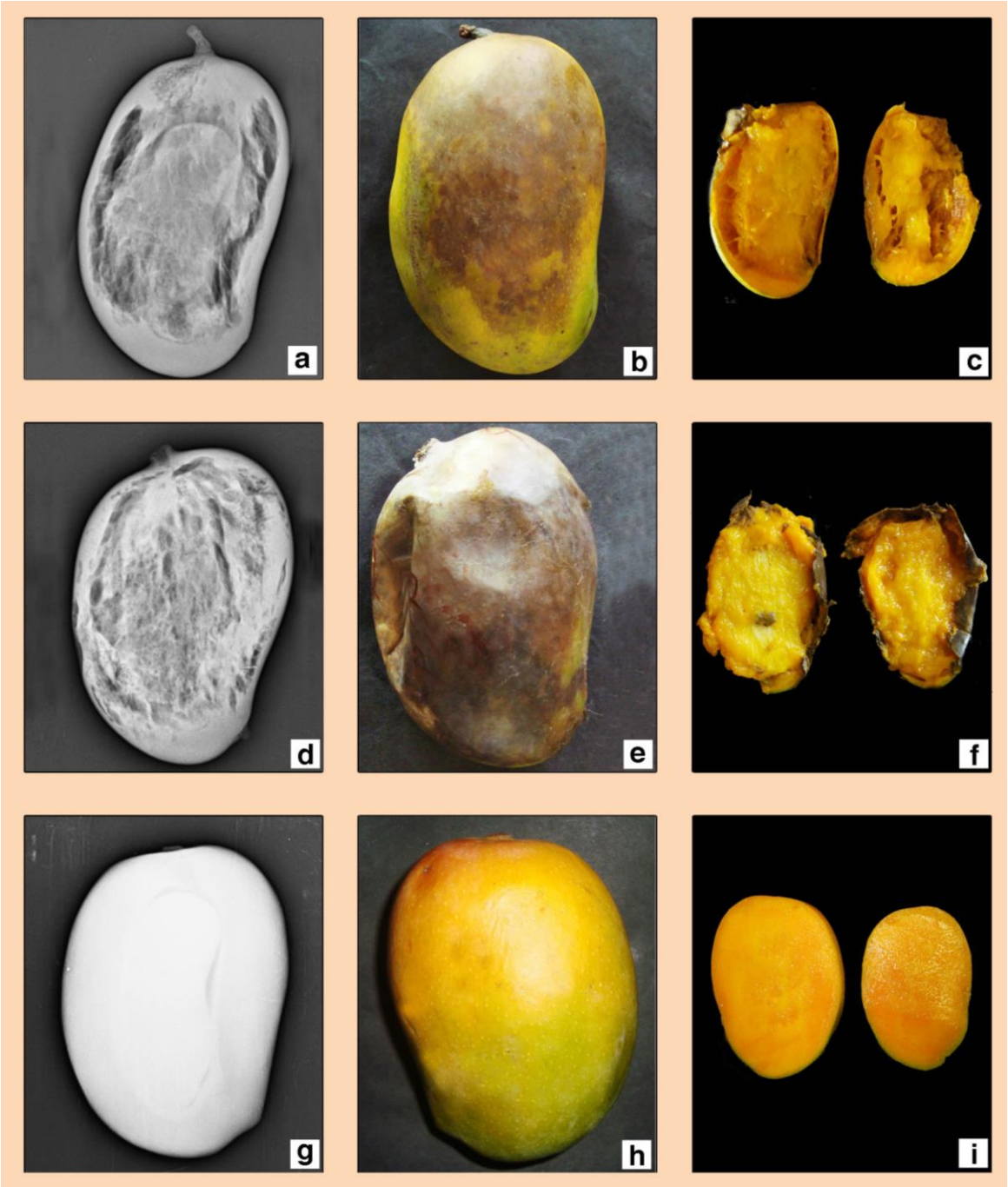

Fig. 3 - X-ray scanning of soft rot (*Rhizopus* rot) of mango fruit. a. X-ray image 4 days post-inoculation, b. uncut fruit 4 days post-inoculation, c. cut fruit 4 days post-inoculation, d. X-ray image 5 days post-inoculation, e. uncut fruit 5 days post-inoculation, f. cut fruit 5 days post-inoculation, g. X-ray image of healthy fruit, h. Healthy uncut mango, i. Healthy cut fruit.

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