

## Non-destructive evaluation of Jelly Seed Disorder in Mango

**R.R. Sharma & K. Rama Krishna**

Division of Food Science and Postharvest Technology

ICAR-IARI, New Delhi-12.

(Email: [rrs\\_fht@rediffmail.com](mailto:rrs_fht@rediffmail.com))

Mango (*Mangifera indica* L.) is the choicest fruit of India in terms of not only production but also economic importance and acceptability by the consumers. India is the largest producer of mangoes in the world and it covers nearly 36% of total fruit area and 39.6% of production in India. Even though India is the largest producer and has more than 1600 mango genotypes, its contribution to the mango export earnings from agriculture products is less than 2%. Problems such as internal disorders, insect infestation and pesticide residue along with inadequate postharvest technology and management system are the major bottlenecks to the expansion of mango trade from the country. During the last few years, jelly seed disorder has caused havoc in certain areas, thereby hindering the export and consumption of mango.

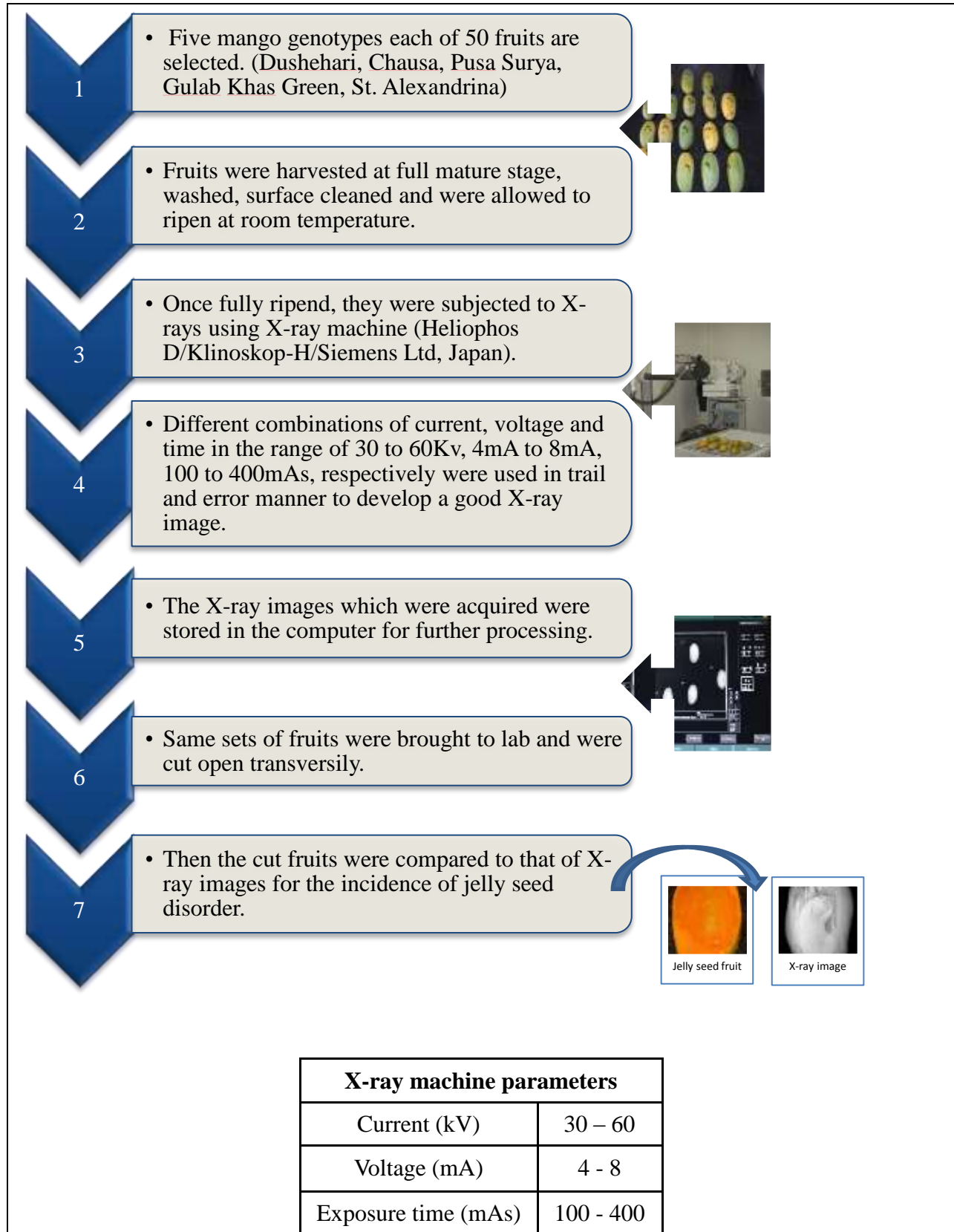
The jelly seed disorder is associated with the ripening process, being unique by mesocarp breakdown in the vicinity of the seed and development of off flavor. When in an advanced state, affected tissues may become discoloured and the fruit almost entirely affected. Unfortunately, fruits affected by jelly seed can't be identified physically and consumers come to know only when fruits are cut open. Only then, they find that few fruits in the lot are not worth consuming. Now, with the increased awareness of consumers on quality of produce, necessitates producer, seller or exporter of any commodity to pay special attention on quality of products for marketing.

With the advancement in technology, the dream of use of several non-destructive techniques such as Nuclear Magnetic Resonance (NMR), X-ray and Computed Tomography, Near Infra-Red (NIR) Spectroscopy, Electronic nose, Ultrasound etc., for screening of many ailments in fruits has come true. Among them, X-ray imaging is one of the non-destructive techniques, which is widely applied in quality estimation of fruits. X-ray inspection has a distinct advantage over other detection techniques, as it is non-destructive imaging of interior features of

sample, which detects internal defects and can be easily handled. This has become increasingly common in recent years in food industries of processed foods, packaged foods, canned foods, etc., due to increase in emphasis on food safety.

X-ray is a radiation which is a kind of electromagnetic wave whose wavelength is shorter than ultraviolet and microwaves. Use of X-ray radiation for food products has no problem in microbiological safety and nutritional quality of irradiated food. Even though X-ray imaging has great potential in resolving the problems associated with mango export, a very little work has been done for the detection of internal breakdown disorders in mango using X-ray imaging, and no research work on jelly seed detection using X-rays has yet appeared in the literature. Hence, an attempt was made to explore the possibility of detecting jelly seed disorder using X-ray imaging.

***Methodology***

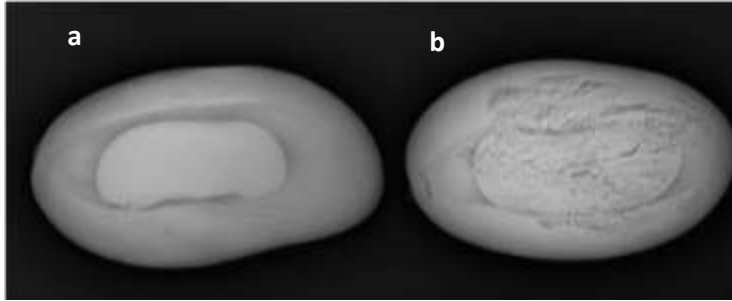




Images showing 1.mango fruits, 2.exposure to X-rays, 3.Image acquisition in computer, 4.X-ray image processing (left to right).

Mango genotype	Jelly seed affected portion (%)	Mango fruit	
		Length (mm) Min-Maximum	Width (mm) Min-Maximum
Dushehari	57	90.43 - 120.56	49.12 - 67.36
Chausa	51	86.41 – 92.36	65.67 – 77.60
Pusa Sruya	37	92.13 – 113.67	78.12 – 89.74
Gulab Khas Green	60	70.45 – 79.10	61.23 – 71.24
St. Alexandrina	42	45.21 – 56.14	59.80 – 68.11

It was found that using X-ray source of 48Kv, 6.5mA, with exposure time of 320mAs gave the best contrast images of jelly seed internal disorder in chosen mango genotypes. The fruits susceptible with jelly seed disorder in X ray image showed dark grey areas around the stone, while that of good fruit showed light grey areas in full mango image. Jelly seed incidence was highest in Gulab Khas Green followed by Dushehari and least incidence was in Pusa Surya. Hence, it can be concluded that X-ray imaging is a useful method for detecting jelly seed disorder in mango and this techniques can be incorporated into supply chain for better consumer acceptance creating security to the food for which we pay.



X ray image of a) good fruit, b) Jelly seed affected fruit

*Special advantages of this method*

- Most reliable in detecting the Jelly Seed disorder in mango fruits.
- This techniques is comparatively cheaper than other non-destructive techniques.
- It is easy to work with the X-ray machine.
- Interpretation of the data in the form of images is more accurate.
- It can be integrated with sorting system in supply chain of mango.
- Value of the product will be higher as 100 % surety is assured on quality.

		
Dushehari	X-ray image of the jelly seed affected mango	Destructive image of the same fruit showing both sides
		
Chausa	X-ray image of the jelly seed affected mango	Destructive image of the same fruit showing affected portion
		
Pusa Surya	X-ray image of the jelly seed affected mango	Destructive image of the same fruit showing affected portion
		
St. Alexandrina	X-ray image of the jelly seed affected mango	Destructive image of the same fruit showing affected portion
		
Gulab Khas Green	X-ray image of the jelly seed affected mango	Destructive image of the same fruit showing affected portion

**Terms - Do not remove or change this section ( It should be emailed back to us as is)**

- This form is for genuine submissions related to biotechnology topics only.
- You should be the legal owner and author of this article and all its contents.
- If we find that your article is already present online or even containing sections of copied content then we treat as duplicate content - such submissions are quietly rejected.
- If your article is not published within 3-4 days of emailing, then we have not accepted your submission. Our decision is final therefore do not email us enquiring why your article was not published. We will not reply. We reserve all rights on this website.
- Do not violate copyright of others, you will be solely responsible if anyone raises a dispute regarding it.
- Similar to paper based magazines, we do not allow editing of articles once they are published. Therefore please revise and re-revise your article before sending it to us.
- Too short and too long articles are not accepted. Your article must be between 500 and 5000 words.
- We do not charge or pay for any submissions. We do not publish marketing only articles or inappropriate submissions.
- Full submission guidelines are located here: <http://www.biotecharticles.com/submitguide.php>
- Full Website terms of service are located here: <http://www.biotecharticles.com/privacy.php>

As I send my article to be published on BiotechArticles.com, I fully agree to all these terms and conditions.

---