

**RESEARCH ARTICLE :**

Performance evaluation of mango harvesting techniques

■ **VIRESH KUMARGOUD, S. JAVARE GOWDA, S.K. KARTHIK AND G.V. MOHITHKUMAR**

ARTICLE CHRONICLE :**Received :**

14.07.2017;

Accepted :

29.07.2017

KEY WORDS :

Performance evaluation, Mango harvesting, Alphonso, Totapuri, Pre-harvest damage

SUMMARY : Keeping the quality of mango fruits is a varietal character; it depends to a great extent on the harvesting techniques. The field performance of an Indian Institute of Horticultural Research (IIHR) harvester, a local harvester, tree shaking and hand picking with and without pedicel were compared for cultivars Alphonso and Totapuri mangoes. In case of Alphonso an average man could harvest 428, 400, 232, 285 and 329 fruits per hour from 3-5m high trees using above harvesting techniques, respectively. While for Totapuri, the corresponding values were 385, 344, 178, 92 and 170 fruits per hour the pedicel length of both Alphonso and Totapuri mangoes harvested were 1.27, 0.31, 0.41, 0.95 and 0.00 cm. The average shelf-life was 11.6, 9.0, 5.66, 12.0 and 10.5 days in case of Alphonso and 13.3, 11.0, 7.0, 14.0 and 12 days in Totapuri. IIHR harvester was found to be more feasible and may easily be popularized amongst the mango growers. The presence of pedicel could control the sap oozing and lateral infection while increasing the shelf-life and reducing the damage (6.4%) to the fruits. The operating cost of harvesting was reduced (Rs. 85/tonne for Alphonso and Rs. 75/tonne for Totapuri) as compared to other harvesting techniques. The cost of IIHR harvester is about Rs. 50.

How to cite this article : Kumargoud, Viresh, Gowda. S. Javare, Karthik, S.K. and Mohithkumar, G.V. (2017). Performance evaluation of mango harvesting techniques. *Agric. Update*, 12 (TECHSEAR-4): 1135-1137; DOI: 10.15740/HAS/AU/12.TECHSEAR(4)2017/1135-1137.

BACKGROUND AND OBJECTIVES

Mango (*Mangifera indica*, Linn), a native of India is one of the most relished fruits in the tropics. It occupies a prominent place among the fruits of the world and is considered as the king of fruits in India. At present, it occupies an area of 10.63 million hectares out of total fruit growing area of 24.87 million hectares. At the same time, its production is 9.0 million tonnes out of the total fruit production of 22.16 million tonnes (Chadha, 1989).

During the period from harvest until the fruit reaches consumer's table, there are any many occasions for it to be spoiled. The postharvest and pre-harvest losses occur due to various reasons such as lack of proper harvesting techniques, storage facilities, improper handling, transportation, rapid ripening and microbial spoilage. Mango is a highly perishable fruit which suffers from high postharvest losses to the extent of about 22-37% (Mujumdar, 1985). Harvest and postharvest losses can be reduced to some

Author for correspondence :

VIRESH KUMARGOUD

Department of
Agricultural Engineering,
University of
Agricultural Sciences,
G.K.V.K., BENGALURU
(KARNATAKA) INDIA
Email: vkgouda@gmail.com

See end of the article for authors' affiliations

extent by improvement of pre-harvest factors and adopting proper harvesting techniques. In view of these facts, the present investigation was undertaken, to study the existing harvesting techniques used by mango growers.

RESOURCES AND METHODS

The present investigation on different mango harvesting techniques was undertaken at University of Agricultural Sciences, GKVK, Bangalore orchard. For these investigation cultivars Alphonso and Totapuri were selected.

The different methods adopted for harvesting mango fruits were a) hand picking without pedicel: the fruits were plucked manually without pedicel; b) hand picking with pedicel: the fruits were harvested with pedicel using a secateur, c) tree shaking: the fruits were harvested by shaking the branches of the tree. When the tree size was big, the picker had to climb up the tree and shake the branches of the tree. The fruits are collected from the ground; d) local harvester: most common method of harvesting mango fruits, consisting of harvesting by holding the fruit in the space between a pole and frame assembly, and as the pedicel is being pulled, the fruit is collected safely; e) IIHR harvester: this harvester was developed at IIHR, Bangalore. It consisted of a pole and frame assembly, shearing blade and net. The shearing blade with a length of 11 cm was welded to the frame at a distance of 12cm from the top. The blade was sharpened and sufficiently curved to avoid contact with

the fruit and to cut the pedicel with 1 to 2 cm. the fruit was harvested by properly positioning the harvester to warp around the fruit, ensuring that the fruit was sufficiently low inside the harvester so that the pedicel was sheared with the blade while the fruit was held between the frame and pole.

The fruits were harvested at physiologically mature hard green stage. The harvesters were tested for harvesting capacity, cost of harvesting. Fruit damage and shelf-life of the harvested fruit. The pedicel length was measured after harvesting the fruits. The fruits were stored at room temperature in a well-ventilated room to determine the shelf-life.

OBSERVATIONS AND ANALYSIS

The comparative results of testing IIHR harvester in comparison with other systems is given in Tables 1 and 2. The harvesting capacity in both Alphonso and Totapuri mangoes differed significantly with different harvesting techniques. The harvesting capacity was found to be higher with IIHR harvester (175.45 and 77.05 kg per h for Alphonso and Totapuri, respectively) followed by local harvester (159.8 and 68.75 kg per h, respectively). The worst harvesting capacity was noticed with tree shaking in Alphonso (96.5kg per h) and hand picking with pedicel in Totapuri (17.35 kg per h). For IIHR harvester, the operation was very convenient and fruit could be easily harvested upto a height of 2.5m from the ground. It was convenient to harvest the fruit with a pole angle of upto 60° (with horizontal) with the shearing

Table 1: Comparison of harvesting methods in Alphonso mango

Treatments	Harvesting efficiency	% of fruits harvested with pedicel	Pedicel length (cm)	Harvesting capacity (kg/hr)	Shelf-life days	Cost of harvesting (Rs./ton)
Hand picking without pedicel	328.8	0.0	0.0	133.5	10.5	170
Hand picking with pedicel	285.5	100.0	0.95	115.8	12.0	250
Tree shaking	232.2	52.7	0.42	96.5	5.7	100
Local harvester	399.0	22.7	0.31	9.0	9.0	105
IIHR harvester	428.2	94.0	1.27	175.5	11.6	85

Table 2: Comparison of harvesting methods in Totapuri mango

Treatments	Harvesting efficiency	% of fruits harvested with pedicel	Pedicel length (cm)	Harvesting capacity (kg/hr)	Shelf- life days	Cost of harvesting (Rs./ton)
Hand picking without pedicel	170.0	0.0	0.0	36.2	12.0	150
Hand picking with pedicel	92.0	100.0	1.1	17.4	14.0	200
Tree shaking	178.0	44.2	0.4	36.5	7.0	100
Local harvester	344.0	4.4	0.4	68.8	11.0	80
IIHR harvester	98.2	98.2	1.3	77.1	13.3	75

blade not touching the fruits. However, the harvesting capacity was also dependent on yield of fruits per tree. The hand plucking of fruits was a slow process and harvesting these fruits with pedicel further reduced the harvesting capacity. The different harvesting techniques caused significant differences in pedicel length of both Alphonso and Totapuri fruits. IIHR harvester was able to harvest fruits with an average pedicel length of 1.27cm Alphonso and 1.26 cm in case of Totapuri. % of harvested fruits with pedicel was 94 and 98.18 per cent, respectively which resulted in increased shelf life of harvested fruits as it was previously reported by Mujumdar (1985) and Laxminarayana (1980). In other methods of harvesting, the pedicel length was short (Table 1 and 2) and most of the fruits were not harvested with pedicel, which results in burns and stains on the fruits leading to a decrease in appeal to the consumer (Chadha, 1989).

The shelf-life of Alphonso and Totapuri differed significantly due to different harvesting techniques. IIHR harvester (11.6 and 13.3 days, respectively) and hand plucking with pedicel (12 and 14 days respectively) increased the shelf-life of the harvested fruits. These fruits had fewer incidences of stem-end rot and other infections as there was no wound from the pedicel. The fruits were also attractive in colour due to absence of sap bleeding on them. Similar observations were also reported by Pathak (1967). In the case of the local harvester, tree shaking and hand plucking without pedicel fruits had lower shelf-life (Table 1 and 2). The fruits harvested with these methods had short pedicel length or no pedicel with more mechanical injuries, leading to increased incidence in pathogenic decay and sap burns. This was in conformity with the results reported earlier by Chaplin (1984). The cost involved in Alphonso and Totapuri harvesting was the lowest in the case of the IIHR harvester (Rs. 170 and Rs. 150 per tonne, respectively). The operation of the harvester was simple and the fruits could be easily harvested upto a height of 2.5 m from the ground. However the cost towards the harvest of Alphonso and Totapuri was found to be very high with hand picking with pedicel (Rs. 250 and Rs. 200, respectively) followed by hand picking without pedicel. Hand plucking with pedicel was a slow and tedious process which resulted in low harvesting capacity and high cost.

Varied responses were noticed with respect to mechanical fruit damage caused by the different harvesting techniques (Table 3). Out of all the evaluated

harvesting methods, hand picking with pedicel had the least mechanical damage (3%). Whereas moderate mechanical damage (4.6%), was noticed with hand picking without pedicel. In the case of IIHR harvester, the mechanical damage was 6.4% and for the local harvester it was 9.2%. The maximum fruit damage (42.6 %) was noticed with tree shaking which was due to the dropping of fruits on to the ground.

Table 3 : Assessment of post-harvest damage

Harvesting method	Total harvest	Number of fruits mechanically damaged	% age of fruits
T ₁ Hand picking without pedicel	500	23	4.6
T ₂ Hand picking with pedicel	500	15	3.0
T ₃ Tree shaking	500	213	42.6
T ₄ Local harvester	500	46	9.2
T ₅ IIHR harvester	500	32	6.4

Conclusion :

IIHR harvester was found to be more feasible and may easily be popularized amongst the mango growers. The presence of pedicel could control the sap oozing and lateral infection which increase shelf tonne for Alphonso and Rs. 75 per tonne for Totapuri) as compared to the other harvesting techniques. The initial cost of harvested is about Rs. 50.

Authors' affiliations :

S. JAVARE GOWDA, S.K. KARTHIK AND G. V. MOHITHKUMAR,
Department of Agricultural Engineering, University of Agricultural Sciences, G.K.V.K., BENGALURU (KARNATAKA) INDIA

REFERENCES

- Chadha, K.L.** (1989), Mango research in India, New developments. *Indian Food Packer*, **43**(6) : 33-47.
- Chaplin, G.R.** (1987). Postharvest physiology of mango fruit. *Abstract in processing of first Australian mango research workshop. Cairn. Queensland*, Nov. 26-30, pp.261-268.
- Laxminarayana, S.** (1980). *Mango tropical and sub-tropical fruits*, AVI publishing, Westport, pp.184-257.
- Mujumdar, P.K.** (1985). *Mango fruits of India*, Naya Prakash, Calcutta, pp.69-123.
- Pathak, V.N.** (1967). Mode of infection and prevention of stem end-rot of mango fruits, *Plant Disease Repor.*, **51**(9):794-746.

12th
Year
★★★★★ of Excellence ★★★★★