

Mitigating mango fruit decay

Mango postharvest decay is a major concern for the mango growers as it is highly perishable in nature. There are several reasons that lead to postharvest decay such as harvesting of fruits at sub-optimal stages, mechanical injury, poor packaging and transport conditions, and high level of pre-harvest infection. The article highlights the main causes responsible for postharvest decay and its management strategies.

MANGO (*Mangifera indica* L.) is one of the most important fruit crops of India having an area of 2.70 million ha with an annual production of 26.29 metric tonnes per ha. The postharvest decay of mango fruits is one of the biggest constraints for mango growers. It initiates from the field, after harvest, in grading and packing areas, in storage during transportation, and in the wholesale and retail markets. In addition, the losses also occur because of poor storage facilities, lack of know-how, market distribution or simply the improper knowledge of the farmers. Postharvest decay reduces mango fruit quality and shelf-life, limiting domestic and worldwide commercialization and causing significant financial losses. Similar to other fresh produce, mangoes can deteriorate after harvest because of the rapid proliferation of diseases during ripening and storage. There are many postharvest pathogens that are responsible for mango postharvest decay which includes anthracnose, *Alternaria*, *Penicillium*, stem end rot etc. Among the pathogens, anthracnose (*Colletotrichum gloeosporioides*) is one of the most important pathogens responsible for the postharvest decay of mango. It is reported that 25-50% postharvest loss occurs at different postharvest stages of mango. Not only pathogens, other factors which may also be responsible for postharvest decay of mango fruits such as bruising, cuts, and physical damage due to tissue breakdown and physiological processes.

Factors responsible for postharvest fruit decay

Mechanical injury: Inappropriate handling during harvesting, packing, transporting, storing, etc. might result in mechanical damage. The rate of water loss and gaseous

exchange is often increased when fruits suffer mechanical injury, such as bruising or cracking, which makes them more vulnerable to organism attack.

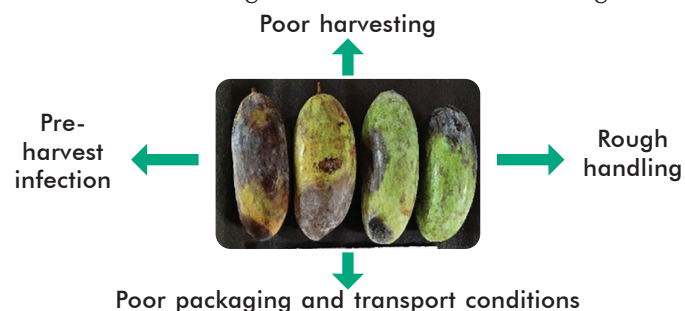
Microbial action: Microbiological attacks can potentially cause damage to fruits. The primary causes of microbiological deterioration are molds, bacteria, yeast, and fungi. However, fungus and bacterial infections are largely accountable for fruit losses during the postharvest period.

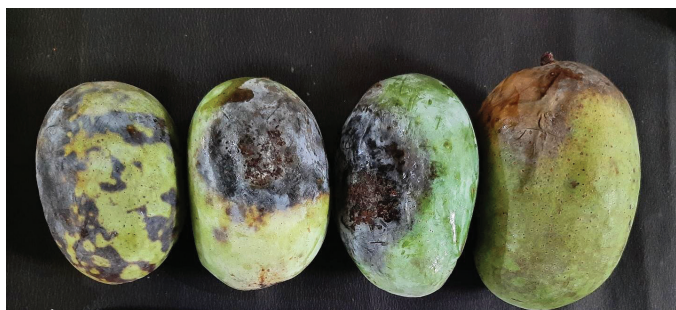
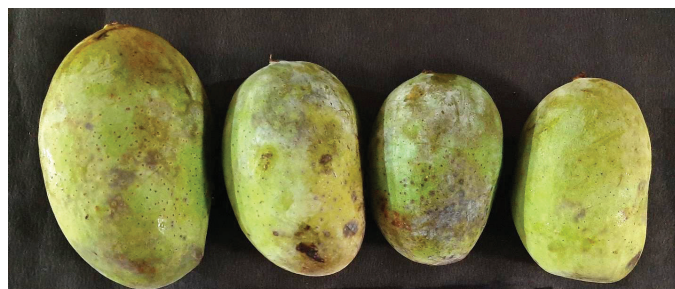
Environmental factors: Postharvest loss of fruits is largely influenced by external conditions, including temperature, humidity, and the kind and amount of gases in controlled atmospheric storage. The elevated temperature and increased relative humidity encourage the growth of microorganisms, leading to significant harm to the fruits.

Secondary factors: A favourable environment for secondary causes of loss is created by inadequate harvesting, shipping, storage, and marketing practices as well as laws. Furthermore, using insufficient harvesting tools and rough handling of fruit throughout the process causes bruises and increases the likelihood that the produce will come into touch with the soil, which could contaminate it with microorganisms.

Control measures

Plant growth regulators applications: Foliar applications of plant growth regulators in optimum concentrations may be helpful for reducing the postharvest decay of mango fruits. Plant growth regulators ability to delay the senescence, which makes it difficult for decaying organisms to develop and thrive. Forchlorfenuron (20 ppm) immediately after fruit set was found to minimize the incidence of fruit decay during storage. Plants sprayed with NAA 100 ppm at colour break stage experienced minimum spoilage during cold storage. Mango cv. Amrapalli pre-sprayed with 5 ml of Paclobutrazol at the fruit set is effective in enhancing shelf-life by reducing postharvest decay. Spraying of GA₃ 75 ppm at 20 days before harvest reduced the postharvest decay and enhanced the shelf-life of fruits up to 21 days.





Decay of mango fruits at different storage intervals

Nutrient management: The application of nutrients (micro or macro) is one of the most important ways to reduce postharvest decay and improve the shelf-life of mango fruits. Mango trees grown under high nitrogen levels reduced the postharvest pathogens of mango, including anthracnose and stem end rot stored under ambient conditions. Amrapalli mango was sprayed three times at 30, 20, and 10 before harvest with CaCl_2 (2%) and K_2SO_4 (1%) reduced the black spot caused by anthracnose and stem end rot when stored under ambient conditions. Spraying of CaNO_3 (1%) at 15 and 30 days before harvest reduced the physiological loss in weight and enhanced the shelf-life of mango fruits up to 6 days.

Application of fungicides: The best method for controlling postharvest decay of mango fruits is the pre-harvest application of fungicides. The postharvest application of fungicides on mango fruits may have residue problems. Application of fungicides (Amistar 0.1% and Contaf 0.1%) 15 days before harvest reduced the decay incidence of mango cv. Langra fruits when they were kept under low-temperature storage. Combined application of fungicides (Tecto 1.8 ml/L + Sportak 0.5 ml/L) 15 days before harvest successfully alleviated the disease severity

index of mango fruits. The lowest incidence of decay in mango fruits occurred when fungicides were applied as a preharvest spray, as they inhibited the activity of the field inoculum pathogen during postharvest storage.

Hot water treatment: Hot water treatment (HWT) is one of the traditional and easiest ways to control postharvest decay. HWT is highly recommended due to its cost-effectiveness and simplicity of running at a grower level. HW treatment can effectively inhibit many important postharvest pathogens and identified as an elicitor for the activation of the defensive response in harvested fruits. Mango fruits dipped in hot water for 2-5 min. at varying temperatures (40-60°C) control the postharvest decay caused by various types of pathogens in storage conditions. Treatment of mango fruits with hot water at 55°C for 5 min reduces the decay incidence and increased their shelf-life up to 35 days. Not only postharvest decay of mango fruits, HWT may also reduce the loss of cell wall degrading enzymes and preserved physio-chemical attributes. Hot water brushing at 55°C for 20 sec. shows good control of anthracnose of mango fruits.

Application of chemicals: Pre and postharvest application of antioxidants and ethylene antagonists



Plant growth regulators application



Application of fungicide



Hot water treatment



Chemical treatment



Cold storage

reduced the decay incidence of mango fruits. Antioxidants, in the form of an enhanced freshness formulation (EFF), and ethylene antagonists like sodium nitroprusside (SNP), have the capacity to reduce the loss of bioactive compounds, respiration rate, and ethylene production. This could serve as a potential tool for optimizing the quality and storability of fruits by reducing decay. In the case of Dashehari mangoes, pre-harvest application of an EFF 2000 μ M at 15 and 30 days before harvest reduces fruit spoilage and decay incidence. Postharvest dipping of mango cv. Langra with EFF (1 or 2%) and sodium nitroprusside (1 or 2mM) for 5 min. reduce the ethylene production, respiration rate, and fruit ripening enzyme Phospholipase-D, which ultimately reduces the postharvest decay of the pathogens and improves biochemical attributes. These treated mango fruits also maintained their shelf-life of up to 35 days under low-temperature storage.

Others: To reduce the postharvest decay, harvesting of fruits at proper stage is most important practices for the growers. Harvesting of fruits either too late or too early is most vulnerable to postharvest decay. After harvesting, fruits are normally forced- air or room cooled, preferably within 24 hr of harvest. Washing mango fruits with 100 ppm sodium hypochlorite for 5 min. to avoid physical damage and reduce the field inoculum pathogens associated with the postharvest decay of fruits. Storing fruits at 10 to 13°C with 85 to 90% RH should provide a shelf-life of 14 to 28 days for mature green fruit, depending on the variety. Ripe fruit can be stored at 7 to 8°C. Diseases are the principal factor limiting storage-life. Optimum ripening temperature is 25°C for best appearance, palatability, and decay control. Different cultivars show various responses to CA. The optimum storage atmospheres for prolonged storage and/or shipping reduced the decay incidence of mango fruits.

Proper postharvest handling is vital to reduce mango decay and maintain fruit quality. Harvest at the right maturity to avoid decay, handle gently to prevent bruises, and control temperature and humidity to slow ripening and deter fungal growth. Keep areas clean to stop pathogen spread, ensure good ventilation to lower infection risks, and manage ethylene to control ripening and extend shelf-life. These practices will help farmers keep more of their yield and provides consumers with better quality fruit, supporting sustainable mango production.

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Profitable Nursery through “Mini-Shade Net”

Shri M. Sankara Rao is a marginal farmer, belonging to a remote village of Naiduvalasa of Rambadrapuram Mandal of Vizianagaram district in Andhra Pradesh. He is an ex-trainee of KVK, Vizianagaram. Having gained knowledge and skill in nursery, he established nursery unit with “mini-shade net” under the technical guidance of KVK faculty. He raised seedlings of different vegetables and papaya under *mini-shade net* (60 sq m) and produced high quality virus-free papaya seedlings (2,500) and vegetables seedlings, viz. Tomato (5,000), Brinjal (5,000), Chilli (5,000) during May 2021 to October 2021, with which, he received a net income of ₹ 25,700. Farmers from the neighbouring villages got attracted with the benefits gained by protected shade-net nursery production; and accordingly, approached KVK, Vizianagaram for further guidance to adopt the technology.



A view of nursery unit of Shri M. Sankara Rao with mini-shade net

Source: ICAR Annual Report 2022-23