Post-harvest Rot in Elephant Foot Yam

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Elephant foot yam (*Amorphophallus paeoniifolius*), often regarded as the "King of tuber crops" is a significant commercial tuber crops of tropical and subtropical region of the world (Kumar et al., 2017). This herbaceous, perennial C3 plant is native to Southeast Asia. Sree Padma, Gajendra, Sree Athira (a hybrid), Bidhan Kusum and NDA-9 are the prominent varieties suited for cultivation in India (Ravi et al., 2009).

The commonly grown commercial variety widely used. States of Kerala, West Bengal and Andhra Pradesh contributes about 70% of the tuber crops produced in India (Srinivasan and Ramananthan, 2005).

Rich in starch, fibre, vitamins, and minerals, elephant foot yam is a potent remedy for piles and gastrointestinal disorders. It is extensively used as a major component in many Ayurvedic medicines for the treatment of hemorrhoids, inflammatory conditions and rheumatism (Ray, 2015). They also possess constituents with antihyperglycemic and antinociceptive activities (Rahaman,2014). The crop has a great production potential of 50-80 t ha^{-1} and the net economic return is above 1 lakh rupees per ha. Thus plays a crucial role in food security (Ravi et al., 2009).

Postharvest diseases

Postharvest diseases are those that are developed in the harvested part of the plant. The chances for the occurrence of postharvest diseases in EFY is high since from its harvest, as they are rich sources of starch and moisture content, leading to great reduction in the quantity and quality of corm stored. Infection of seed corms also inhibit sprouting and make the plant more susceptible to field diseases. The development of postharvest rot in elephant foot yam significantly reduces its marketability and storability and gradually results in economic losses (Veena et al., 2021). Biotic and abiotic factors like host factors, environmental factors, and microbiome interactions have great effect on the development of postharvest diseases in elephant foot yam. Even a minute cut or wound on the corm surface during harvest can provide entry points for pathogens (Kuruppu et al., 2023). Fungi are the primary pathogens of postharvest diseases, followed by bacteria. The crop loss due to postharvest rot can be upto 25-30%, equating to financial losses of Rs. 3,50,000 to 4,00,000/ha (Veena et al., 2021).

Causative organisms

Storage rot is the significant postharvest disease in elephant foot yam that causes drastic economic losses. The pathogens not only damage the seed corms stored, but also make the plants prone to many field diseases too. Major storage diseases are *Sclerotium* rot, black rot or *Botryodiplodia* rot by *Botryodiplodia theobromae* (rotting and blackening of tubers in patches), *Phytophthora* rot, *Fusarium* rot and *Erwinia* rot. *Sclerotium rolfsii* (*Athelia rolfsii*), *Lasiodiplodia theobromae, Rhizoctonia solani, Colletotrichum gloeosporioides* and many Fusarium spp. are the major pathogenic fungi causing postharvest diseases. The only bacterium that cause serious disease is *Erwinia carotovora*, causing the *Erwinia* rot, especially under high temperature storage conditions (<40℃) with poor ventilation (80-100% crop loss), turns the infected corms watery and produce foul odour. The toxins released by these microbes diminishes the quality and nutritional values of elephant foot yam (Adithya, 2018; Misra et al., 2003).

Corms showing different types of rot (Veena et al., 2021)

Symptoms

Even though the symptoms of the disease may vary with the causative organisms, different diseases can have very similar symptoms too. And the symptoms in even a single plant part can changes with the advancement of disease in every stage. The fungal infection mostly causes discolouration, tissue softening, rotting and occasionally with external white powdery appearance. Symptoms may or may not be present externally. Inside the corm, there may be black or brown colour spots that gradually grow to bigger, irregular patches. The affected portion may show powdery mass of tissue. Some of the infected corms show tissue putrefaction with black or brown discolouration and brown colour oozing from

the lesions were also observed (Veena et al., 2021).

Precautions

Healthy planting material always offers good quality and yield of plant produce. Infected seed corms affect coming generation. Avoiding injuries during harvest can minimize pathogen invasion. Adhering soil and roots, damaged corms or those showing any symptoms of infection must be eliminated before storage. It is better to cure the corms before prolonged storage, as it toughens the skin and heals whatever the injuries made (Veena et al., 2021). Curing of corms are carried out by keeping them in open shaded place at 28±2℃ temperature for one or two weeks or until the adhering soil on the corm desiccates and drop off. After curing, corms are graded based on their size and shape. The corms are then kept in layers sandwiched with paddy straw/dried palm/banana leaves to keep away from bruises during transportation. (Misra et al., 2007).

Disease management

Proper storage of harvested corms plays a crucial role in the prevention of storage diseases. It is advised to store the corms in a well-ventilated room with frequent monitoring. Culling out of infected tissues of corms with sharp knives helps in reducing the transmission of infection to healthy corms. Healthy tissues adjacent to the infection should also be removed. Chemical control involves treating the plants with carbendazim (0.1%) + streptomycin (150 ppm) on 30 days before harvest and treatment of the corms after harvest with 0.3% copper oxychloride and 100 ppm streptomycin (Murthy et al., 2008). It is also advised to treat cut corm pieces before planting with mancozeb (0.2%) and monocrotophos (0.1%). Treatment of corm with mancozeb or combination fungicide containing mancozeb and carbendazim (0.2%) before storage found effective against storage rot (<5%) (ICAR-CTCRI, 2018). Chances of storage rot can also be reduced by treating corms with cow dung slurry or cow dung slurry amended with *T. asperellum* @ 5gKg^{-1} or ICAR-CTCRI developed biopesticide Nanma @ 7mL^{-1} (Veena et al., 2021).

Conclusion

The postharvest diseases in food crops have not received much attention they deserve. Postharvest rot poses significant challenge that affects both the market value and overall sustainability of the corm. Only proper management of postharvest diseases can ensure yield and thereby enhance marketability and food security. Implementation of proper handling practices, ambient storage facility, and integrated pest management strategies can aid the farmers to reduce loss of corms. Continued research on disease development and its management and proper awareness to farmers on management strategies can reinforce the challenge to mitigate the impact of postharvest rot in elephant foot yam.

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