International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 4 Issue 1, December 2019 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

Identification of the Fungal Postharvest Disease on Peach Fruits

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ABSTRACT

This study investigated the fungi associated with the spoilage of the most world-popular fruits cultivated commercially, namely peach, although its botanical name is (Prunus persica (L.) Batsch) belongs to the family Rosaceae. A total of 500 mixed samples of peach fruits were collected. The spoilage peaches fungi were isolated, characterized and identified. The fungi isolated and identified from the spoiled peaches were, Monilinia fructicola, Sphaerotheca sp, Alternaria tenuis, Aspergillus niger, Aspergillus flavus, Botryodiplodia sp, Cladosporium carpophilum, Penicillium sp, Rhizopus sp and Trichothecium sp. The most prevalent fungi isolated from the samples and found in all samples collected from peach fruits and caused severe post-harvest losses were Aspergillus sp, Penicillium sp and Rhizopus sp and considered as the main species that cause the postharvest disease infection of peach fruits The study showed that the presence of these fungi associated with peach spoilage caused high risk to humans and animals due to they produce microbial toxins or presence pathogenic microorganisms in food products, which lead to food poisoning. The suitable and proper technology in each harvesting steps must apply in order to minimize the contamination of these microorganisms and maintain good quality during harvesting, grading, cleaning, packaging and transportation.

KEYWORDS: *Peach fruits, postharvest diseases, postharvest losses and fungal diseases*

How to cite this paper: Ahmed Rashed Al-Najada "Identification of the Fungal Postharvest Disease on Peach Fruits" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-4 | Issue-1, December 2019, pp.872-874, URL: www.ijtsrd.com/papers/ijtsrd29729.pdf

IJTSRD29729

INRODUCTION

losses during harvest and postharvest are common phenomena in fruits due to their perishable nature. However, Serious economic losses worldwide are caused primarily by postharvest fungal diseases. Postharvest losses may occur during postharvest handling, pathogens infection, storage, transportation and processing, which decreases the quality, quantity and market value of agricultural commodities (kader 2005, Parfitt *et al* 2010). Fruits are susceptible to attack by pathogenic fungi Due to their low pH, higher moisture content and nutrient composition, which cause decaying and make them unacceptable for consumption by producing mycotoxins (Phillips 1984, Moss 2002). Fruits postharvest diseases due to fungi invaded are responsible for about 30 percent losses during harvest and consumption (Parpia 1976, Bashar *et al* 2012). The post-harvest disease is one of the most prevalent and common disease, which could lead to drop and decline in quality of ripped fruits by shortening their storage lifetime. The percentage loss of fruit over the marketable period has to be the highest because of its high perishability, and susceptible to post-harvest diseases. A wide variety of fungal pathogens cause postharvest disease in fruits, and some of these infect produce before harvest and then remain quiescent until conditions are more favourable for disease development after harvest. Other pathogens infect produce during and after harvest through surface injuries (Bijendra *et al* 2017). Peach is one of the most important stone fruit, its botanical name is (Prunus persica (L.) Batsch) belongs to the family Rosaceae is the most important and world-popular fruits cultivated commercially due to its high marketing value with favorable taste and abundant phytonutrients (Lurie *et al* 2005). An average peach consists 85-88% water and 5% dietary fibers. It also consist 18% of sugar, 2% protein and vitamin A 11%, B1% and C 5% (USDA SR-21) (Razzaq 2017). Peach plays an important role in daily life; it is used for production of jams, jellies or fruit drinks, yogurt, icecreams and other dairy products (Razzaq 2017). However, various postharvest fungal diseases limit the duration of storage and marketing life of peaches and present a major factor that causes the postharvest losses (Karabulut & Baykal 2004, Liu 2005, Karabulut and Baykal 2004). fungi have been identified all over the world that cause rotting in peach fruits and reduce their nutritional value, medicinal value and storage period (Gobayashi *et al* 1992, Fan & Tian 2000, Karabulut et al. 2002, Karabulut & Baykal 2004, De Cal *et al* 2009). Food losses have an impact on food security for poor people, on food quality and safety, on economic development and on the environment.

MATERIALS AND METHODS:

Fruit materials

A survey was conducted to assess the extent of loss in peach fruits caused by fungal diseases during post-harvest. A bout 500 samples of infected fruits were purchased from different fruits market. The samples were sorted to identify infected peaches, which were then transferred into sterile polythene bags, labeled, and assessed in the laboratory. The loss due to fungal diseases was assessed at weekly intervals for three months (June to August 2019).

Isolation of fruit spoilage fungi

Before the isolation process in the laboratory, petri plates, surgical blades media bottles and distilled water were

sterilized in the autoclave at 121°C for 20 minutes. Sample of fungus from each infected area of each fruits was isolated. The fruits were washed with sterile distil water and then sub-culturing the fungi washed off water. The sub-culturing was carried out by using a sterile fresh medium of potato dextrose agar (PDA) and incubated at 28°C for 5-7 days until fungal proliferation on medium surface. The isolation of pure fungal colony in culture medium was performed by using slants of a sterile fresh medium of PDA and incubated at 28°C for 5-7 days. The isolated fungi were maintained at 4°C (Iniekong *et al* 2015).

Identification of the isolated fungi

The pathogens were identified by their morphological, reproductive and cultural characteristics (Ellis 1971, Barnett & Hunter 1972, Watanabe 2002, Gilman 2008, Samson and Varga, 2007).. The pathogenicity of the isolated fungal species was confirmed by inoculating them in 250 ml Erlenmeyer flasks containing 5% fresh uninfected fruits peels under aseptic conditions, to induce rotting.The inoculated flasks were incubated at 28°C in a rotary incubator shaker with shaking at 150 rpm for five days. Tomkin & Trout (1931) reported that pathogenicity tests, pathogens were re-inoculated after isolation onto healthy peach fruits.

RESULTS AND DISCUSSION:

Quality losses in fresh fruits may occur as a consequence of microbiological, enzymatic, chemical and physical changes. In the present study, a total of ten fungal species were isolated and identified from the peach fruits during the storage period. They were identified as *Monilinia fructicola, Sphaerotheca* sp, *Alternaria tenuis*, *Aspergillus niger*, *Aspergillus flavus, Botryodiplodia* sp, *Cladosporium carpophilum*, *Penicillium* sp, *Rhizopus* sp and *Trichothecium* sp (Table 1). Previous studies found that the main worldwide postharvest diseases caused by fungi in peach and stone fruits were identified as brown rot caused by *Monilinia fructicola* or *M. laxa*, *Rhizopus*; rot caused by *R. stolonifer*; grey mold caused by *Botrytis cinerea*m, stone fruits caused by *Penicillium* spp., *Cladosporium* spp., *Alternaria* spp., *Colletotrichum*, *Stigmina* ,*Trichothecium* and *Aspergillus* spp (Vreeland *et al* 2000, Lee *et al* 2006, Samson and Varga 2007, Arrebola *et al* 2010, Snowdon and *Colour* 2010, Spadaro and Droby 2016, Mari *et al* 2016). The postharvest losses caused by fungal pathogens in harvested fresh fruits are considered as one of the most serious losses of production at the postharvest and consumption levels (Xu *et al* 2013, Karabulut *et al* 2002, Vitoratos 2013). A number of fungal genera such as *Penicillium, Alternaria* and *Fusarium* are known to produce mycotoxins under certain conditions (Bijendra *et al* 2017). Fungal infection affected on quality, safety and quantity of the fruits, are very dangerous due to they cause a risk for consumers and excrete microbial toxins or presence pathogenic microorganisms in the product, also cause economic losses as a result of microbial spoilage, which decrease the market value of fruits. Moreover, studies revealed that the gray mold decay, blue mold decay and *Rhizopus* decay caused by the fungi of *B. cinerea*, *P. expansum* and *R. stolonifer* were the most economically significant and destructive postharvest diseases of peaches (Mclaughlin *et al* 1992 Hong *et al* 1997, Liu *et al* 2005, Xu *et al* 2013).

Table1. Symptoms of post-harvest fungal diseases in Mangoes fruit

Fruit	Pathogen	Disease	Symptoms
Peach	Alternaria tenuis	rot	Brown to dark brown circular lesions later extend to pulp Lesions.
	Aspergillus niger	rot	light-brown circular spots, that enlarges into darker lesion
	Aspergillus flavus	rot	Powdery yellow green spores
	Botryodiplodia sp.	rot	Black lesions extends to pulp with color, water-soaked spot
	Cladosporium carpophilum		dark-brown spherical cells develop to velvety green appearance
	Monilinia fructicola	rot	Brown rot
	Penicillium sp	Blue mould rot	Watery spots, changes into bluish green at later stages
	Rhizopus sp.	rot	Water soaked lesions, soft decay
	Sphaerotheca sp		powdery mildew
	Trichothecium sp		Pink rot

Spoilage fungi grown on peach

CONCLUSION:

Postharvest losses in fruits being one of the major constraints in worldwide. Peaches are highly perishable fruits and very prone to fungal infection. It is clear that fungal species of *Monilinia fructicola, Sphaerotheca* sp, *Alternaria tenuis, Aspergillus niger, Aspergillus flavus, Botryodiplodia* sp, *Cladosporium carpophilum, Penicillium* sp, *Rhizopus* sp *and Trichothecium* sp, were the commonest fungal diseases peach fruits and caused severe postharvest losses. the isolates of *Aspergillus* sp, *Penicillium* sp and *Rhizopus* sp were prevalent and found among all examined spoilage fruits and considered as the main species that cause the postharvest disease infection of peach fruits. Consequently, The farmers must give special care and effort to the postharvest fruits to minimize the contamination of these microorganisms and maintain good quality as high as possible during harvesting, grading, cleaning, packaging and transportation, Consequently, the suitable and proper technology in each harvesting steps must apply in order to insure optimum quality and safety at the marketplace.

ACKNOWLEDGEMENT:

The author very thankful to The King Abdulaziz City for Science and Technology for supporting this work.

CONFLICTS OF INTEREST:

The authors declare no conflict of interest.

REFERENCES:

[1] Arrebola E, Sivakumar D (2010) Bacigalupo, R.; Korsten, L. Combined application of antagonist *Bacillus amyloliquefaciens* and essential oils for the control of peach postharvest diseases. *Crop Prot. 29*, 369–377.

[2] Bijendra K S, Kulveer S Y, Akhilendra V (2017). impact of postharvest diseases and their management in fruit crops: an overview. *J.Bio.Innov6 (5),* pp: 749-760.

[3] De Cal A, Sandín EP, Martinez F, Egüen B, Chien MC, Lee MH, Melgarejo P, Prusky D (2013). Role of gluconic acid and pH modulation in virulence of Monilinia fructicola on peach fruit. Postharvest Biol. Technol. 86, 418–423.

[4] Gatto MA, Ippolito A, Linsalata V, Cascarano NA, Nigro F, Vanadia S, Di Venere D (2011). Activity of extracts from wild edible herbs against postharvest fungal diseases of fruit and vegetables. Postharvest Biol. Technol.61, 72–82.

[5] Gell I, De Cal A, Torres R, Usall J, Melgarejo P (2008) Relationship between the incidence of latent infections caused by *Monilinia* spp. and the incidence of brown rot of peach fruit: Factors affecting latent infection. *Eur. J. Plant Pathol. 121*, 487–498.

[6] Hong CX, Michailides TJ (1997). Prune, plum, and nectarine as hosts of *Trichothecium roseum* in California orchards. *Plant Dis. 81*, 112.

[7] Iniekong PU, Clara IE, Bryan OO, Martin EO (2015). Fungi Responsible for the Spoilage/Deterioration of Some Edible Fruits and Vegetables. Advances in microbiology, 5(4): 285-290.

[8] Janisiewicz WJ, Korsten L (2002). Biological control of postharvest diseases of fruits. *Annu. Rev. Phytopathol. 40*, 411–441.

[9] Kader AA (2005). Increasing food availability by reducing postharvest losses of fresh produce. Int. Postharvest Symp. Acta Hort. 682, 2169–2178.

[10] Karabulut OA, Cohen L, Wiess B, Daus A, Lurie S, Droby S (2002). Control of brown rot and blue mold of peach and nectarine by short hot water brushing and yeast antagonists. Postharvest Biol. Technol. 24, 103–111.

[11] Lee SC, Yoo JS, Kim SH, Chung SY, Hwang CW, Joo CH, Choi YL (2006). Production and characterization of lipopeptide biosurfactant from *Bacillus subtilis* A8-8. *J. Microbiol. Biotechnol. 16*, 716–723.

[12] Liu HX, Jiang WB, Bi Y, Luo YB (2005). Postharvest BTH treatment induces resistance of peach (Prunus persica L. cv. Jiubao) fruit to infection by Penicillium expansum and enhances.

[13] Lurie S, Crisosto CH (2005). Chilling injury in peach and nectarine. *Postharvest Biol. Technol. 37*, 195–208.

[14] Mari M, Bautista BS, Sivakumar D (2016). Decay control in the postharvest system: Role of microbial and plant volatile organic compounds. *Postharvest Biol. Technol. 122*, 70–81.

[15] Mclaughlin RJ, Wilson CL, Droby S, Benarie R, Chalutz E (1992). Biological control of postharvest diseases of grape, peach and apple with the yeasts kloeckera-apiculata and candida-guilliermondii. *Plant Dis. 76*, 470–473.

[16] Parfitt J, Barthel M, Macnaughton S (2010). Food waste within food supply chains: Quantification and potential for change to 2050. Philos. Trans. R. Soc. 365, 3065–3081.

[17] Razzaq A, Imtiaz A, Junaid MA, et al (2017). Strategies to Combat Microbial Food Spoilage Activities in Peach Pulp. Electronic J Biol, 13:4

[18] Rosa M. Massilia R, Melgar J M, Fortuny RS, Belloso OM (2009). Control of Pathogenic and Spoilage Microorganisms in Fresh-cut Fruits and Fruit Juices by Traditional and Alternative Natural Antimicrobials. Comprehensive reviews in food science and food safety, 8(3): pp 157 – 180.

[19] Samson RA, Varga J (2007). Aspergillus systematics in the genomicera. CBS Fungal Biodiversity Centre, Utrecht. p. 206.

[20] Snowdon AL (2010) Colour Atlas of Postharvest-Harvest Diseases and Disorders of Fruit and Vegetables, Volume 1: General Introduction and Fruits; Manson Publishing Ltd.: London, UK.

[21] Spadaro D, Droby S (2016). Development of biocontrol products for postharvest diseases of fruit: The importance of elucidating the mechanisms of action of yeast antagonists. *Trends Food Sci. Tech. 47*, 39–49.

[22] Usall J, Casals C, Sisquella M, Palou L, de Cal A (2015). Alternative technologies to control postharvest diseases of stone fruits. *Stewart Postharvest Rev. 11*, 1–6.

[23] Usall J, Torres R, Vias I, Abadias M, Teixidó N (2013). Principales enfermedades de postcosecha y su control. In *Poscosecha de pera, manzana y melocotón*; Mundiprensa: Madrid, Spain, pp. 247–280.

[24] Vitoratos A, Dimitrios B, Karkanis A, Efthimiadou A (2013). Antifungal activity of plant essential oils against Botrytis cinerea, Penicillium italicum and Penicillium digitatum. Not. Bot. Hort. Agrobot. 41, 86–92.

[25] Vreeland RH, Rosenzweig WD, Powers DW (2000). Isolation of a 250 million-year-old halo tolerant bacterium from a primary salt crystal. *Nature.407*, 897–900.

[26] Xu BT, Zhang HY, Chen KP, Xu Q, Yao Y, Gao H (2013). Biocontrol of postharvest *Rhizopus* decay of peaches with *Pichia caribbica*. *Curr. Microbiol. 67*, 255–261.