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MORPHOLOGICAL IDENTIFICATION AND MANAGEMENT OF FUNGAL POST-HARVEST PATHOGENS OF PEACH (*Prunus persica* L)

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ABSTRACT

The present study was designed to determine the fungal post-harvest pathogens of peach from fruit markets of Dhok kala khan, Raja Bazaar and Mandi Mor located in Rawalpindi, Pakistan. During the year 2016-17, 36 fruits were collected randomly and morphological characterization of fungal isolates confirmed that *Botrytis cineria*, *Aspergillus niger*, *Rhizopus stolinifer* and *M. piriformis* are causing post-harvest rot of peach. Among all these, *R. stolinifer* was found to be most prevalent pathogen. The essential oil of brassica, taramira and ginger were used for management of *R. stolinifer* with 0.05%, 0.5% and 5% concentration. Taramira oil at 5% concentration resisted the growth of *R. stolinifer* after 3 and 5 days while only 0.1 mm growth was recorded after 7 days.

Key word: Morphological identification, post-harvest, fungal, peach, essential oil.

INTRODUCTION

Peach (*Prunu spersica* L.) belongs to Rosaceae family. Peaches are belief to be the "Queen" of fruits and have the very proximate position after the apples in popularity. It is a noteworthy fruit, having a delight able and enjoyable taste, aroma and a good-lookingcolour. China is the leading Peach producing country with about 54% share of the total world production followed by Italy and the Spain (Habib, 2015). In Pakistan. Peach is a traditional fruit of Khyber Paktunkhwa province and it is cultivated on the area of 6,330 hectares with the production of 36,155 tonnes (GOP, 2016). Peach is characteristically soft-fleshed and highly perishable fruit, and has a limited market life potential. Due to rapid softening, physiological disorders and deterioration of quality which significantly, decrease their marketing value and period (LaRue, 1989). Peaches are stored at a low temperature to reduce the quality loss at various stages such as processing, eck grammer it should be believed storage, transportation, sale etc. Optimum maturity of each peach cultivar to assure maximum taste and storage quality, the fruit has the ability to ripen satisfactorily (LaRue, 1989). The best maturity varies according to markets for distance. Different plant pathogenic organisms mostly fungal diseases include grey mould,black bread mold, softening, rotting caused by *Botrytis cinerea*, *Penicillium expansum*, *Rhizopus stolonifera* and *Aspergillus* spp. have been identified all over the world and reduce their nutritional, medicinal value and storage period (Gobayashi *et al.*, 1992; Qing and Shiping, 2000). An essential oil is a concentrated hydrophobic liquid containing volatile aroma compounds from plants.Oils have been used for thousands of years in numerous cultures for medicinal and health purposes. Essential oils (EOs) are volatile oily liquids obtained from different plant parts and widely used as food flavours. Essential oil uses range from aromatherapy, cleaning products, household personal beauty care and natural medicine treatments. The essential oils are extracted from distilling or extracting the different parts of plants, including the seeds, flowers, leaves, bark, roots, resin and peels. In old days, Jews and Egyptians prepare essential oils by soaking the plants in oil and then, filtering the oil through a linen bag.The present study was designed to develop an environment friendly post-harvest diseasemanagement of peach.

MATERIALS AND METHODS

A survey was conducted in the local markets of Rawalpindi (Dhok kala khan, Raja bazaar and Mandi Mor) and 36 (12 from each market) peach fruits were picked randomly in sterilized polythene. The diseased along with some healthy portions of fruit were sliced into small 6-8mm pieces and surface sterilized with 10% sodium hypochlorite for 3 min. and dipped thrice in sterilized distilled water to remove traces of sodium hypochlorite. The segments were dried on double layer of sterile filter paper. The segments were transferred to CZPEK Dextrose Agar (Glucose 5g, KH_2PO_4, 0.125g, $NaNo_3$ 0.5g, $MgSO_4$, 0.125, Yeast extracts 0.25g, $FeSO_4$, 0.25g, Agar, 5g, Water 250ml) and incubated at $25^0C \pm 2^0C$. The pathogens were further purified with single spores method (Choi *et al.*, 1999). The pure culture of each pathogen was preserved in silica gel method (Tariq *et al.*, 2016). Mycelium colour, spore size, spore shape, fruiting bodies, septations, concentric zones and conidiophores were identified by microscopic observation. A symptomatic peach fruits (3 for each isolate) were surface sterilized with sodium hypochlorite (10%), washed thrice with sterile distilled water and dried in sterile conditions. Fruits were sprayed with spore suspension (10^6 spores/ml) of each isolate and sterile distilled water was used as a negative control. The experiment was repeated twice and fruits were incubated at $25^0C \pm 2^0C$. The pathogens were again isolated from artificially

inoculated fruits and compared with inoculated cultures. Seeds and leaves (15 gm) of Brassica, *Erucasativa* and Ginger were grounded and mixed with 200 mL of ethanol (95%) and essential oil was extracted with soxhlet apparatus (Redfern *et al.*, 2014). 0.05 %, 0.5% and 5% of each oil was prepared with 0.01% Tween 80. Each concentration was added separately in Czpek dextrose agar media and a plug of 7 days old fungal culture was transferred in the centre of plate. The plates were incubated at $25^0C \pm 2^0C$ and colony diameter was recorded after 3, 5 and 7 days interval.

RESULTS AND DISCUSSION

Rotten spots along with grey and blackish fungal mycelium were recorded on collected fruits which covered the entire fruits at later stage of infection. A total number of 28 fungal isolates were isolated from infected samples. Velvety to woolly colony were recorded in 6 isolates *Aspergillus niger* (As-M1, As-M2, As-D, As-R1, As-R2, As-R3) and a compact white or yellow basal felt covered by a dense layer of dark-brown to black conidial heads were recorded. Conidia subglobos were 3 to 6µm in diameter and colourless sporangiophore were recorded as 8 to 14.6µm x 1 to 1.6µm. Conidial heads were large, globose, dark brown, becoming radiate and tending to split into several loose columns with age. Spore size was ranged 19 to 30 um x 3.5 to 6 with um. These morphological characterization were similar with *A. niger* (Rasool *et al.*, 2014). Whitish to brownish colony color were recorded in 12 isolates (Rh-M1, Rh-M2, Rh-M3, Rh-M4, Rh-M5, Rh-M6, Rh-D1, Rh-D2, Rh-D3, Rh-R1, Rh-R2 and Rh-R3). Sporangiospores were globose, brownish, streaked and angular with 6 to 14 × 6 to 11 µm. Sporangiophores were pale to dark brown, aseptate, 2 to 6 mm long and 15 to 26 µm and sporangium was 185-280 µm long. The sporangiophores were erect, aerial, unbranched and sporangia were measured as 90 to 185 µm in diameter. The sporangiophores were 500 to 800 µm in length and sporangia produced many sporangiospores that were irregular, round or oval measuring 6 to 12 × 5 to 9 µm. These morphological characterizations were similar with *Rhizopus stolinifer* (Parveen *et al.*, 2016). Whitish to greyish with woolly and fluffy growth were recorded in 10 isolates Mu-M1, Mu-M2, Mu-M3, Mu-M4, Mu-M5, Mu-D1, Mu-D2, Mu-R1, Mu-R2, Mu-R3. Conidia were long, branched and the table smooth with 7.2 to 9.3 x 4.5 to 8.1 µm µm. White sporangiophore were ellipsoidal and aromatic with 3 to 9µm and produced droplets at the basal part. Grey sporangium was ranging 224 x 254 µm and sporangia were blackish and ranged from 78 to 249 x 81 to 279µm. These morphological characteristics were in agreement with the descriptions of *M. piriformis* (Saito *et al.*, 2016). After, 3 days, maximum reduction of 5% *R.stolonifer* was recorded in taramira (0mm), brassica (2.9 mm) and ginger (3.2 mm), respectively. Eos oftaramira did not allow growing the fungus after 5 days while 4.4 mm and 6.1 mm colonies of *R.stolonifer* were recorded in brassica and ginger, respectively (Figure 1).

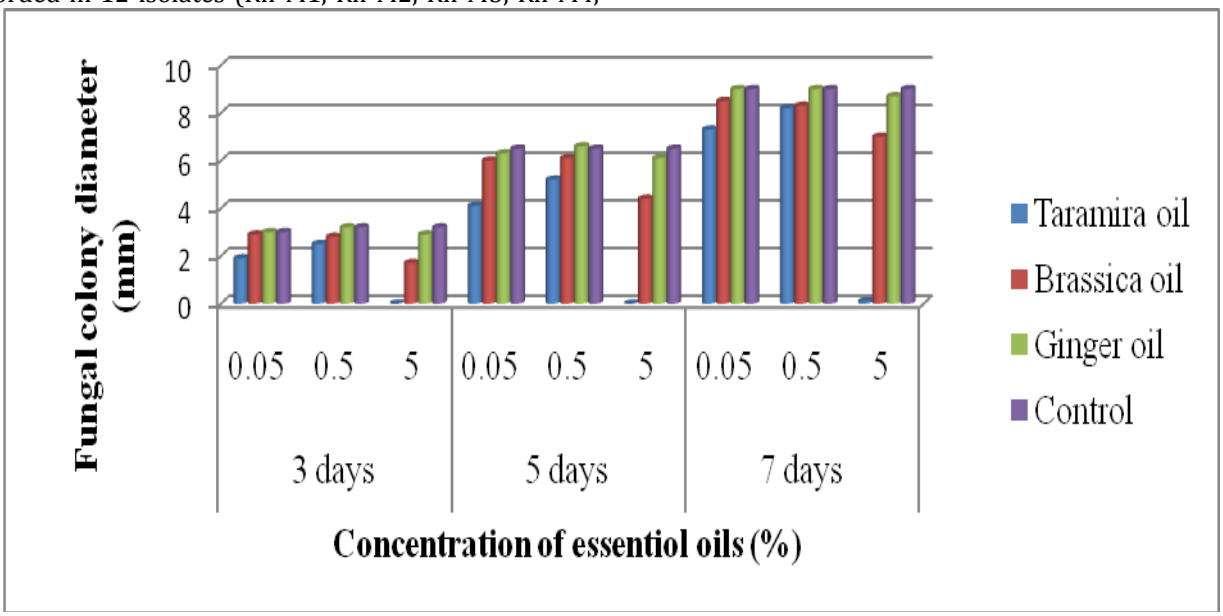

Figure 1: Management of *R.stolonifer* with different EOs application.

A very minute growth (0.1mm) of *R.stolonifer* was recorded in colony diameter of *R.stolonifer*treated with taramira while 9mm growth was recorded in control. Several EOs have been reported to be great inhibitor of postharvest pathogens, yet reports on the use of taramira, Brassica, and ginger oil on peaches are limited. Differential inhibition of pathogens by EOs may be due to their composition, which contributes to their biological activity. For example, high content of citral was found as the main compound in lemon grass oil, while clove oil contains eugenol, caryophyllene, furfurol, α-pinene and eugenyl acetate and eugenol a phenolic compound (70 to 90 %) was the main contributor. The taramira oil at highest concentration (5%) proved highly effective in inhibiting the mycelial growth of all these pathogenic fungi followed by

other plant oils and this study may be used as a new tool for preservation and extension of shelf-life of peach fruits.

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