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Studies on incidence of wilt disease in guava plantation of Varanasi and adjacent districts

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The wilt disease incidence in guava orchards ranged between 3.9-30%. Defoliation. die back and bark cracking were the important symptoms. *Fusarium solani. F. moniliforme, F. oxysporum, F. oxysporum* f. sp. *psidii* were dominant in all the seasons. Other associated saprophytes viz., *Alternaria alternata, A. flavus, A. nidulans, A. niger, Penicillium citrinum, Trichoderma harzianum* and *T. viride* were dominant in summer, while *Aspergillus luchuensis, Humicola* sp, and *Fusarium solani* were dominant in rainy and winter seasons. *Aspergillus flavus, A. fumigatus, A. humicola, Cunninghamella echinulata, Penicillium* sp. and *Trichoderma viride* were isolated randomly in all the seasons. *Cunninghamella, Fusarium* spp. and *Macrophomina phaseolina* were isolated from wilted twigs whereas *F. solani, F. longipes, F. moniliforme F. oxysporum* f. sp. *psidii* and *Macrophomina phaseolina* were isolated from rootbits and root sections. Maximum soil temperature (43°C) was recorded in summer. The maximum organic matter in the soil was in rainy season (2.10%).

Key Words : Wilt disease incidence, Guava crop

INTRODUCTION

Guava *(Psidium guajava L.)*, an angiospermic plant of the family Myrtaceae, is a tropical fruit crop. In our country, it is grown commercially as a cash plantation crop rich in nutritive value, vitamins and minerals. But plantation suffers from destructive wilt disease since long and hence, the disease is of national importance. Keeping in view the economic significance and loss due to wilt disease, the present paper aims at the investigation of disease incidence, distinctive symptoms, isolation of fungi and their soil factors' relationship in some orchards of Varanasi, Mirzapur and Jaunpur districts of Uttar Pradesh.

MATERIALS AND METHODS

Guava field survey was made during 1992-93 in seven different orchards scattered in Varanasi, Mirzapur and Jaunpur districts. The disease incidence with important symptoms were noted (in winter, summer and rainy seasons). Samples (root, twigs and bark) and soil from the orchards were brought to the laboratory in sterilized polythene bag for further studies.

Isolation of soil mycoflora

Soil (10 g) from root region of wilted plants were transferred to 250 ml Erlenmeyer flask containing 100 ml sterile distilled water. To get a homogeneous suspension of soil-water, the flasks were shaken on an electric shaker and dilution ($1 : 10^3$) was prepared with sterilized water. One ml of the soil : water suspension dilution was poured on Petri dishes containing Martin's agar medium (Martin, 1950). The fungal colonies were recorded and identified after incubation at $25 \pm 1°C$ for a week.

Isolation of fungi from root, root sections and wilted twigs

Following Harley and Waid (1955), rootbits or wilted twigs or root sections (1 cm long) were cut and treated with 0 1% $HgCl_2$ solution for 1 min and then washed with several changes of sterile distilled water. Then they were transferred to Czapek-Dox plates in replicates. The plates were incubated for a week at $25 \pm 1°C$ and fungal colonies growing on them were recorded and identified.

Physico-chemical studies of soil

Soil texture (sand, silt and clay) was determined as suggested by Piper (1944), while moisture content and soil temperature were recorded following Misra (1968). Soil pH was measured by pH meter. Total organic carbon was estimated by rapid titration method whereas total organic matter was calculated by multiplying to total organic carbon with 1.724.

RESULTS AND DISCUSSION

Maximum percentage of wilting (30%) was recorded in Malahiya orchard followed by 24.6, 22.7, 21.2, 5.0 and 3.9% in Banpurwa-Varanasi, Badalapur-Jaunpur, Madarawa-Varanasi, Bharuhana-Mirzapur and Lakhana, Gyanpur-Varanasi orchards respectively. Age of trees ranged between 3-10 years. Yellowish colouration of the leaves, defoliation, die back and bark cracking were the important symptoms observed in these orchards. In partial wilting, symptoms appeared on one or more branches of the tree simultaneously, whereas other branches remained apparently healthy. Unripe fruits with yellowish-brown to black symptoms either fell down or remained attached to the wilted trees.

Soil mycoflora isolated during different seasons was as follows :

Winter season : *Aspergillus flavus, A. luchuensis, A. sydowi, Cephalosporium* sp., *Cladosporium cladosporioides, Curvularia lunata, Drechslera australiensis, Fusarium moniliforme, F. solani, F. oxysporum, F. oxysporum* f. sp. *psidii, Humicola* sp., *Macrophomina phaseolina, Mucor mucedo, Penicillium chrysogenum, Trichoderma lignorum, T. viride* and a black sterile mycelia.

Summer season ; Alternaria alternata, Aspergillus flavus, A. nidulans, A. niger, A. sydowi, Chaetomium globosum, Curvularia lunata, Fusarium moniliforme, F. solani, F. oxysporum, F. oxy. f. sp. *psidii, Macrophomina phaseolina* (except Gyanpur, Varanasi orchard), *Penicillium citrinum, Phoma* sp., *Trichoderma harzianum* and *T. viride.*

Rainy season : Alternaria alternata, Aspergillus luchuensis, Chaetomium globosum, Curvularia echinulata, Fusarium longipes, F. moniliforms, F. solani, F. oxysporum f. sp. *psidii, Gliocladium fimbriatus, Humicola* sp., *Macrophomina phaseolina, Mucor mucedo, Myrothecium roridum, Penicillium funiculosum, P. rubrum, Phoma glomerats, Rhizopus* sp., *Trichoderma lignorum, T. viride* and a white sterile mycelia.

Fusarium solani, F. moniliforme, F. oxysporum and *F. oxysporum* f. sp. *psidii* were dominant in all the seasons except in Gyanpur-Varanasi orchard where *F. oxysporum* f. sp. *psidii* and *Macrophomina phaseolina* were not isolated. *Aspergiilus flavus. A. fumigatus, A. humicola, Cuminghamella echinulata, Penicillium* sp. and *Trichoderma viride* were isolated randomly in all the seasons, while *T. lignorum* was isolated in winter season. *Alternaria alternota, Aspergillus flavus, A. nidulans, A. niger, Penicillium citrinum, Trichoderma harzianum* and *T. viride* were dominent in summer whereas *A. luchuensis, Humicola* sp. and *T. viride* were dominent in summer whereas *A. luchuensis, Humicola* sp. and *F. solani* were dominant in rainy and winter seasons.

Present study also revealed that white *Cunninghamella* sp., *Fusarium* sp. and *Macrophomina phaseolina* were isolated from twigs and *Fusarium solani, F. longipes, F. moniliforme, F. oxy.* f. sp. *psidii* and *Macrophomina phaseolina* were isolated from rootbits and root sections.

Variations in temperature in different seasons showed their influence on the distribution of fungi in the present study. The soil temperature was maximum (43°C) in summer followed by rainy (32°C) and minimum in winter (21.5°C) seasons. pH values also differed in different seasons. The organic matter was maximum in rainy season (2.10) followed by winter (1.68) and summer (0.86) seasons (Table 1).

Table 1. Physico-chemical properties of the soil (Mechanical composition of the soil : sand 65.0%, silt 20.4%, clay 14.6%)

Season	Soil pH	Soil moisture content (%)	Soil temp. (°C)	Total organic carbon (% w/w)	Total organic matter (% w/w
Winter	7.4	11.11	21.5	0.98	1.68
Summer	7.1	6.5	43.0	0.50	0.86
Rainy	7.3	25.0	32.0	1.22	2.10

Studies on wilt disease incidence in guava crop were made from time to time. It was 15-30% from Babakkarpur in Allahabad district of Uttar Pradesh (Prasad *et al.*, 1952); while 5-10% in Kanpur and Jaunpur districts (Mathur, 1956). The catastrophic incidence was reported from Punjab, Rajasthan and Haryana (Mohan *et al.*, 1986 ; Katyal, 1972 ; Suhag, 1976 ; Mehta, 1987). In the present study it ranged between 3.9-30% in different areas studied. Variation in the occurrence of soil fungal community is due to fluctuations in edaphic factors (Alexander, 1977). Soil texture and pore space between soil particles also affect growth of fungi and microorganisms (Bahera and Mukherji, 1984). Increase in mycoflora, in the present study in rainy season might may be due to increase in moisture level of soil, while the least number of fungal colonies isolated in summer may be due to low moisture level and high temperature of soil (Warcup, 1957). The dominance of *Aspergillus, Fusarium, Macrophomina phaseolina, Penicillium* and *Trichoderma* in the present study showed their tolerance to the environmental conditions as they have broad ecological spectrum (Upadhyay and Rai, 1979) and the occurrence of *Fusarium* species in soil may be due to their pathogenic nature.

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