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## ISOLATION AND IDENTIFICATION OF FUNGAL DISEASES IN CUCURBITS OF ALLAHABAD URBAN AREA, UTTAR PRADESH, INDIA

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## ABSTRACT

Cucurbits are vegetable crops belonging to family Cucurbitaceae, which primarily comprise of species consumed as food worldwide. In the present study seven infected Cucurbits samples namely; Pumpkin, Cucumber, Muskmelon, Watermelon, Bitter gourd, Bottle gourd, and Ridge gourd were collected from markets of Allahabad urban areas. To isolate and identify the fungal pathogens from collected samples were tested by using Potato Dextrose Agar plate method in the laboratory. A total number of sixteen fungal species were recovered from all seven cucurbits. Out of sixteen, five species of *Fusarium* namely; viz. *F. solani*, *F. equiseti*, *F. oxysporum* sp. *cucumerinum*, *F. oxysporum* sp. *melonis* and *F. oxysporum* sp. *niveum* and two fungal species of *Alternaria* namely; *A. cucumerina*, *A. alternate* were recovered from cucurbits. Nine other fungal species namely; viz. *Cercospora citrullina*, *Didymella bryoniae*, *Erysiphe cichoracearum*, *Pseudoperonospora cubensis*, *Phytophthora capsici*, *Septoria cucurbitacearum*, *Sclerotium rolfsii*, *Corynespora cassicola*, *Verticillium Dahliae* were also recovered from cucurbits. After testing the collected samples, 11 species of fungi were recorded from pumpkin, 10 species from cucumber and watermelon, 9 species from muskmelon, 2 species bitter gourd and 3 species in bottle gourd and ridge gourd.

## INTRODUCTION

Cucurbits are among the most important plant families supplying humans with edible products and useful fibers. Cucurbits belong to the family Cucurbitaceae and consist of about 118 genera and 825 species, according to the last taxonomic treatment of (Jeffrey 1990). Estimated 36 genera and 100 species in India (Chakravarty 1982). Cucurbitaceae is an economically important family of vegetable and fruit crop for the farmers. It is mainly distributed in tropical and subtropical regions although a few of them are grown in temperate regions also (Jeffrey 1990). India is the second largest producer of vegetables with 2.8 % of total cropped area and 13.38% of total vegetable production. Cucurbits are divided into five sub-families: Fevilleae, Melothriaceae, Cucurbitaceae, Sicyoideae and Cyclantherae. The most important cultivated genera are *Cucurbita* L., *Cucumis* L., *Citrullus* L., *Lagenaria* L., and *Luffa* L., found in the sub-family Cucurbitaceae, and *Sechium* L., found in the sub-family Sicyoideae (Whitaker & Davis, 1962). The Indian sub-continent is considered to be the centre of origin for *Cucumis sativus* and a centre of diversity for *C. melo* (Zeven and de Wet, 1982). The genus *Cucumis* consists of 52 species rather than 33 species reported earlier (Ghebretinsae et al., 2007; Kocyan et al., 2007; Schaefer, 2007; Renner et al., 2007). Cucurbits are mostly climbers and trailers, are rarely woody and arborescent. They are characterized by inferior ovary and parietal placentation. The most common uses of cucurbits are as vegetables and fruits. They are valuable sources of vitamins and minerals. *Cucurbita* or yellow flowered cucurbit is considered to be one of the most morphologically variable genera in the entire plant kingdom (Robinson et al., 1976). Archaeological records of the New World suggest that *Cucurbita* was one of the first plant to be domesticated (Nee, 1990). All parts of cucurbits (leaves, shoots, roots, flowers, seeds and fruits) can be used in the preparation of pickles, curries and salads (Upaganlawar and Balaraman, 2009). The paper deals with isolation and identification of fungal diseases in cucurbits of Allahabad Urban area.

## MATERIALS AND METHODS

### Collection and Isolation of fungi from Cucurbits vegetables

The seven infected cucurbits vegetables viz. Pumpkin (*Cucurbita moschata*, 2n = 40), Cucumber (*Cucumis sativus*, 2n = 14), Muskmelon (*Cucumis melo*, 2n = 24), Watermelon (*Citrullus lanatus*, 2n = 22), Bitter gourd (*Momordica charantia*, 2n = 22), Bottle gourd (*Lagenaria siceraria*, 2n = 22), Ridge gourd (*Luffa acutangula*, 2n = 26), were collected from markets in Allahabad urban areas. Samples were put in separate sterilized plastic bags and transferred to the laboratory. The infected tissues transferred individually to Petri dishes containing 20 mL of PDA medium. Incubate the dishes at 30°C for 5 days then dishes were examined and identified. In some cases the infected tissues were stained by cotton blue and Lactophenol (Mc Lean and Ivimey, 1965) and observed under compound microscope. Identification of the pathogens was made with the help of available literature (Biligrani et al., 1981 and 1991, Subramanian, 1971). The pure cultures of isolated fungal strains were maintained in PDA slants with streptomycin at 28°C

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during the study (Aneja, 2004).

Second method is screening of cucurbits fungi were done by following method of Czapek - Dox medium used in this method contained (g/l); sucrose- 30, NaNO<sub>3</sub> - 2, K<sub>2</sub>HPO<sub>4</sub> - 1, MgSO<sub>4</sub> - 0.05, KCl - 0.5, FeSO<sub>4</sub> - 0.01, Agar- agar -20. pH of the medium was adjusted to 5. After autoclaving the medium was poured into Petri plates and allowed to solidify. Cavities of 7 mm size were made in the solidified medium and inoculated with 0.1ml of spore suspension prepared from 7 day old slants. The plates were incubated at room temperature (28 ± 2 C) for three days to allow fungal growth, then again incubated for 18 h at 50 C which is the optimum temperature for fungal activity. After incubation, 10 ml of 1% Congo – Red staining solution was added to the plates that were shaken 15 min. The Congo – Red staining solution was then discarded. 10 ml of 1N NaOH was added to the plates and shaken again for 15 minutes. Finally 1N NaOH was also discarded and the staining of the plates was analyzed by noticing the formation of yellow zones around the fungal spore inoculated wells. All isolates were then examined microscopically and identified according to the method adopted by (Rifai 1969 and Bissett 1991).

#### Pathogenicity test

Some of isolated fungi were used to confirm their pathogenicity test in their respective hosts. Some fresh healthy samples were brought in to the laboratory and surface sterilized with 0.1% HgCl<sub>2</sub>. For inoculations cork borers of (2mm) diameter were used. They were sterilized by placing in spirit lamp flame, dipping in alcohol and shaking off the excess alcohol by flaming (Granger and Horne, 1924). The inoculated samples and their respective controls were kept under sterile conditions at room temperature under bell jars. The artificially inoculated samples were examined daily and the extent of damage was recorded. The pathogens were re-isolated and disease symptoms were clearly evident, the culture and symptoms signs were compared with original.

## RESULTS AND DISCUSSION

After collection of infected cucurbits the isolation of fungi was

done in Bhargava Agriculture Laboratory; Department of Botany University of Allahabad. The finding of laboratory work has been presented in Table (1). A total number of sixteen species of fungi were recovered from seven cucurbits namely; Pumpkin (*Cucurbita moschata*), Cucumber (*Cucumis ativus*), Muskmelon (*Cucumis melo*), Watermelon (*Citrullus lanatus*), Bitter gourd (*Momordica charantia*), Bottle gourd (*Lagenaria siceraria*), Ridge gourd (*Luffa acutangula*). Out of sixteen species, five species of *Fusarium* were most incidence species. Two species of *Alternaria* were recovered from different cucurbits Table (1). There were nine other fungal species namely; *Cercospora citrullina*, *Didymella bryoniae*, *Erysiphe cichoracearum*, *Pseudoperonospora cubensis*, *Phytophthora capsici*, *Septoria cucurbitacearum*, *Sclerotium rolfsii*, *Corynespora cassicola*, *Verticillium Dahliae* have been also recovered from different cucurbits. A wide range of pathogens affect the productivity of cucurbits.

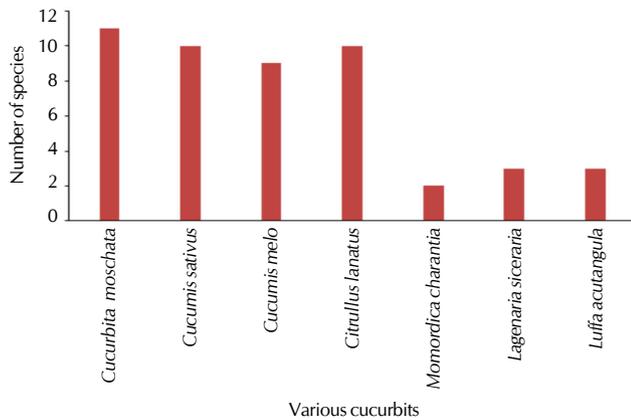
It was noticed that *F. solani* infects pumpkin, cucumber, muskmelon, watermelon, bitter gourd vegetables but it showed negative response on bottle gourd and ridge gourd. *F. equiseti* infects muskmelon, watermelon and it showed negative response on pumpkin, cucumber, bitter gourd, bottle gourd in Table (1). *F. oxysporum cucumerinum* infects only cucumber and it showed negative response pumpkin, muskmelon, watermelon, bitter gourd, bottle gourd, ridge gourd. Similar type of study was also done by Ogura (1992) at Japan. *F. Oxysporum melonisi* infects only, muskmelon but it showed negative response on pumpkin, cucumber, watermelon, bitter gourd, bottle gourd, ridge gourd. *F. Oxysporum niveum* infects watermelon and it showed negative response on pumpkin, cucumber, muskmelon, bitter gourd, bottle gourd, ridge gourd. *Alternaria cucumerina* infects pumpkin, cucumber, muskmelon, watermelon vegetables but it showed negative response bitter gourd, bottle gourd, ridge gourd. *A. alternata* infects pumpkin, muskmelon, watermelon but it showed negative response cucumber, bitter gourd, bottle gourd, ridge gourd. *Cercospora citrullina* infects pumpkin, cucumber, muskmelon, watermelon and it showed negative response on bitter gourd, bottle gourd, ridge gourd. *Didymella bryoniae* infects pumpkin, cucumber, muskmelon, watermelon, it showed negative response on bitter gourd, bottle gourd, ridge

**Table (1): Fungal genera and species which were recovered from various Cucurbits sample collected from Urban Areas of Allahabad district.**

Isolated Fungi	Cucurbits Name						
	Pumpkin	Cucumber	Musk melon	Watermelon	Bitter gourd	Bottlegourd	Ridge gourd
1. <i>Fusarium solani</i>	+	+	+	+	+	-	-
2. <i>F. equiseti</i>	-	-	+	+	-	-	-
3. <i>F. oxysporum cucumerinum</i>	-	+	-	-	-	-	-
4. <i>F. oxysporum melonis</i>	-	-	+	-	-	-	-
5. <i>F. oxysporum niveum</i>	-	-	-	+	-	-	-
6. <i>Alternaria cucumerina</i>	+	+	+	+	-	-	-
7. <i>A. alternata</i>	+	-	+	+	-	-	-
8. <i>Cercospora citrullina</i>	+	+	+	+	-	-	-
9. <i>Didymella bryoniae</i>	+	+	+	+	-	-	-
10. <i>Erysiphe cichoracearum</i>	+	+	+	+	-	-	-
11. <i>Pseudoperonospora cubensis</i>	+	+	-	-	+	+	-
12. <i>Phytophthora capsici</i>	+	+	+	+	-	-	-
13. <i>Septoria cucurbitacearum</i>	+	+	-	-	-	+	-
14. <i>Sclerotium rolfsii</i>	+	-	-	+	-	-	+
15. <i>Corynespora cassicola</i>	-	+	-	-	-	+	+
16. <i>Verticillium Dahliae</i>	+	-	-	-	-	-	+

**Table (2): Number of fungal species found in Cucurbits Vegetables**

Cucurbits Vegetable name	Fungal Species
1. <i>Cucurbita moschata</i> (Pumpkin)	11
2. <i>Cucumis sativus</i> (Cucumber)	10
3. <i>Cucumis melo</i> (Muskmelon)	09
4. <i>Citrullus lanatus</i> (Water melon)	10
5. <i>Momordica charantia</i> (Bitter gourd)	02
6. <i>Lagenaria siceraria</i> (Bottle gourd)	03
7. Ridge gourd ( <i>Luffa acutangula</i> )	03

**Figure 1: Various Fungal species recovered from Cucurbits vegetables**

gourd. *Erysiphe cichoracearum* infects pumpkin, cucumber, muskmelon, watermelon, it showed negative response on bitter gourd, bottle gourd, ridge gourd. Downy mildew is an important disease caused by *Pseudoperonospora cubensis*. *Pseudo peronospora cubensis* infects pumpkin, cucumber, bitter gourd, bottle gourd, it showed negative response on muskmelon, watermelon, ridge gourd. This fungus is common cucurbit pathogen worldwide and also reported in Brazil (Soares *et al.*, 2005).

*Phytophthora capsici* infects pumpkin, cucumber, muskmelon, watermelon it showed negative response on bitter gourd, bottle gourd, ridge gourd. *Septoria cucurbitacearum* infects pumpkin, cucumber, bottle gourd it showed negative response on muskmelon, watermelon, bitter gourd, ridge gourd. *Sclerotium Rolfsii* infects pumpkin, watermelon, ridge gourd, it showed negative response on cucumber, muskmelon, bitter gourd, bottle gourd. *Corynespora cassicola* infects cucumber, bottle gourd, ridge gourd it showed negative response on pumpkin, muskmelon, watermelon, bitter gourd. *Verticillium Dahliae* infects pumpkin, ridge gourd it showed negative response on Cucumber, muskmelon, watermelon, bitter gourd, bottle gourd in Table (1).

Table (2). Indicate that pumpkin, cucumber, muskmelon, watermelon were notice highly susceptible to fungi. There were 11 fungal species have recovered from pumpkin. There were 10 species of fungi have recovered from cucumber and watermelon. There were 09 fungal species have recovered from muskmelon. The lowest number of fungi recovered from bitter gourd, bottle gourd, ridge gourd which 02, 03, 03 species respectively.

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