

## New record of *Choanephora cucurbitarum* (Berk & Ravenel) Thaxt. infecting *Colocasia esculenta* 'Fontanesii' and other hosts from Chhattisgarh

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### ABSTRACT

*Choanephora cucurbitarum* is a facultative saprophyte fungus belongs to phylum *Zygomycota* and causes fruit rot, flower rot and leaf blight disease in several host plants. During the rainy season of 2017-18, infections were observed from different locations in Chhattisgarh in *Colocasia esculenta*, *Brassica oleracea* var. *botrytis*, *Lablab purpureus*, *Abelmoschus esculentus*, *Solanum melongena*, *Lagenaria siceraria*, *Capsicum annuum* and *Solanum lycopersicum*. Water soaked necrotic spots on leaves later necrotic spots coalescing and blighting on leaves. On severe infection leaf lamina reduced to rotten pulpy mass. Silvery spine or whiskers like sporangiophore bearing dark spores (superficial sporangia) on spadix coupled with black rot and dieback of the flower of colocasia, black rot in fruits of brinjal, necrosis in cauliflower, necrosis on fruits of hyacinth Bean, flowers of okra, flowers of bottlegourd, fruits of chilli and fruits of tomato. Sporangium was terminal and usually pendent on the recurved end of an erect sporangiophore with a definite columella which was globose in shape. Aseptate branches further swell to form young ampulla bearing spores. The disease was symptomatically and microscopically confirmed with earlier published standard monographs and literature.

**Keywords:** *Choanephora*, *Colocasia*, Flower rot, Wet rot.

### INTRODUCTION

The fungus *Choanephora cucurbitarum* (Berk & Ravenel) Thaxt. is a facultative saprobe causing fruit rots, flower rot and leaf blights on a variety of plants including squash, pumpkin, pepper, pea and bean. Apart from these crops, this fungus also attacks several other crops viz., cereals such as rice, sorghum and millets (Chandrakala and Vidyasagar, 2018). The fungus also caused pod blight known as wet rot, blossom blight and whisker rot (Kucharek *et al.*, 2003). This disease is common in squash and southern pea but occurs in the floral parts of many types of plants (Adebanjo, 1994). It causes blossom blight, die back, wet rot and soft rot of stem or side shoots of chilli plants (Maeda *et al.*, 2010). In Malaysia, crop losses of okra ranged from 20% to 73% (Huan and Jamil, 1975) and Nigeria, from 24 to 73% (Adebanjo and Dede, 1985). There was a total failure in seed production for cauliflower in Delhi, India (Siddiqui *et al.*, 1974). *Choanephora cucurbitarum* was observed and recorded for the first time in major cucumber growing area of Rajasthan in India with a 45.61% - 64.22% disease incidence level under protected cultivation (Kumar *et al.*, 2022).

### MATERIALS AND METHODS

Infected leaves and plant parts were collected from diseased plants viz. elephant ear (*Colocasia esculenta* 'fontanesii'), cauliflower (*Brassica oleracea* var. *botrytis*), hyacinth bean (*Lablab purpureus*), okra (*Abelmoschus esculentus*), brinjal (*Solanum melongena*), bottle gourd (*Lagenaria siceraria*), chilli (*Capsicum annuum*), tomato (*Solanum lycopersicum*) and brought to the laboratory. The symptoms were digitally recorded using a camera both under field conditions as well as in the laboratory. Fungal structures from fresh samples were mounted with lactophenol cotton blue on a glass slide and observed under a microscope (NIKON trinocular microscope model EC-E200) and digital images were captured. The fungal pathogen was isolated to a pure culture on potato

dextrose agar (PDA). To test the pathogenicity of the isolated fungus, some pieces of mycelia and spores were inoculated into potted healthy host plants that were grown in sterilized garden soil in an aseptic condition. On a healthy host leaf, an infection court was created by scrapping with a sterile needle. A piece of mycelium of the pathogenic fungus was inoculated on the wound created and thereafter covered with a transparent polyethylene bag for 24 hours. In the control, a wound was created and only a piece of gelled PDA was introduced. For the spore inoculation, a spore suspension of the test pathogen was prepared by harvesting freshly sporulating 7-8 days old culture in plates by flooding with 6-10 ml distilled water. The resultant spore-cum-mycelial suspension was filtered through muslin cloth and obtained filtrate was diluted with sterile distilled water to get an inoculum concentration of  $5 \times 10^5$  spores/ml and artificially inoculated by spraying with an atomizer. The control experiment was carried out with sterile distilled water without spores. The leaves, stems and soil were covered with transparent polyethylene bags and allowed to stay for 24 hours. After 48 h of inoculation, plants developed typical water-soaked lesions leads to necrosis and rotting of leaves.

### RESULTS

Chhattisgarh is a state in central India with a tropical and subtropical climate. Almost all types of vegetables are suitable for cultivation under these climatic conditions. *Choanephora* sp. is present in traces in Chhattisgarh but not in invasive and extent form (CABI; EPPO, 2008). However in recent years this pathogen is seen across a host wide range in the state which has not been reported and published yet. Hence present investigations were focused on a new records of *Choanephora* sp. with expanding host range from Chhattisgarh. During the rainy season of 2017-18, infections were found from different locations in black stem elephant ear (*Colocasia esculenta* 'Fontanesii'), cauliflower (*Brassica*

*olearcea* var. *botrytis*), hyacinth bean (*Lablab purpureus*), okra (*Abelmoschus esculentus*), brinjal (*Solanum melongena*), bottle gourd (*Lagenaria siceraria*), chilli (*Capsicum annuum*) and tomato (*Solanum lycopersicum*) (Fig. 1-2, 4, 6-9). A symptomatology study revealed that symptoms appeared as a wet rot on the blossoms and blossom ends of the fruit. The fruit became soft and watery and fast-growing,



**Fig. 1:** Symptoms of Wet rot of Black stem Elephant Ear (*Colocasia fontanesii*). **a.** water soaked necrotic spots on leaves; **b.** necrotic spots coalescing and blighting on leaves; **c.** leaf lamina reduced to rotten pulpy mass.



**Fig. 2:** Symptoms of wet rot of black stem elephant ear (*Colocasia esculenta* 'Fontanesii'). **a.** rotting of spathe and spadix causing dieback; **b.** Silvery spine or whiskers like sporangiophore bearing dark spores (superficial sporangia) on spadix coupled with black rot and dieback of the flower.



**Fig. 3:** **a.** Water soaked lesions and rotting of leaves; **b.** later bearing silvery spine or whiskers like sporangiophore bearing dark spores (superficial sporangia) coupled with necrosis in cauliflower (*Brassica olearcea* var. *botrytis*)



**Fig. 4:** Silvery spine or whiskers like sporangiophore bearing dark spores (superficial sporangia) coupled with necrosis on, **a.** fruits of hyacinth bean (*Lablab purpureus*); **b.** flower of okra (*Abelmoschus esculentus*)



**Fig. 5:** **a.** Black fruit rot of brinjal (*Solanum melongena*); **b.** whiskers like sporangiophore bearing dark spores (superficial sporangia) coupled with black rot of fruits.



**Fig. 6:** Silvery spine or whiskers like sporangiophore bearing dark spores (superficial sporangia) coupled with necrosis on, **a.** flowers of bottle gourd; **b.** fruits of chilli.

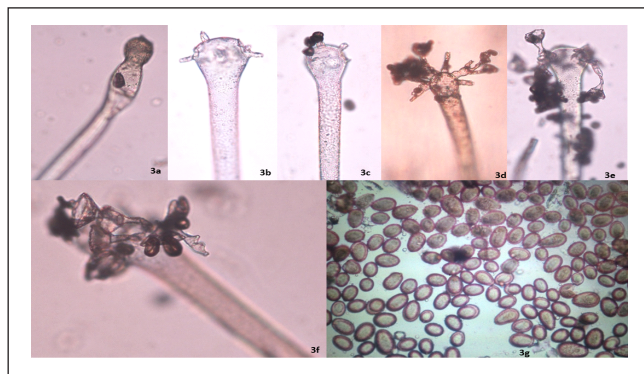
whisker-like fungal growth appeared on the blossoms and fruits. The fungal strands were whitish-grey with tiny black spores on the tips that resembled pin cushions. And in leaves, it appeared as water-soaked necrotic spots later that coalesced and caused blight. For further confirmation, diseased samples were taken and cultured on PDA media and microscopy was also done and noticed that the sporangium was terminal and





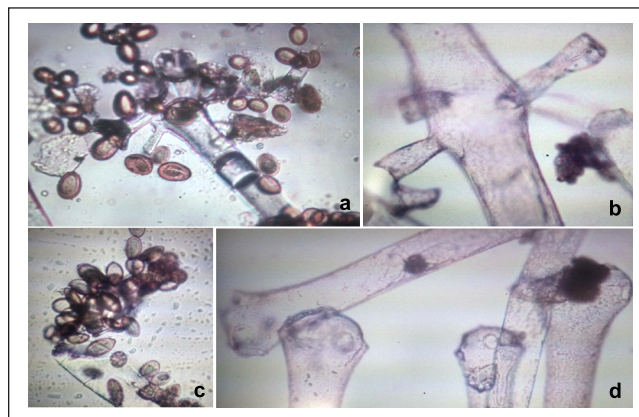
**Fig. 7:** White silvery spine or whiskers like sporangiophore bearing dark spores (superficial sporangia) coupled with necrosis on fruits of tomato.

usually pendent on the recurved end of an erect sporangiophore with a definite columella which was globose in shape (Fig. 8 & 9). Pathogenicity of the *Colocasia* and cauliflower isolates of *Choanephora cucurbitarum* were



**Fig. 8:** a-c. Development of primary vesicle and ampulla of *Choanephora* infecting elephant ear (*Colocasia esculenta*); d-f. Aseptate branches further swell to form young ampulla bearing spores; g. Spores.

proved. Disease incidence of *Choanephora cucurbitarum* was observed 25-30 % in black stem elephant ear (*Colocasia esculenta* 'Fontanesii') from Kharshiya, Raigarh, cauliflower (*Brassica oleracea* var. *botrytis*) from Labhandi, Raipur and okra (*Abelmoschus esculentus*) from IGKV Farms, Raipur



**Fig. 9:** Development of primary vesicle and ampulla of *Choanephora* infecting cauliflower (*Brassica oleracea* var. *botrytis*). a-b. Sporangiophore and primary vesicle with aseptate branch with synchronous development of spores on ampulla; c-d. Primary vesicles with scars after ampulla and branchlets are torn away

followed by 10-15% in hyacinth bean (*Lablab purpureus*) from Cherikhedi, Raipur, brinjal (*Solanum melongena*) from Jora, Raipur, chilli (*Capsicum annum*) from Jora, Raipur and 10-20% in tomato (*Solanum lycopersicum*) from Raigarh (Table 1).

**Table 1:** Expanding host range of *Choanephora cucurbitarum*, symptoms, plant parts affected, signs and disease incidence.

S.No.	Location	Host	Symptoms	Signs	Disease incidence
1.	Kharshiya, Raigarh	Black stem Elephant Ear ( <i>Colocasia fontanesii</i> )	Blighting and yellowing of leaves, water-soaked necrotic spots on leaves later coalescing to form a rotten pulpy mass, rotting of spathe and spadix causing dieback	Silvery spine or whiskers like sporangiophore bearing dark spores (superficial sporangia)	25-30 %
2.	Labhandi, Raipur	Cauliflower ( <i>Brassica oleracea</i> var. <i>botrytis</i> )	Water-soaked lesions and rotting of leaves of inner whorl, necrosis, malformed or no curd development	whitish fungal strands later turning grey with tiny black spores on the tips that resembled pincushions	25 to 30%
3.	Cherikhedi, Raipur	Hyacinth Bean ( <i>Lablab purpureus</i> )	wet rot of blossom and pod	entire fruit covered with whitish fungal whiskers like thin strands bearing spores	10-15%
4.	IGKV Farms, Raipur	Okra ( <i>Abelmoschus esculentus</i> )	wet rot of flowers and fruits deformation of fruits and small size of fruits	entire flower covering the fruit covered with fungal whiskers bearing spores	25-30%
5.	Jora, Raipur	Brinjal ( <i>Solanum melongena</i> )	black rot of entire fruits, small fruit size	entire fruit covered with black mass of spores and thin upright fungal strands	10-15%
6.	IGKV Farms, Raipur	Bottle gourd ( <i>Lagenaria siceraria</i> )	wet black rot of flowers and necrosis, wet rot of fruits starting from the region of flower attachment	thin upright whisker-like fungal sporangiophore bearing spores on flowers	20-25%
7.	Jora, Raipur	Chilli ( <i>Capsicum annum</i> )	wet black rot of flowers	flowers covered with sporangiophore bearing spores	10-15%
8.	Raigarh	Tomato ( <i>Solanum lycopersicum</i> )	wet rot of fruits	Fruits covered with fungal whiskers bearing sporangiophore	10-20%

## DISCUSSION

Obtained results confirmed with earlier published standard monographs and literatures (Kucharek *et al.*, 2003; Singh *et*

al., 2011). Sinha (1939) reported that during the rainy season the *Colocasia antiquorum* leaves were found to suffer from pulpy rot which appeared to differ greatly from the blight disease caused by *Phytophthora colocasia*. An examination revealed infected leaves to be *Phytophthora colocasia* associated with *Choanephora cucurbitarum* Thaxter and *C. trispora* Thaxter. Later these two fungi occurred either separately or in combination with *Phytophthora colocasia*. Based on earlier published literatures and to the best of our knowledge this is the first report of *Choanephora cucurbitarum* infection with expanding host range in Chhattisgarh and with the extent of 20-25% disease severity in cauliflower.

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