



Identity of *Colletotrichum* infections in large cardamom (*Amomum subulatum* Roxb.)

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Abstract

The pathogen causing blight and severe devastation of large cardamom in Sikkim and Darjeeling Hills was isolated and identified as *Colletotrichum gloeosporioides* (Penz.) Sacc. {perfect state *Glomerella cingulata* (Stoneman) Spauld. & Schrenk}. We propose the name, *Colletotrichum* blight for the disease.

Keywords: *Amomum subulatum*, blight, *Colletotrichum gloeosporioides*, *Glomerella cingulata*, large cardamom

Leaf blight of large cardamom (*Amomum subulatum* Roxb.) caused by *Colletotrichum* state of *Glomerella cingulata* (Stoneman) Spauld. & Schrenk was first reported from Muzaffarpur, Bihar (Prasad *et al.* 1984). Later, it was described as anthracnose caused by *G. cingulata*, perfect state of *C. gloeosporioides* (Penz.) Sacc. from Sikkim, the traditional area where the crop is cultivated (Srivastava 1989). However, according to them, there was no record of widespread occurrence of the disease. Symptoms of an outbreak of leaf and sheath blight appeared in 1999 and were described by Pun *et al.* (2006) but the causal organism was not identified. A survey in 2006 recorded 44.2%-62.9% incidence of the disease in various districts of Sikkim and Darjeeling Hills (Saju *et al.* 2010). The disease appears generally with the advent of pre-

monsoon showers followed by clear sunny days during March-May and progresses rapidly during the rainy season. Apart from foliar infections (Fig. 1a), the severity of the disease lies in pseudostem lesions which are blackish brown initially and subsequently turn into grey or black patches with brown margins (Fig. 1b & c). In most cases, the lesions on the pseudostem become necrotic and as a result the entire leaves dry out giving a burnt up appearance. Later the pseudostem lodges at the point of necrotic lesion (Fig. 1d & e) and the entire plantation appears dried up (Fig. 1f). The seeds of infected plants do not mature and remain white or light brown instead of black. In this study we report the identity of the disease.

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Fig. 1. Symptoms of *Colletotrichum* blight of large cardamom

(a) Enlarging and coalescing leaf spots; (b) & (c) Lesions and fungal growth on the pseudostem; (d) & (e) Lodging of pseudostems at the point of necrotic lesions; (f) Completely destroyed plants.

The diseased specimens were collected from about 150 plantations in Sikkim and Darjeeling Hills during a survey in 2006 to assess the disease incidence (Saju *et al.* 2010). The pathogen was isolated on PDA. *In-vitro* pathogenicity tests were conducted by inoculating detached leaves with agar plugs of the pathogen. One year old plants of cv. Varlangey grown from suckers in polybags were used for *in-vivo* pathogenicity studies. The pseudostem was inoculated with agar plugs and the infection was monitored.

Repeated isolations from leaf, leaf sheath, rhizome, peduncle and capsules indicated the association of the fungus *C. gloeosporioides*

(Penz.) Sacc. [perfect state *G. cingulata* (Stoneman) Spauld. & Schrenk]. The sexual and asexual stages of the pathogen were not spatially separated in diseased samples as evidenced by their growth in a culture obtained from the same lesion. A great amount of demarcation was observed among different isolates of the pathogen for mycelial growth and spore formation when grown on PDA. The slimy orange asexual spore mass and perithecia were formed in culture luxuriantly. The pathogen infected the detached leaves in *in vitro* and pseudostems in *in vivo* tests and was re-isolated from the infection site. In *in vivo* tests, lesions were observed after 21 days of

inoculation. The pure culture was deposited with National Fungal Culture Collection of India, Agharkar Research Institute, Pune (NFCCI 2762). Voucher specimens of diseased samples and pure cultures were also deposited with the institute's collection (SDH 1/CRCC 582). When lesions on the leaf sheath were examined by light microscopy after staining with safranine and lactophenol-cotton blue, hyphae were found throughout tissues where cells are dead and there was extensive degradation of the host cell walls. The hyphae were present inside the cells, within the cell walls and in the intercellular spaces.

It was observed that the infected bearing and old tillers that are cut and spread around the plant base as part of routine cultural operation after harvest of the crop serves as inoculum for the next season. Socio-economic reasons such as lack of scientific method of cultivation and negligence of plantations aggravate the problem. The disease has totally destroyed the high yielding, most popular but susceptible cv. Varlangey in the region. The disease is also becoming severe on another popular cv. Sawney. We propose that the disease should be further referred to as *Colletotrichum* blight.

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