

Pseudoperonospora cubensis on *Sechium edule* in India

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Abstract. *Sechium edule* is commonly grown for its edible immature fruits, starchy roots, tender shoots and leaves by tribal populations in north-east India. *Sechium edule* is also grown in many South American and Asian countries. Downy mildew symptoms were observed on the leaves of *S. edule*. Based on the morphological characters the pathogen was identified as *Pseudoperonospora cubensis*. This is the first report of this organism causing downy mildew on *S. edule* in Meghalaya, India.

Sechium edule is grown in the hills of Meghalaya, Manipur, Mizoram, Nagaland, Sikkim and West Bengal in India (Rai *et al.* 2002). Edible immature fruits, tender shoots and large starchy roots of *S. edule* are eaten by tribal communities in north-east India. Roots are often used as a substitute for potato (Yadav *et al.* 2005). *Sechium edule* is also grown in Mexico, Brazil, Taiwan, China and Cuba. Fruits are used for preparing pasta, sauces and juice. Medicinal uses, including leaf infusions for dissolving kidney stones, and for treatment of arteriosclerosis and hypertension, have also been documented (Saade 1994).

Downy mildew symptoms were observed on the leaves of *S. edule* during September 2008 in Barapani, Meghalaya (north-east India). Symptoms included yellow spots on the upper leaf surface. Heavy sporulation was observed on the lower surface of the leaves. Later on leaves turned necrotic. Voucher specimens have been deposited in Herbarium Cryptogamiae India Orientalis, New Delhi, India (HCIO No. 48787) and in Institute Herbarium of ICAR Research Complex for NEH Region, Meghalaya, India (ICARHNEH-56).

Fungal structures were harvested by dislodging them from infected tissue onto a strip of clear tape (Correll *et al.* 1987). Sporangiphores emerging from stomata were of 184–(220)–288 × 5–(6.4)–8 µm ($n=50$). Overall branching pattern of sporangiphores was monopodial. Ultimate branchlets measured 5–(7)–12 × 1–(1.9)–3 µm ($n=50$). Brown sporangia (25–(28.1)–33 × 18–(18.8)–20 µm) were ovoid to ellipsoidal in shape with l/b ratio 1.3–(1.6)–1.7 ($n=50$). Prominent hyaline papilla were also present on sporangia. The sporangia were narrowing toward the apical and distal ends (Fig. 1). Haustoria appeared to be clavate-branched. Based on these observations the organism was identified as *Pseudoperonospora cubensis* (Choi *et al.* 2005; Ko *et al.* 2008; Voglmayr *et al.* 2008). Monophyly of the genus *Pseudoperonospora* has also been confirmed through extensive molecular analysis (Riethmüller *et al.* 2002). Pathogenicity was confirmed by spraying a sporangial suspension on healthy twigs of *S. edule*; non-inoculated twigs served as control. Inoculated leaves developed symptoms after 12–16 days whereas control plants remained healthy.



Fig. 1. Sporangiphores and sporangia of *Pseudoperonospora cubensis* on *Sechium edule* (HCIO No. 48787). Bar = 10 µm.

This pathogen has been reported on *S. edule* from Brazil, Cuba, Panama, China and Taiwan (Farr *et al.* 2005; Ko *et al.* 2008). Many species have been reported to be the host of *P. cubensis* viz. species of the genera *Benincasa*, *Lagenaria*, *Luffa*, *Momordica*, *Trichosanthes*, *Cucumis*, *Cucurbita* and *Citrullus* (Crous *et al.* 2004). To our knowledge, this is the first report of *P. cubensis* on *S. edule* from India. Downy mildew is of concern to tribal populations of north-east India since this crop is grown extensively for human and animal consumption.

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Manuscript received 9 January 2009, accepted 7 December 2009