5 March 1988. Revised 3 June 1988

1. Pathak, V. N., *Diseases of fruit crops*, Oxford and IBH Publishing Co., 1980, p. 309.
2. Kent, G. W., *Phytopathology*, 1915, **5**, 266.
3. Ezkiel, W. N., *Phytopathology*, 1930, **20**, 583.
4. Saccardo, P. A., *Syllogeous Fungi*, 1986, **4**, 150.
5. Manjal, R. L., *Indian Phytopathol.*, 1960, **13**, 150.
6. Srivastava, M. P. and Singh, A., *Haryana Agric. Univ. J. Res.*, 1973, **3**, 221.
7. Mahrshi, R.P., *Indian J. Mycol. Plant Pathol.*, 1985, **16**, 199.

ANTHRACNOSE — A NEW DISEASE OF SMALL CARDAMOM

R. SUSEELA BHAI, JOSEPH THOMAS and R. NAIDU

Division of Plant Pathology, Indian Cardamom Research Institute, Kailasanadu 685 553, India.

Small cardamom (*Elettaria cardamomum* Maton) popularly known as the 'Queen of Spices' is an important spice crop cultivated on a large scale in the western ghats of South India. The crop is susceptible to many fungal, bacterial and viral diseases which seriously affect the production[1]. During 1985–86 crop season, incidence of a new disease on cardamom capsules in the form of brown spots was observed. Subsequently, similar symptoms on capsules were noticed in many cardamom plantations in Udumbanchola and Vandiperiyar areas of Idukki District of Kerala and Anamalai areas in Tamil Nadu. The disease was noticed during September to December. In the subsequent cropping season, the disease appeared in increasing proportions ranging between 10 and 28% in Anamalai areas.

Symptoms of the disease, first appeared on fresh capsules as small water soaked spots, later developed into characteristic reddish brown lesions (figure 1). These lesions were round to oval in shape ranging between 1 and 2 mm in diameter and on maturation developed characteristic reddish brown colour with more or less light coloured soft sunken centres. The lesions showed distinct periphery and depressed centres resembling typical anthracnose symptoms. The affected capsules showed 1–6 lesions per capsule. Disease symptoms were clearly visible on cured capsules also.

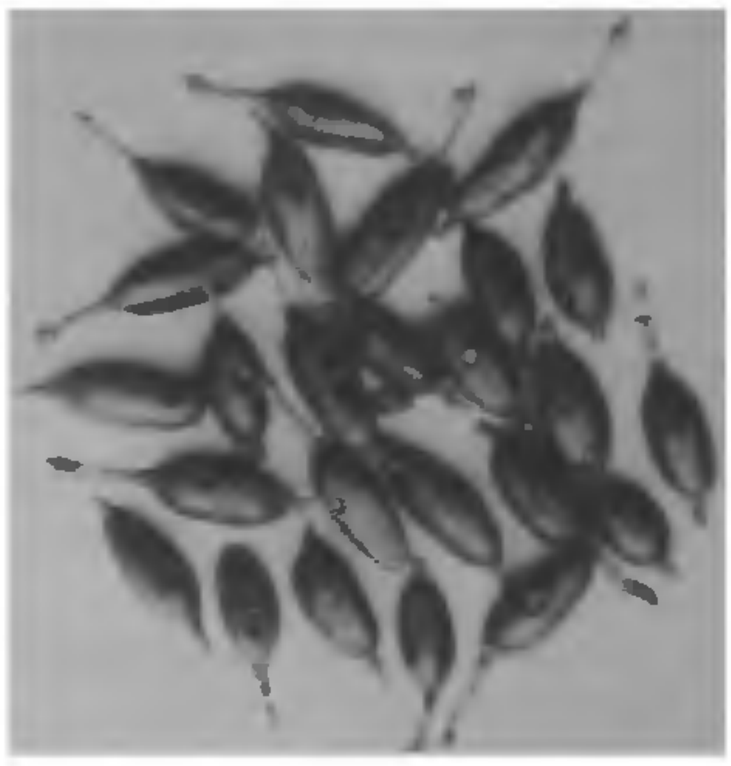

Figure 1. Symptoms of anthracnose on green capsules of cardamom.

The fungus was isolated on potato dextrose agar medium by plating the young lesions under aseptic conditions.

Microscopic and cultural studies revealed the association of the fungus *Colletotrichum gloeosporioides* (Penz.) Penz. & Sacc. with the disease. The fungus produced dark brown coloured setae and abundant cylindrical straight conidia ranging from 12 to 24 μm × 2.4 to 5 μm within one week after plating in the medium. The pathogenicity of the fungus was tested by spraying the conidial suspension from 7-day-old cultures[2] on capsules of live plants in the field and on detached capsules under laboratory conditions. The capsules were surface-sterilized with 1% sodium hypochlorite and thoroughly washed with sterile water just before inoculation. Symptoms typical of anthracnose lesions were observed on the 10th day after inoculation. In detached capsules tested under laboratory conditions symptoms initiated within 7 days after inoculation. The fungus was reisolated from artificially infected capsules. There was no significant differences in disease symptoms when pathogenicity tests were done under *in vitro* and *in vivo* conditions except that in the former the symptoms initiated within a shorter period. The culture has been deposited in the Herbarium of CMI, Kew, England under reference No: I.M.I. 318652.

Colletotrichum sp. has been reported to cause leaf spot in another zingiberaceous crop, turmeric[3] (*Curcuma longa*) and in a wide variety of other crops[4]. The *Xanthomonas* sp. induced blister-like symptoms on cardamom capsules reported earlier[5] seems to be entirely different from the present one. A review of the literature revealed that *C. gloeosporioides* has not earlier been reported as pathogenic in cardamom. Therefore, this report

constitutes a new record of the fungus on small cardamom.

The authors are grateful to the Director, CMI, Kew, England, for identification of the fungus.

8 July 1988

1. Nambiar, M. C., Pillai, G. B. and Nambiar, K. K. N., *Pestic. Ann.*, 1975, p. 122.
2. Susheel Sharma, Agarwala, R. K. and Dohroo, N. B., *Indian Phytopathol.*, 1986, **39,** 128.
3. Ramakrishnan, T. S., *Indian Phytopathol.*, 1954, **7,** 111.
4. Naik, M. K. and Hiremath, P. C., *Curr. Sci.*, 1986, **55,** 625.
5. Agnihothrudu, V., *Cardamom News*, 1974, **6,** 5.

SHOOT TIP CULTURE OF PEPPER FOR MICROPROPAGATION

SADHANA AGRAWAL, N. CHANDRA and S. L. KOTHARI

Department of Botany, University of Rajasthan, Jaipur 302 004, India.

LITERATURE on pepper (*Capsicum*) tissue culture has recently been reviewed[1]. Agrawal and Chandra[2] reported differentiation of multiple shoot buds and plantlets from cultured embryos of *Capsicum annuum* L. var. *mathania*. Regeneration of shoots has been reported from cotyledon[3], hypocotyl[3,4] explants and from protoplast derived callus tissue[5] of *C. annuum*. In a more recent report, regeneration from different organ explants of several genotypes of *C. annuum* has been described[6]. The present report describes the micropropagation of *Capsicum* through shoot tip cultures.

Seeds of *Capsicum annuum* var. *mathania* and an intervarietal hybrid 'Bharat' of *C. annuum* L. were obtained from the Agriculture Research Station, Durgapura and Indo-American Hybrid Seeds, Bangalore respectively. Seeds were soaked in tapwater for 24 h before surface sterilizing with 0.1% $HgCl_2$ solution for about 5 min and washed thoroughly with sterile water. They were germinated in culture tubes fitted with filter paper bridges and containing sterilized tapwater. Shoot tips (3–4 mm long) with 2–4 leaf primordia were excised from 15-day-old seedlings and cultured on MS[7] medium supplemented with kinetin (Kn), 6-benzylamino purine (BAP) alone or in combination with 3-indoleacetic acid (IAA), 3-indolebutyric acid (IBA) or naphthaleneacetic acid (NAA). The pH of the medium was adjusted to 5.8 before autoclaving. The cultures were maintained in diffused continuous light from fluorescent tubes and incandescent bulbs at 26±2°C.

Table 1 shows the morphogenetic responses of shoot tip explants of *C. annuum* var. *mathania* on MS medium supplemented with BAP, Kn, IAA,

Table 1 *Morphogenetic responses of shoot tip explants of Capsicum annuum var. mathania on MS medium with BAP, Kn, IAA, IBA or NAA added singly or in combinations*

	BAP		Kinetin	
	3	5	3	5
MS + mg/l	S**(60)	S***(80)	S*(80)	S**(60)
IAA	1R*(60)	S**(60)	S***(80)	S**(60)	S**(60)
IBA	1R**(60)	S**(60)	S**(60)	S**(80)	S**(60)
NAA	1 S* R**(100)	S* R**(100)	S* R**(100)	S* R**(100)	S* R**(80)
IAA or IBA	3R**(80)	S* R*(80)	S* R*(80)	S* R*(80)	S* R*(80)
IAA or IBA	5R*(100)	S* R*(70)	S* R*(90)	S* R*(80)	S* R*(70)

R, roots; S, shoots/shoot buds; *1–2; **3–6; ***7–12; Figures in parentheses are per cent cultures responded.