

Pod Rot of Cowpea (*Vigna sinensis*) Caused by *Choanephora cucurbitarum*

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In August 2001, pod rot of cowpea caused by *Choanephora cucurbitarum* was found in the experimental fields of the Gyeongsangnam-do Agricultural Research and Extension Services, Korea. Initial symptoms of the disease were the appearance of water-soaked, dark-green lesions and followed by rapid rotting of the infected tissues. As the disease progressed, whitish mycelia and monosporous sporangiophore with monosporous sporangia were produced on the lesions. The fungus produced white to pale yellowish brown mycelia with scattered monosporous sporangiophore and monosporous sporangia containing sporangiospores on potato dextrose agar (PDA). Monosporous sporangiophore was long, slender, and branched at the apex, with each branch bearing a sporangiospore. Sporangium was subglobose in shape and 42.6-112.6 μm in size. Monosporous sporangia were elliptic, fusiform or ovoid, brown in color, and 9.8-23.4 \times 7.2-12.8 μm in size. Sporangiospores were elliptic, fusiform or ovoid in shape, dark brown or brown in color, 12.9-24.6 \times 8.6-15.4 μm in size, and had three or more appendages. Zygospores were black and 43.6-72.4 μm in size. The fungus grew on PDA at 15-40°C, and optimum temperature was 30°C. This is the first report on pod rot of cowpea caused by *C. cucurbitarum* in Korea.

Keywords : *Choanephora cucurbitarum*, cowpea, pod rot, *Vigna sinensis*.

Some fungi belonging to Zygomycetes are known to cause diseases on plants or plant products. *Choanephora* attacks the withering floral parts of many plants after fertilization, and invades fruits causing soft rot primarily of crops such as summer squash or pumpkin, pepper, and okra (Agrios, 1997).

Cowpea (*Vigna sinensis*) has been widely cultivated in tropical, subtropical, and semi arid areas. Recently, its cultivation has been increasing in Korea. It is known to contain rich protein, glucosides, and vitamin B. Mature or immature seeds are used for foodstuff, vegetables or feed stuff

(Jo, 1993). During a disease survey on cowpea fields in the summer of 2001, a severe pod rot was observed in the experimental fields of the Gyeongsangnam-do Agricultural Research and Extension Services, Korea. Infection rate of the diseased pods ranged from 8.4% to 14.3% in two fields surveyed.

Typical initial symptoms on pods were water-soaked, dark-green lesions and rapid rotting of the infected area (Fig. 1A). The pathogen penetrated through wounds and made infection on the plant tissues (Fig. 1B). Usually, the infected pods cannot produce usable seeds. Whitish mycelia and monosporous sporangia were produced on the lesions. Severely infected pods became withered or rotten under high temperature and humid conditions, which are favorable to disease development. Fungal hyphae grew on the surface of pod tissues and covered the lesions with abundant sporangia and sporangiospores. The symptoms were similar to soft rot caused by *Rhizopus* spp. or *Mucor* spp.

A total of 30 isolates of the fungus were collected from diseased pods of cowpea, but no mycological differences were found among the isolates (Table 1). The fungal colonies on PDA were white to pale yellowish brown, and formed abundant monosporous sporangia (Fig. 2A). Sporangia were subglobose in shape and 42.6-112.6 μm in size (Fig. 2D). Monosporous sporangiophore was long, slender and branched at the apex, with each branch bearing a sporangiospore. Monosporous sporangia were elliptic, fusiform or ovoid in shape, pediculate, striate, and 9.8-23.4 \times 7.2-12.8 μm in size (Fig. 2B, C). These formed at the end of the branches of monosporous sporangiophores and monosporous sporangia. Sporangiospores were elliptic, fusiform or ovoid in shape, light brown or dark brown in color, 12.9-24.6 \times 8.6-15.4 μm in size, and had three or more appendages (Fig. 2E). Zygospores were subglobose, hemispherical in shape, black in color, and 43.6-72.4 μm in size (Fig. 2F). The temperature for mycelial growth of the fungus ranged from 15 to 40°C on PDA, and the optimum growth temperature was about 30°C. The fungus grew very rapidly on PDA and the mycelia covered the whole plate within 34 h (Fig. 3). Most of the fungal characteristics examined in

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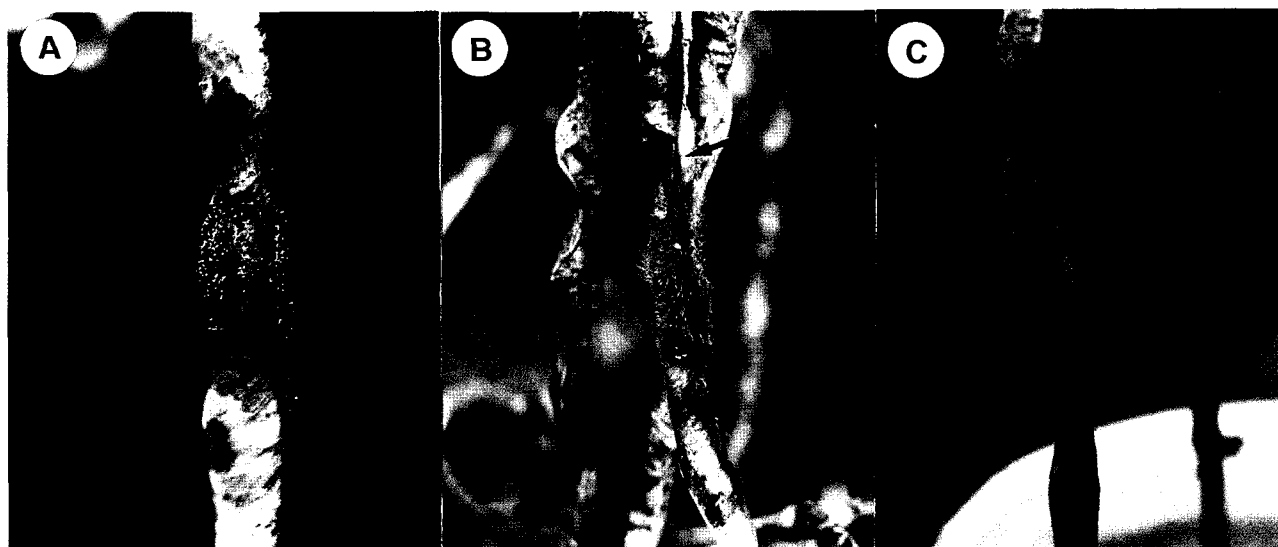


Fig. 1. Symptoms of pod rot of cowpea caused by *Choanephora cucurbitarum*. (A) Symptoms of pod rot with water-soaked lesions and early stage of rot; (B) typical symptoms caused by fungal penetration through wounds (arrow); (C) symptoms induced by artificial inoculation.

Table 1. Comparisons of mycological characteristics between the present isolate and *Choanephora cucurbitarum* described by Udagawa et al. (1978)

	Present isolate	<i>C. cucurbitarum</i> (Udagawa et al.)
Sporangium		
shape	subglobose	subglobose
size	42.6-112.6 μm	50-120 μm
Sporangiospore		
shape	elliptic, fusiform, ovoid with appendages, striate	elliptic, ovoid with appendages, striate
color	light brown to dark brown	light brown
size	12.9-24.6 \times 8.6-15.4 μm	18-24 \times 9-14 μm
Monosporous sporangiolium		
shape	elliptic, fusiform, ovoid, pediculate, striate	elliptic, ovoid, pediculate, striate
size	9.8-23.4 \times 7.2-12.8 μm	15-22 \times 9-12 μm
Zygospor		
shape	subglobose, hemispherical	subglobose, hemispherical
color	black	black
size	43.6-72.4 μm	50-90 μm

this study were almost identical to those of *Choanephora cucurbitarum* (Berkeley and Ravenel) Thaxter previously described (Agrios, 1997; Kobayashi et al., 1992; Farr et al., 1995; Udagawa et al., 1980). Accordingly, the causal fungus of cowpea pod rot was identified as *C. cucurbitarum*.

To test pathogenicity of the fungus, monosporous sporangia suspension was prepared from culture media, and the spore concentration was adjusted to $3 \times 10^5/\text{ml}$ using a hemacytometer. The inoculation was made by spraying 50 ml of spore suspension per plant grown in 1/5000 a Wagner pots. The cowpea plants were cultivated

in sterilized soil for 76 days to bear pods. Then, the inoculated plants were placed in a humid chamber with 100% relative humidity at 30°C for 24 h and kept in the greenhouse until disease observation. Typical symptoms on pod rot of cowpea appeared at 4 days after inoculation. The symptoms that developed on the inoculated cowpea plants were similar to those observed in the fields (Fig. 1C).

The fungus was re-isolated from inoculated cowpea plants. Although the *Choanephora* pod rot on cowpea has been reported in other countries (Farr et al., 1995), this disease has not been reported in Korea yet (The Korea Society of Plant Pathology, 1998).

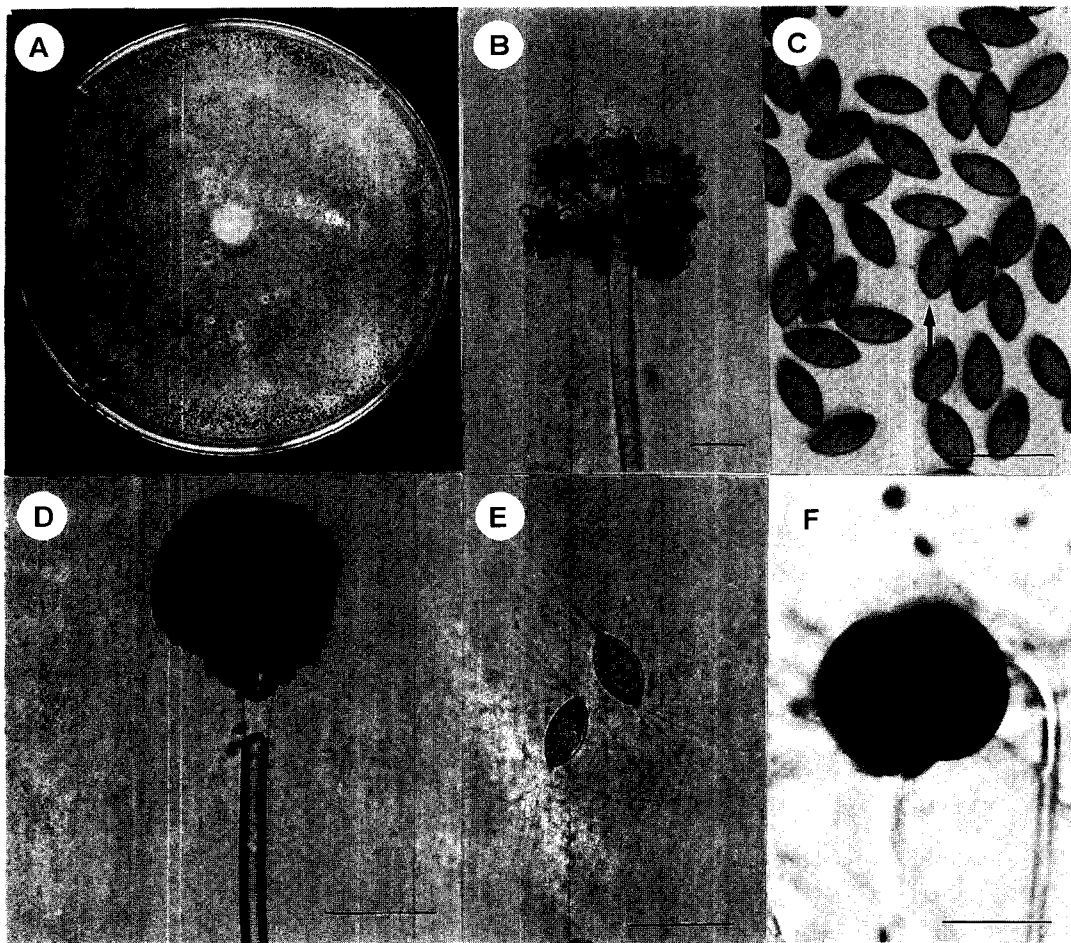


Fig. 2. Mycological characteristics of *Choanephora cucurbitarum*, the causal organism of pod rot of cowpea. (A) Mycelial growth on potato dextrose agar; (B) monosporous sporangiophore and monosporous sporangia; (C) monosporous sporangia with pediculate (arrow); (D) sporangium and sporangiophore; (E) sporangiospores with appendages; (F) zygospore (scale bars: 20 μ m).

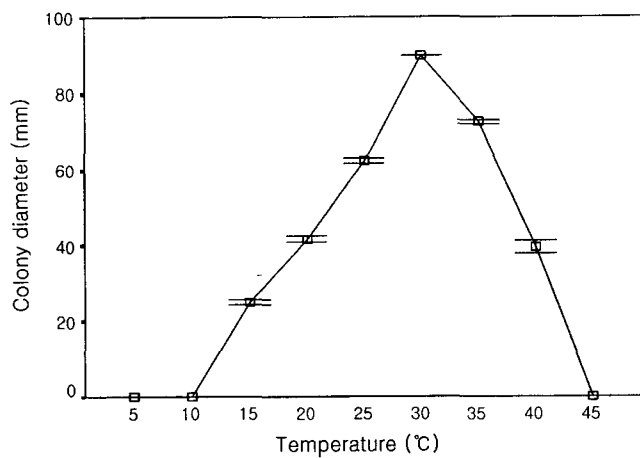


Fig. 3. Effect of temperature on mycelial growth of *Choanephora cucurbitarum*, the causal organism of pod rot of cowpea. Linear mycelial growth was measured 34 h after incubation on potato dextrose agar. Data are means of three replications. Bars represent standard deviations.

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