

Some Undescribed *Cladosporium*, *Alternaria*, *Curvularia* and *Eurotium repens* in Korea

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한국산 미기록 *Cladosporium*, *Alternaria*, *Curvularia*와 *Eurotium repens*에 관한 연구

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Abstract: The following ten species collected from the air of Seoul City and the soils in Korea are reported as undescribed to Korean fungal flora: *Cladosporium sphaerospermum*, *C. herbarum*, *C. colocasiae*, *Alternaria chlamydospora*, *A. cheiranthi*, *A. citri*, *Curvularia ovoidea*, *C. inaequalis*, *C. affinis*, and *Eurotium repens*.

Keywords: *Cladosporium*, *Alternaria*, *Curvularia*, *Eurotium*, Atmospheric mycoflora, Fungal identification.

Min *et al.* recorded *Hyphomycetes* from Korean soils (1980), island soils (1981), and paddy field soils (1981, 1982). Among many species of them, Kim *et al.* (1971) and Lee *et al.* (1976) reported only the genus *Aspergillus* from other materials. The fungal flora of Korea, however, have not completely been described. The author subjected many unreported *Hyphomycetes* in Korea and also surveyed of the fungal spores in the air of Seoul, Korea (1985). The main components of the atmospheric mycoflora in Seoul were *Penicillium*, *Aspergillus*, *Cladosporium*, *Alternaria*. Some isolates of them, and other isolates collected from other soil samples are described in this paper.

Cladosporium sphaerospermum Penzig

Penzig, *Michelia*, 2;473(1882); Ellis, *Dematiaceous Hyphomycetes*, p.315(1971); Udagawa *et al.*, *Kinruizukan*, vol. 2, p.861(1977).

Colonies on Czapeck agar growing well, velvety or very small granules on colony surface, abundant sporulation with the age, grayish brown with pale green color or dark brown, abundant exudate with colorless or pale beige color; reverse greenish black or black.

Colonies on malt extract agar growing rapidly, at first lanose but becoming to velvety surface with many small granules, abundant sporulation at the age, grayish brown or dark brown or dull brown; reverse almost real black.

Colonies on potato sucrose agar growing rapidly, at first grayish brown but becoming to dark brown or grayish brown, lanose with the composition of very small granules at central areas, more or less raised, dense mycelial felt, some exudate with pale beige color; reverse pale greenish black or brownish black.

Conidiophores macronematous and micronematous, emerged from submerged or aerial myc-

elia, generally 50~150 μ long, 2.5 μ thick, pale dark olivaceous brown, smooth or verruculose. Conidia budding, mostly globose to subglobose, 3~5 μ diameter, dark olivaceous brown, verrucose the warts clearly visible. Ramo-conidia 0~3 μ septate, up to 30 μ long, 3~5 μ thick, smooth or verruculose, olivaceous brown colored.

Habitat: Isolated from the air of Koorodong, Yungdeungpoku. April 15, 1980, SA-A2-1-1, K.S.Chun and soil of Buchun, Kyunggido, April 1, 1980, B-70-2-4, K.H.Min.

Note: Very common species from air, soil, foodstuffs, plants and animals.

***Cladosporium herbarum* Link ex S.F. Gray**

Link ex S.F.Gray, *Nat. Arr. Br.* Pl. 556 (1821); Hughes, *Can. J. Bot.*, 36: 750 (1958); Ellis, *Dematiaceous Hyphomycetes*, p. 313 (1971); Udagawa *et al.*, *Kinruizukan*. vol. 2. p. 860 (1977)

Syn. *Dematium epiphyllum* Pers. (1801); *D. herbarum* Pers. (1801); *Cladosporium epiphyllum* Pers. ex Fr. (1829); *C. graminum* Pers. ex Corda (1837); *C. fagi* Oudem (1902); *C. multigeniculatum* Yamamoto (1959).

Colonies on Czapeck agar growing moderately, lanose or like *Mucor* on the basis of short conidiophore or mycelium length, at first whitish gray but becoming gray colored with conidial structures, more or less wrinkled or raised, abundant exudate, with uncolored or pale beige; reverse black or brownish black.

Colonies on malt extract agar growing rapidly, abundant mycelial structures like *Mucor* or *Acremonium* but lanose surface, central area wrinkled irregularly, pale brown or pale grayish brown or pale gray colored at the sporulation areas; reverse black or pale brownish black.

Colonies on potato sucrose agar growing rapidly, abundant mycelial structures like lanose

surface, wrinkled or raised on the surface irregularly, grayish brown or whitish gray at the abundant sporulation areas; reverse usually black or brownish black.

Conidiophores generally macronematous, straight or flexuous, pale to olivaceous brown, smooth, up to 25~225 \times 3~6 μ , terminal and intercalary vesicular swellings. Conidia budding, vesicle 18~85 μ , branched with conidial chains, ellipsoidal or oblong rounded at the ends, pale to brown, or olivaceous brown, thickened walled and verruculose with warts, 0~3 septated, single cell 4.5~23 \times 3~8 μ , two cell conidia 5~15 \times 4~7 μ ,

Habitat: Isolated from the air of Dongsungdong, Chonoku, Seoul, April 15, 1980, SP-A-A-19-1-1, K.H.Min.

Note: A very common species, specially abundant on plants, air & soil.

***Cladosporium colocasiae* Sawada**

Sawada, *Rep. Nat. Hist. Ass. Formosa*, No. 25 (1916); Ellis, *Dematiaceous Hyphomycetes*, p. 312 (1971); Matsushima, *Icones Microfungorum A Mateushima Lectorum*, p. 34 (1975).

Colonies on Czapeck agar growing restrictly, velvety surface, generally greenish grayish brown, but central area grayish brown, but marginal area pale gray color, dense or thick mycelial structures, central area somewhat raised; reverse black, but marginal area greenish black.

Colonies on malt extract agar growing rapidly, well wrinkled surface irregularly, velvety containing the very small granules, abundant sporulation with the age, dull greenish gray; reverse black but marginal areas greenish brown.

Colonies on potato sucrose agar growing well, velvety or very small granular surface, wrinkled irregularly, dull greenish gray with the abundant sporulation, central area wrinkled irregularly; reverse black but marginal areas brownish green.

Conidiophores macronematous, erect, straight or flexuous, pale to brown, smooth, $4\sim 6\ \mu$ thick, $170\ \mu$ long, intercalary vesicular swellings $8\sim 10\ \mu$. Conidia from terminal, cylindrical or oblong rounded at the ends, or ellipsoidal, pale to brown colored, smooth-walled, $1\sim 3$ septate, $12\sim 30\times 6\sim 8\ \mu$.

Habitat: Isolated from the soil of Kwa-chun, Kyunggido, April 18, 1980, MD 2509, K.H.Min.

Note: This species causes irregular spots on plant leaves, but it is common in air and soils.

Alternaria cheiranthi Bolle

Bolle, Meded. Phytopath. Lab. Willie Commelin Scholten, 7 : 55(1924); Ellis, Dematiaceous Hyphomycetes, p. 472(1971).

Syn. *Helminthosporium cheiranthi* Lib. (1827); *Macrosporium chieranthi* Fr. (1832).

Colonies on Czapeck agar growing well, lanose or floccose but like *Mucor*, abundant mycelial structures, pale gray or whitish gray color on the sporulation with the age, but marginal areas dense thin mycelial felt becoming dark brown or brownish black.

Colonies on malt extract agar growing well, very abundant mycelial structures, lanose or floccose surface, pale beige or pale gray but at marginal areas gray or grayish brown to black; reverse brownish gray or grayish black.

Colonies on potato sucrose agar growing rapidly, abundant mycelial felt like *Mucor* turf, lanose or floccose, on the sporulation areas pale gray or gray or somewhat grayish brown, but marginal areas black or grayish black; reverse brownish gray or gray to black.

Conidiophores arising straight or flexuous. septate, olivaceous brown or pale brown, smooth-walled, $120\ \mu$ long, $4\sim 7\ \mu$ thick with several scars. Conidia usually solitary, sometimes in

chains of 2 or 3, various shapes, pyriform, ovoid or elongated, pale to yellowish brown, usually rounded at the end, numerous transverse and longitudinal septa, $20\sim 85\ \mu\times 10\sim 30\ \mu$.

Habitat: Isolated from soil of Osan, Kyunggido, April 5, 1980, OLP6, K.H.Min.

Note: Recorded from plants, specially *Cruciferae*. On the leaves it forms yellowish to black powdery growth.

Alternaria chlamydospora Mouchacca

Mouchacca, Mycopath. Mycol. Appl. 50 : 217 (1973); Ellis, More Dematiaceous Hyphomycetes, p. 141(1976).

Colonies on Czapeck agar growing moderately, velvety or lanose surface with very small granules, black or brownish black colonies with the sporulation, black mycelial structures; reverse brownish black or black, dull pinkish brownian pigments diffusing into the agar.

Colonies on malt extract agar growing rapidly, lanose or funiculose, black or brownish black, abundant mycelial felt at marginal area diffusible mycelial structures; reverse black or brownish black.

Colonies on potato sucrose agar growing rapidly, lanose or funiculose surface, black or brownish black with the abundant sporulation diffusible mycelial structures on agar media, abundant mycelial felt; reverse brownish black or grayish black.

Conidiophores up to $145\ \mu$ long, $3\sim 5.5\ \mu$ thick, pale brown. Chlamydospores many septated, variable in size and shape, pale brown. Conidia at first obpyriform, becoming variable size, brown, smooth or verruculose, $15\sim 50\ \mu\times 5\sim 42\ \mu$, beak $2\sim 5.5\ \mu$ thick.

Habitat: Soil of Kwachun, Kyunggido, April 18, 1980, M-G-2, K.H.Min.

Note: This fungus is uncommon species from desert soil in Egypt and Iraq.

***Alternaria citri* Ellis & Pierce apud
Pierce**

Ellis & Pierce apud Pierce, *Bot. Gaz.*, 33:234 (1902); Ellis, Dematiaceous Hyphomycetes, p. 466 (1971).

Colonies on Czapeck agar growing well, lanose or floccose at central areas whitish *Mucor* like turf, but marginal areas grayish black or brownish black with thin mycelial structures, more or less exudate formation, with uncolored; reverse brownish or grayish black.

Colonies on malt extract agar growing well, lanose or floccose surface, sometimes flocculent, abundant sporulation with the dark brown or dull brown colors; reverse dull brown or dark brown.

Colonies on potato sucrose agar growing rapidly, lanose or floccose colonies at central areas white mycelial structures but almost marginal areas grayish black or dark gray with the abundant sporulation of the age, abundant mycelial structures; reverse brownish or grayish black.

Conidiophores simple or branched, straight or flexuous, septate, pale to brown or olivaceous brown, $300\ \mu \times 3\sim 6\ \mu$ in length, with a terminal scar. Conidia solitary, simple or branched chains, sometimes curved, various in shape, commonly oval, pale to dark brown, smooth to verruculose, 8 transverse, $8\sim 40\ \mu$ in beak shape, $6\sim 2\ \mu$ in broader part, beaks mostly $8\ \mu$ or less long, $2.5\sim 5\ \mu$ thick, colorless or pale brown.

Habitat: Isolated from the air of residential house, Dongsungdong, Chongnoku, Seoul, April 15, 1980. SP-A-19-2-5, and Huamdong, Yongsanku, Seoul, April 5, 1980. SP-A-5-1-4, K.H. Min.

Note: Recorded from China, Japan, Burma, India, Iran. This fungus damages fruits and leaves of *Citrus* spp. with black rot of orange.

***Curvularia affinis* Boedijn**

Boedijn, *Bull. Jard. Bot. Buitenz.* III, 13(1): 130 (1933); Ellis, *Mycol. Papers*, No. 106:41 (1966); Ellis, Dematiaceous Hyphomycetes, p. 453 (1971).

Colonies on Czapeck agar growing well, colonies effused, lanose or floccose to hairy, mostly weak turf formation at central portion with grayish or pale brownish gray, but thick dense mycelial felt with the sporulation of dark gray or grayish black; reverse dark brown to black.

Colonies on malt extract agar growing rapidly, floccose or flocculent, very coarse mycelial felts, dark brown or brownish black with the sporulation of age, abundant exudate uncolored; reverse brown or brownish black.

Colonies on potato sucrose agar growing rapidly, floccose or flocculent, very coarse mycelial structures, very dark gray or grayish black with the abundant sporulation, abundant exudate uncolored; reverse brownish black to black on the center of colonies, but with far distance agar medium pale beige or very pale orange.

Conidiophores arising on the hyphae singly or loosely branched on stromata, straight or flexuous, sometimes geniculate, septate, brown, smooth-walled, various length, often swollen at the base. Mycelium branched, septate, pale brown to brown colored, smooth walled, $2\sim 8\ \mu$ thick hypahae. Conidia straight or curved, broadly fusiform to ellipsoidal, almost 4-septate, sometimes 5-septate, intermediate cells brown, $23\sim 43\ \mu$ long, $7.6\sim 12.8\ \mu$ thick in the broadest part.

Habitat: Isolated from the air of human habitat. Yunnamdong, Mapoku, Seoul, March 27, 1980, SP-A-11-1-14, K. S.Chun.

Note: This isolate agrees well with the original description in various characteristics. However, conidia are typically

septate without 5-septate. This fungus was isolated from soils of Congo, Java, Malaysia, Parkistan and Venezuela.

***Curvularia inaequalis* Boedijn**

Ellis, *Mycol. Pap.* 106:38 (1966); Ellis, Dematiaceous Hyphomycetes, p.456(1971).

Colonies on Czapeck agar growing well, abundant mycelial structures, lanose or floccose but *Mucor* like mycelium at the center area, dark gray to black with the abundant sporulation, somewhat thick mycelial structures, abundant exudate uncolored; reverse submerged mycelium black to very dark gray.

Colonies on malt extract agar growing well, velvety surface showing granular surface abundant mycelial structures, grayish black or brownish black to black with the sporulation, very abundant exudate uncolored; reverse grayish black or brownish black with the pigmented pale pinkish beige.

Colonies on potato sucrose agar growing rapidly, thin velvety or granular surface, central area lanose mycelial structures, thin or strong mycelil felt, gray black to carbon black; reverse brownish black to black with pale pinkish pigmented agar.

Conidiophores macronematous or mononematous, straight or flexuous, usually smooth-walled, brown. Conidia solitary, simple, with hilum smooth-walled, 4 septate, averaging $30 \times 15 \mu$.

Habitat: Isolated from the air of Shinchon, Seoul, March 27, 1980, F-A-9-2-8, K.S.Chun.

Note: Common species from *Hordeum*, *Pisum*, *Triticum*, and soils in Canada, Australia, Papua.

***Curvularia ovoidea* (Hiroe & Watan.) Muntanola**

Ellis, *Mycol. Pap.* 106:2~43(1966); Ellis,

Dematiaceous Hyphomycetes, p.456(1971).

Colonies on Czapeck agar growing rapidly, lanose or floccose, whitish gray turf formation but at marginal areas thin mycelial structures with graysh black or brownish black colors; reverse dark brown or dark gray.

Colonies on malt extract agar growing well, lanose or floccose, central areas pale gray or pale brown turf but at marginal areas dense or rich mycelial felt with dark brown or dark gray; reverse brownish black or grayish black.

Colonies on potato sucrose agar growing well, lanose or floccose, central areas pale gray of pale gray of pale grayish green with weak mycelial turf, but marginal areas dense or thick mycelial felt with dark gray or brownish black, more or less exudate uncolored; reverse brownish dark gray or grayish black.

Conidiophores macronematous, mononematous, straight or flexuous, brownish, smooth-walled. Conidia with hilum scarcely, smooth-walled mainly 3 septate, middle septum not median, dark brown, curved, asymmetrical shaped, $18 \sim 23 \times 12 \sim 14 \mu$.

Habitat: Isolated from the air of Yunnamdong, Mapoku, Seoul, March 27, 1980, SP-A-11-1-7, K.S.Chun.

Note: Common species on *Capsicum* plant. Isolated from India and Japan. It was isolated from Korea for the first time in this paper.

***Eurotium repens* de Bary**

Rape and Fennell, The genus *Aspergillus*, p.152 (1965)

Syn. *Aspergillus glaucus* var. *repens* Corda (1842); *Eurotium barbariorum* Fuck(1870); *Aspergillus repens* Sacc. (1886); *Aspergillus scheelei* Bain. et Sartory (1912); *Aspergillus* var. *scheelei* Bain. et Sartory (1912)

St. anam: *Aspergillus repens* (Corda) de Bary.

Colonies on Czapeck agar growing restrictly, one week colony diameter 2 cm, velvety or lanose surface, thin mycelial structure, conidial areas yellowish green or dull green at the maturation; reverse at first greenish yellow to dark green.

Colonies on malt extract agar growing restrictly, one week 1.5 μ diameter, lanose or hairy surface, thin mycelial felt, conidial areas dull green with the maturation; reverse pale green to dull green.

Colonies on potato sucrose agar growing well, typically lanose pale green or yellowish green at the conidial areas, more thick mycelial structure; reverse brownish yellow or dark brown.

Conidial heads abundant, loosely columnar, 125~200 μm in length; conidiophores smooth, mostly colorless, 500 to 100 μ in length; vesicular about 25 to 40 μ in diameter; sterigmata in one series 7~10 μ by 3~4 μ; conidia ovoid to subglobose or globose, spinulose, 4.5~7×5.0~6.5 μ in size.

Cleistothecia usually abundant, loosely networked, yellow to orange, spherical to subglobose, mostly 75 to 100 μ; asci 10 to 12 μ 8 ascospores; ascospores leticular, mostly 4.8 to 5.6 μ by 4.0 to 4.5 μ, smooth-walled, with equatorial area rounded or flattened, furrow without crests or ridges.

Habitat: Soil of Sung-nam, Kyunggido, April 30, 1980, SP-S-1-10, K.H.Min.

Note: This fungus is common in foods, air and soils in the world.

적 요

한국의 토양과 서울 시내의 공기로부터 진균류를 분리하였으며 그 중에서 다음 10군을 미기록 종으로 보고한다: *Cladosporium sphaerospermum*, *C. herbarum*, *C. colocasiae*, *Alternaria chlamyospora*, *A. cheiranthi*, *A. citri*, *Curvularia ovoidea*, *C. inaequalis*,

C. affinis, and *Eurotium repens*.

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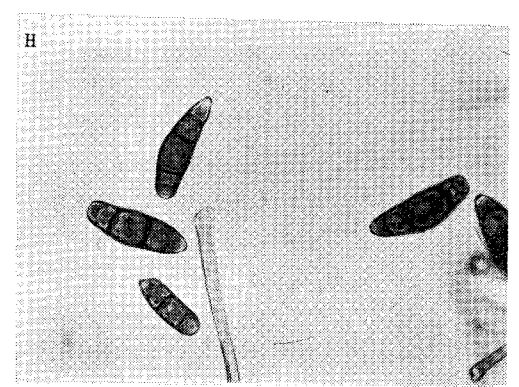
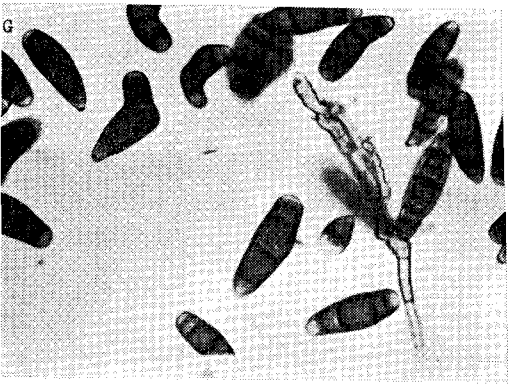
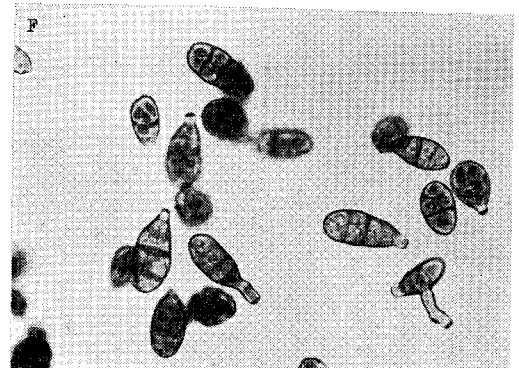
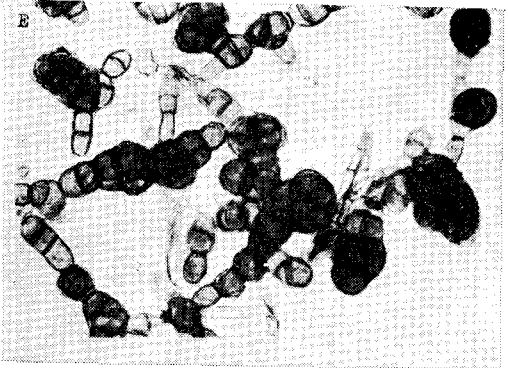
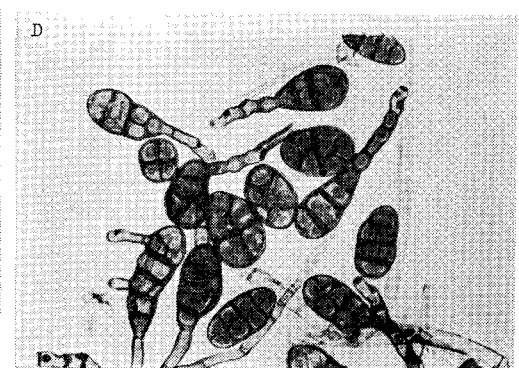
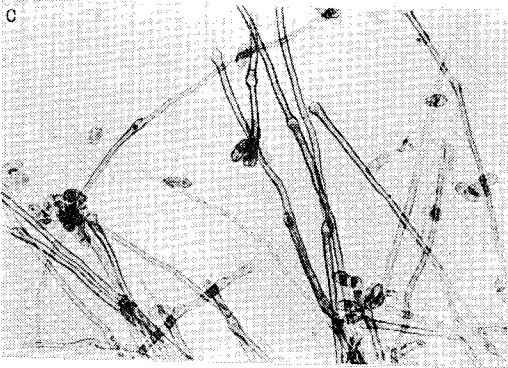
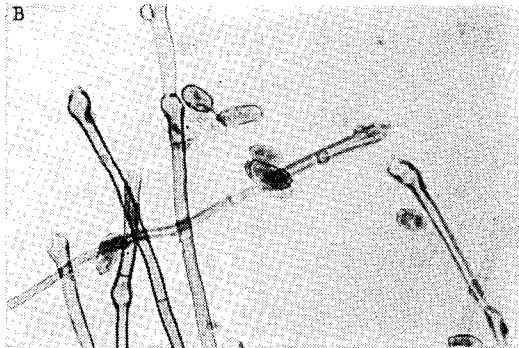
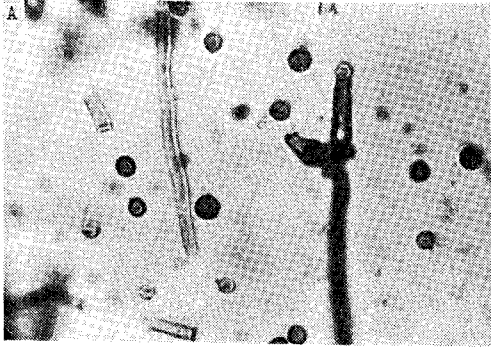
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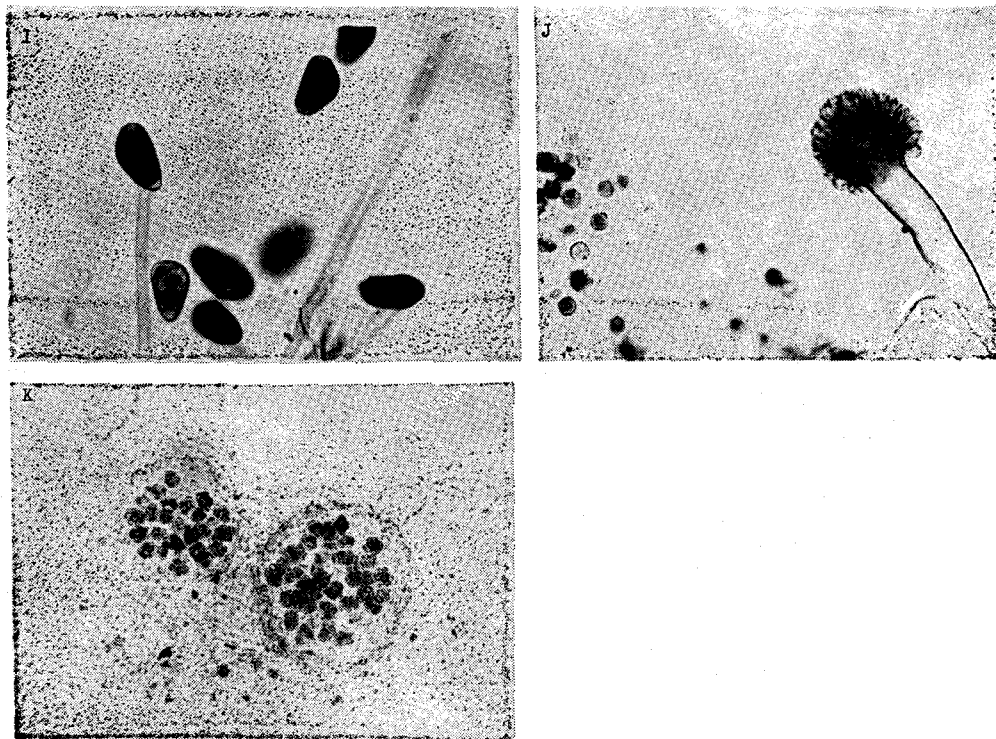


Plate 1 A: *Cladosporium sphaerospermum*
 B: *C. herbarum* (ca×600)
 C: *C. colocasiae* (ca×400)
 D: *Alternaria cheiranthi* (ca×600)
 E: *A. chlamydospora*
 F: *A. citri*

G: *Curvularia affinis*
 H: *C. inaequalis*
 I: *C. ovoidea* (ca×600)
 J: *Eurotium repens*, conidial state (×600)
 K: *E. repens*, ascocarp (×400)

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<Received July 29, 1985;

Accepted August 27, 1985>