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Review: Responses of *Phycomyces* to environmental signals. How and why do *Phycomyces* sporangiophores bend in response to light?

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Phycomyces is a unicellular fungus with numerous responses to blue light, including phototropism by the giant sporangiophores. The sporangiophores show a pronounced positive phototropism when illuminated with unilateral blue light. The orientation of the phototropism, positive or negative, is determined by the ratio of the maximal light fluence rate on the proximal side to that on the distal side of the sporangiophore cell. Based on this hypothesis we found that the maximal bending angle was larger in thin sporangiophores than in thick ones, and larger in the sporangiophores with lower contents of cell components such as β–carotene than in those with higher contents. Several parameters influence the determination of the phototropic orientation and the maximal bending angles. To elucidate the photoreceptor and signal transduction systems, genetic and physiological analyses have been carried out using many mutants with abnormal phototropism. Possible photo perception and transduction systems of light signals were discussed.

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Review: A taxonomic and ecological study of the genus *Fusarium*

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Based on joint studies with the BBA, Germany and the NRRL, U.S.A., species of *Fusarium* were investigated taxonomically and ecologically based mainly on Japanese isolates from graminaceous substrata (hosts) such as rice and wheat. Among ca. 500 strains, 36 species and six varieties of *Fusarium*, including 2 species and a variety transferred recently to other genera, were classified from Japan. Four new species and seven new records of species from Japan were also found. During the study, 2 new species, *F. nisikadoi* and *F. kyushuense*, were formally described, and *F. globosum* was reported as a new record from Japan. Macro- and microconidia have been traditionally recognized as important taxonomic characters of *Fusarium*. *Fusarium nisikadoi* formed long chains of conidia, which were variable in shape, and their clavate conidia were up to 7-septate. A conidial chain consisting of septate conidia was described as a new morphological character of the genus, and the conidia were not categorized well as either macro–, micro– or mesoconidia as defined previously. Four trichothecene-producing strains originally isolated from diseased wheat and a vinyl plate in Japan was described as *F. kyushuense*, which produced aerial conidia mostly holoblastically. Japanese strains of *F. globosum* show different reactions in conidiogenesis to light conditions. Under BLB light, falcate sporodochial conidia were typically induced, but aerial globose conidia were suppressed, Their clavate conidia were longer under BLB. Application of both complete darkness and continuous BLB light is recommended as standard light conditions to identify *Fusarium* species. Environments surrounding the cultivated host plants may affect distribution of *Fusarium* species. Occurrence of *Fusarium* species on wheat spikelets and similar structures was studied. With the geographic shift from northern to southern Japan, the species of *Fusarium* frequently found on the wheat spikelets gradually shifted from *F. avenaceum*, to *F. sporotrichioides, F. graminearum*, and *F. incarnatum*. Each species of *Fusarium* may be adapted to a specific environmental condition, even on the same plant host.

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Note: Two powdery mildew fungi on the memorial trees planted in the garden of reception hall "Geihinkan," Tokyo

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Powdery mildew fungi were found on two memorial trees, viz. small-leaved European linden (*Tilia cordata*, fam. Tiliaceae) and English oak (*Quercus robur*, fam. Fagaceae), which have been planted in the garden of Geihinkan, Tokyo.

The fungus on *T. cordata* was identified to be *Uncinula oleosa* var. *zhengii*, and another one on *Q. robur* was *Microsphaera alphitoides* var. *alphitoides* respectively.

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Short Communication: *Mutinus elegans* (Gasteromycetes, Phallaceae) new to Japan

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A gasteromycete species, *Mutinus elegans* is recorded from Japan for the first time. It has been found in Takatsuki-shi, Osaka-fu (western Japan), fruiting in November and December in helio-thermophilous habitats

(on the ground along paths or in open space), under or near bamboo (*Phyllostachys bambusoides*) and hardwoods (*Quercus acutissima, Zelkova serrata, Cinnamomum camphora*, etc.). A Japanese description and illustrations based on the studied material are presented.

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Short Communication: Morphological characteristics of Chinese black truffle in Yunnan province

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The morphological characteristics of black truffles harvested in Yunnan, China, were investigated. Ascocarps were collected in pure pine forests composed of mainly *Pinus armandi* mixed with *P. yunnanensis*. The forest soil was very poor, calcareous and purple, and its pH was 6.5–7.4. The fungus formed dichotomous ectomycorrhizas with fine roots of *P. armandii*. Ascocarps were 2–8 (–10) cm in diam, and the peridium bore irregular polygonal, flattened warts with poorly defined radial splits. Ascospores were (20)–25–35–(40) × (14)–18–25–(32) μm (excluding spines). Spines were 4–6(–7) μm long, broad at the base, and often slightly hooked at the apex. Ascospores showed partial reticulation (pseudo-reticulum) by anastomosis of broad bases in a few spines. Yunnanese black truffles differ from *T. himalayense, T. pseudohimalayense*, and the Japanese black truffle, *T. indicum*, in morphology of the peridium and ascospore.

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Review: Taxonomic studies on graminicolous *Helminthosporium* species

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Taxonomic criteria in so-called graminicolous *Helminthosporium*, namely, *Drechslera, Exserohilum* and *Bipolaris*, are discussed. Culture conditions and the formation of the teleomorph of rice brown-spot fungus *Bipolaris oryzae, Cochliobolus miyabeanus*, were confirmed. Ascocarps were produced on Sachs-agar medium with a piece of sterilized rice-straw. The fungus is self-sterile and hermaphroditic and has a two-mating-type system with sexual differentiation in sexual reproduction. Maternal characteristic is essential for the ascocarp production, and this was easily lost during subculture. Distribution of the two mating types of the fungus in the field was confirmed both from Japan and American samples. Identity of *Helminthosporium* leaf-spot fungi attacking Oryzoideae plants was proved. In order to recognize variability of conidium morphology in species of *Bipolaris* and *Curvularia*, the concept of reproductive isolation is useful and some examples were introduced. *Pseudocochliobolus*, the teleomorph of some members of *Bipolaris* with straight, small conidia, and *Curvularia*, are closely related but different from *Cochliobolus*, the teleomorph of *Bipolaris* species with medium to large sized conidia. The difference between these two groups was discussed. *Cochliobolus* was not monophyletic and should be reevaluated. In this case, it is important to elucidate the nature of conidial septum structure in both members.

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Review: Systematics and species diversity of yeasts

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Isolation studies of ballistosporous yeasts were carried out in the Asia–Pacific region, and the following new species were found in the phyllosphere of the Main Island of Japan, the Ogasawara Islands in the Pacific Ocean, Thailand, New Zealand, and Yunnan Province of China: *Bensingtonia ingoldii, B. intermedia, B. miscanthi, B. naganoensis, B. musae, B. sakaguchii, B. subrosea, B. thailandica, B. yamatoana; Bullera boninensis, B. coprosmaensis, B. hannae, B. huiaensis, B. miyagiana, B. mrakii, B. oryzae, B. penniseticola, B. pseudoalba, B. shimicola, B. unica, B. variabilis, B. waltii; Kockovaella imperatae, K. machilophila, K. phaffii, K. sacchari, K. schimae, K. thailandica; Sporobolomyces blumeae, S. coprosmae, S. caprosmicola, S. dimmenae, S. draycophyllus, S. falcatus, S. griseoflavus, S. inositophilus, S. lactophilus, S. linderae, S. novazealandicus, S. nylandii, S. oryzicola, S. poonsookiae, S. ruber, S. sasicola, S. subbrunneus, S. taupoensis, S. vermiculatus, S. xanthus, S. yunnanensis; Udeniomyces megalosporus*. Yeast species containing Q-10 (H_2), a monohydrated ubiquinone, have long been considered to be rare. However, these yeasts were proved to be common in the tropical and subtropical phyllosphere of Asia.

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Review: Responses of *Pilobolus* to environmental signals

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Pilobolus, characterized by formation of swollen subsporangial vesicles and projection of sporangia into the air when sporangiophores mature, is one of the most useful model organisms in considering the "signal perception–stimulus transduction–response" system in fungi. In *Pilobolus*, as in the closely related fungus *Phycomyces*, light effectively controls sporangiophore initiation and growth, sporangium development, and determination of phototropic direction. *Pilobolus* also responds to gravitative and centrifugal stimulation by bending in the

negative direction. These responses, however, depend on the species of *Pilobolus* and the developmental stage of the sporangiophores. Comparative analyses of these responses among different species of *Pilobolus* and between *Pilobolus* and *Phycomyces* are effective to elucidate the mechanisms of sensory physiology of fungi.

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Short Communication: Reappraisal of heat treatment method for the isolation of ascomycetes from soil

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The heat treatment method for isolating heat–activated ascomycetes from soil was reappraised. Using a specific soil sample, the effects of dilution rate, temperature, and treatment period were examined experimentally. The best result was obtained by diluting the soil in 0.12% agar solution preheated to the treatment temperature, and by treating at 65°C or 70°C for 15 or 30 min. The appropriate dilution rate should be decided by a preliminary experiment in each case.

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Original paper: On the physiological factors affecting mycelial growth of *Phellinus linteus* in liquid culture

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Phellinus linteus has been reported to show a potent anti–tumor activity. In order to obtain mycelium in large quantity, the physiological factors affecting mycelial growth of *P. linteus* in liquid culture were examined. Mycelial growth was observed in the temperature range of 10–35°C and significant growth was observed at 25–32.5°C. The dependency of growth on the initial pH was examined at 25°C. *Phellinus linteus* grew in the pH range from 3.0 to 7.0 with the optimum at pH 5.5. The effect of carbon source on the growth was examined with twelve carbohydrates including pentoses and hexoses. The hexoses were much more effective than the pentose for the mycelial growth and glucose showed the most effective growth in hexoses. Of the nitrogen sources tested, inorganic nitrogen sources did not support the growth of *P. linteus* mycelia, while individual or combined use of organic nitrogen sources such as yeast extract and polypeptone showed significant growth. In the case of aerated culture, the lag–phase was 7 days, but the total amount of mycelia obtained was greater than that in the non–aerated culture. Increase in glucose content to 4% shortened the lag–phase, and mycelial yield reached 7.8g/L as dry weight.

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Short Communication: Taxonomic position of the fungus producing the anthelmintic PF1022 based on the 18S rRNA gene base sequence

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A fungal strain PF1022 produces a new cyclic depsipeptide, PF1022, which shows potent anthelmintic activity against animal parasites both in vitro and in vivo systems. It grows as a sterile mycelium forming neither sexual spores nor asexual spores under various cultural conditions. In order to investigate the taxonomic position of strain PF1022, we analyzed its 18S rRNA gene base sequence and that of related strains. The phylogenetic relationship among the tested strains indicated that strain PF1022 should be classified in the family Xylariaceae of the phylum Ascomycota, and that its nearest relative was *Rosellinia necatrix* IFO 32537.

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Note: *Pleurotus cornucopiae* var. *citrinopileatus* newly found in the Chugoku district, western Japan

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Pleurotus cornucopiae var. *citrinopileatus*, an agaric species highly prized as edible in northern Japan, occurs very rarely in western Japan (including the Kinki, Chugoku, Shikoku and Kyushu districts), where it was hitherto known only from the Kikuchi valley of Kumamoto Pref., Kyushu. Recently it was collected in a deciduous broad-leaved forest on Mt. Hyonosen, Tottori Pref. The collection represents the first record of the fungus from the Chugoku district and the second one in western Japan.

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