PP-2

Fungi from Insects as a Source of Bioactive Compounds

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Insects such as attinine ants, macrotermitine termites, wood wasps and ambrosia beetles have cultivated fungi as a food source for millions of years. Fungi associated with these insects may also be involved in producing compounds with various biological activities. Some compounds produced by these fungi affect the growth and development of other fungi thereby protecting the fungal crop of insects.

The tea shot hole borer beetle (*Euwallacea fornicates*, TSHB) lives symbiotically with the fungus *Monacrosporium ambrosium* (syn. *Fusarium ambrosium*) in galleries made by TSHB in tea stems. *M. ambrosium* isolated from the TSHB beetles was cultured on a large scale in potato dextrose broth. After 4 weeks, the combined ethyl acetate extract of the liquid culture and mycelia of *M. ambrosium* was found by TLC bioautography method to show antifungal activity against a plant pathogen *Cladosporium cladosporioides*. Chromatographic separation of the extract yielded twelve naphthoquinones, eight of which showed antifungal activity against *C. cladosporioides* at a concentration of 64 µg/spot and all at 128 µg/spot. Six were identified as anhydrojavanicin, dihydroanhydrojavanicin, 5,8-di-hydroxy-2-methyl-3-(2-oxopropyl)naphthalene-1,4-dione, javanicin, solaniol and anhydrofusarubin. The combined ethyl acetate extract of *M. ambrosium* was also found in the agar dilution assay to inhibit the growth of two endophytic fungi *Pestalotiopsis camelliae* (100% at 1000 ppm) and *Phoma multirostrata* (38.1 % at 1000 ppm) isolated from tea stems of TRI 2023,.

The antifungal nature of the naphthoquinones produced by *M. ambrosium* suggests its ability to prevent/inhibit the growth of other fungi in TSHB galleries thus protecting the habitat of TSHB beetles.