Biochemical characterization of ochratoxin A-producing strains of the genus Penicillium

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Abstract

In order to explore the biochemical scope of ochratoxin A-producing penicillia, we screened 48 Penicillium verrucosum isolates for the production of secondary metabolites. Fungal metabolites were analyzed by high-pressure liquid or gas chromatography coupled to diode array detection or mass spectrometry. The following metabolites were identified: ochratoxins A and B, citrinin, verrucolones, verrucines, anacines, sclerotigenin, lumpidin, fumiquinazolines, alantrypinones, daldinin D, dipodazine, penigequinolines A and B, 2-pentanone, and 2-methyl-isoborneol. By use of average linking clustering based on binary (nonvolatile) metabolite data, the 48 isolates could be grouped into two large and clearly separated groups and a small outlying group of four non-ochratoxin-producing isolates. The largest group, containing 24 isolates, mainly originating from plant sources, included the type culture of P. verrucosum. These isolates produced ochratoxin A, verrucolones, citrinin, and verrucines and had a characteristic dark brown reverse color on yeast extract-sucrose agar medium. Almost all of a group of 20 isolates mainly originating from cheese and meat products had a pale cream reverse color on yeast extract-sucrose agar medium and produced ochratoxin A, verrucolones, anacines, and sclerotigenin. This group included the former type culture of P. nordicum. We also found that P. verrucosum isolates and three P. nordicum isolates incorporated phenylalanine into verrucine and lumpidin metabolites, a finding which could explain why those isolates produced relatively lower levels of ochratoxins than did most isolates of P. nordicum.

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