

## Bookreview

PENIMAT: A computer assisted identification scheme for terverticillate *Penicillium* isolates. By P. D. BRIDGE, Z. KOZAKIEWICZ AND R. R. M. PATERSON. Mycological paper 165, Kew, International Mycological Institute, 1992. 59 pages + 3,5" disk. Price £ 27.50, available from IMI, Bakeham Lane, Egham, Surrey TW20 9TY, UK.

*Penicillium* is commonly encountered genus of a significant role in natural ecosystems and in addition of a great economic importance. Although major progress in *Penicillium* systematics has been made during the last 15 years, identification of penicillia is still not always easy and requires experience. Especially the terverticillate penicillia belong to a critical group, within which clear-cut morphological characters are often lacking.

As the authors pointed out, the identification program PENIMAT was produced as a result of broad-based multi-disciplinary approach to the study of the terverticillate penicillia that started at IMI in 1984. During this study over 200 physiological, biochemical and morphological features of nearly 350 strains were examined and the results were subjected to numerical analysis. The package PENIMAT (PENicillium Identification MATrix) represents computer assisted probabilistic identification scheme. It differs from computer based dichotomous keys in achieving a quantified identification. It consists of two files, one containing the identification matrix and the other containing the identification program. The data matrix is based on 300 strains, including ex-type cultures and consists of 57 characters and 37 fungal groups. The characters are presented in five groups: 13 physiological characters (growth at 37° C, growth on several organic acids, growth on nitrite and creatin agar, yellow colour on CZ NH<sub>4</sub>, etc.); 15 morphological characters from Czapek agar plate (colour of spores, texture of colony, size of colony etc.); eight microscopic features (conidiophore branching, spore length and width, surface structure of conidiophores); 13 secondary metabolite characters (for example brevianamid A, citrinin, chaetoglobosin C, penitrem A, terrein); and eight scanning electron microscopy characters (form a surface structure of conidia). The fungal groups represent 27 species and varieties and three distinct groups still without firm taxonomic status. The majority of the species belongs to the subgenus *Penicillium* (*P. atramentosum*, *P. aurantiogriseum* clusters 4 and 6, *P. aurantiogriseum* var. *neoechinulatum* and var. *melanoconidium*, *P. brevicompactum*, *P. camembertii*, *P. chrysogenum*, *P. claviforme*, *P. clavigerum*, *P. echinulatum*, *P. expansum*, *P. granulatum* var. *globosum*, var. *granulatum* and var. *mononematosum*, *P. griseofulvum*, *P. hirsutum*, *P. hirsutum* var. *allii*, *P. hordei*, *P. olivinoviride*, *P.*

*roquefortii*, *P. solitum* var. *solitum* and var. *crustosum*, *P. verrucosum*, and *P. viridicatum*). Three species belong to the subgenus *Furcatum* (*P. citrinum*, *P. corylophilum*, and *P. raistrickii*). Noteworthy, one critical terverticillate species, namely *Penicillium commune*, is not included in the identification matrix nor any authors' remarks on the taxonomic position of this species are mentioned. Use of the computer based key is very simple. Negative, positive, or unknown results are typed in the lists of characters on the screen as 0, 1, or 2, respectively. The identification is completed by the displaying of the most likely species name of the treated strain and of the likelihood score. After experience of the authors the "good" identification score will be in excess of 0.85. A screen may display the names and identification scores for the next two most likely species and full test results. If the score is lower, additional warnings about the quality of the identification are given and discrepant characters may be displayed. Certain characters, though, especially SEM and secondary metabolites features, are no doubt useful, but for many laboratories they may be difficult to achieve. Although the identification can be attempted from restricted numbers of characters, the result in this case is often failure in identification. Use of PENIMAT may also be complicated by the preparation of many different media for physiological tests. Of great value are descriptions of species, unfortunately they are somewhat brief. The brochure is completed three appendixes: data matrix, calculation of identification scores, and laboratory methods used including physiological, biochemical, and SEM methods.

This brochure is very valuable for the new approach of the authors, which is rarely used in filamentous fungi. It is very useful for mycologists working with *Penicillium* in the food industry, soil microbiology, mycotoxicology, etc.

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