

NOTES ON BEAUVERIA

J. A. VON ARX

Baarn*

Relationship between *Beauveria* and some other genera is discussed. SEM-micrographs of the conidiophores of *B. nivea* are given. Synonymy of *Tolypocladium* with *Beauveria* is emphasized. The orthographic error *B. arenarium* (Petch) v. Arx (1986) is corrected and should be read *B. aranearum*.

The hyphomycetous genus *Beauveria* Vuill. includes fungi occurring either on living or dead insects, or isolated from litter, soil, or from soil-inhabiting animals. In culture all species form expanding or restricted colonies which are white, lanose, floccose or powdery. The hyphae are delicate and hyaline. The conidiogenous cells develop either directly on the hyphae, or on large, swollen cells and are then clustered. Typical conidiogenous cells are swollen, ampulliform or nearly spherical, and form a narrow conidiogenous rhachis which usually elongates percurrently or sympodially. The conidia are small, obovate and hyaline, with a small but distinct scar at the base.

In 1986 a fungus was encountered on living larvae of an unknown insect found on litter collected in a 'snow valley' at the Gemmi-Pass (2300 m) in Switzerland. The fungus was identified as *Beauveria nivea* (Rostr.) v. Arx. Its clustered conidiogenous cells are ovate. In young states the rhachis is short; at first it elongates percurrently, but later it becomes cicatrized by sympodial elongation. The rhachis is not geniculate, but slightly protuberant scars were visible. SEM micrographs from a similar fungus were received from Dr. M. M. Dreyfuss (Basle) as *Tolypocladium inflatum* W. Gams. These micrographs are made from the cyclosporin-producing strain S 79391F, referred to by Dreyfuss (1987). This strain has conidiogenous cells with a very distinct, long, often geniculate rhachis with sessile or slightly protuberant scars (Fig. 1).

Beauveria (including *Tolypocladium*) is closely related to other entomogenous fungi (von Arx, 1986) and also to *Nomuraea* Maubl. sensu Samson (1974). Only two species, *N. rileyi* (Farlow) Samson and *N. atypicola* (Yasuda) Samson, were treated, but several further species now classified in the closely related genus *Isaria* Fr. or in the unrelated genus *Paecilomyces* Bainier, have to be added. In *Nomuraea* species conidiogenesis is considered to be 'phialidic', but it should be studied more carefully by SEM and TEM.

The related genus *Culicinomyces* Couch should be restricted to water-inhabiting species, parasitizing mosquito larvae. Morphological characters are not available for an adequate distinction from *Beauveria*, *Isaria*, *Diheterospora* Kamyschko and other relatives. Some Hyphomycete specialists do not accept the synonymy of *Tolypocladium* with *Beauveria*. This synonymy, however, was required, because *B. nivea* (= *T. inflatum*

* Address: Bruglaan 7, 3743 JB Baarn, Netherlands.

W. Gams) and *B. bassiana*, the type species of the two genera, are more closely related to each other than to other species classified in *Beauveria* and *Tolytocladium*. Young cultures of the two species cannot be distinguished by morphological characters; the small differences in old cultures may be a consequence of temperature requirements.

Teleomorphs are unknown in *Beauveria* species. Only the Clavicipitales, however, include fungi with such particular anamorphs and cultural characters.

The name *Beauveria arenarium* (Petch) v. Arx (in Mycotaxon 25: 2157, 1986) is an orthographic error. It should be read: *Beauveria araneorum* (Petch) v. Arx (basionym: *Acremonium araneorum* Petch in Trans. Br. mycol. Soc. 16: 242, 1932).

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Fig. 1. *Beauveria nivea*, conidiogenous cells and conidia. Note the long rhachis with annellations and/or lateral scars (from S 79391F) (c. 9000 ×).

