

1974). In addition it acts as a biodeteriogen causing rotting in beech-wood stacks (Sharp, 1975), and causes several diseases to crops in the field, e.g. crown rot of peanuts, boll rot of cotton, bole rot of sisal, seedling blight in sorghum and moulding in onions, shallots and garlic (Raper & Fennell, 1965). It is the most common *Aspergillus* and causes decay of cold stored fresh fruit (Barkai-Golan, 1980). It is also a human pathogen, attacking in particular aural cavities (Stuart & Blank, 1955; Gregson & La Touche, 1961), causing endocarditis (Carrizosa *et al.*, 1974) and colonizing old tuberculous or abscess cavities (Voisin *et al.*, 1964). On the positive side *A. niger* is used industrially to produce gallic, citric, oxalic, gluconic and fumaric acids. It also produces amylolytic, proteolytic, lipolytic and pectolytic enzymes. It is used for testing nutrient deficiencies in soil, fungicide testing, in numerous experiments on the nutritional and physiological requirements of moulds, and in various fermentations to study microconidiation in fungi.

Results of this study indicate that *A. niger* includes the following species: *A. tubingensis* Mosseray, *A. phoenicis* (Corda) Thom, *A. awamori* Nakazawa, *A. pulverulentus* (McAlpine) Thom and *A. ficuum* (Reich.) Hennings. Scanning electron micrographs of these are given in Fig.51. It is possible that the conidial form in *A. niger*, *A. phoenicis* and *A. ficuum* (Fig.51a,b,c) may be different from that in *A. tubingensis*, *A. pulverulentus* and *A. awamori* (Fig.51d,e,f). However, these differences in the absence of other reliable diagnostic characteristics are considered insufficient to warrant separation. Until further detailed studies can be made on these taxa, they are interpreted as varieties of *A. niger*.

Aspergillus niger* var. *phoenicis (Corda) Al-Musallam, *Revision of the Black Aspergillus Species*: 56 (1980).

Aspergillus phoenicis (Corda) Thom, *The Aspergilli*: 175 (1926).

Aspergillus awamori var. *hominis* Bat. & Maia, *Anais soc. biol. Pernam.* **15**: 186 (1957).

Aspergillussaitoi Sakaguchi, Iizuka & Yamazaki, *J. Appl. Mycol. (Japan)* **3**: 68 (1949).

Aspergillussaitoi var. *kagoshimaensis* Saka *et al.*, *J. Agr. chem. Soc. Japan* **24**: 140 (1951).

Aspergillus luchuensis var. *rubeolus* Shih, *Lingnan Sci. J.* **15**: 374 (1936).

Description: As in *A. niger* var. *niger*.

Type: **Japan:** Kuro-koji, 1952, K. Sakaguchi (IMI 211395, isotype of *Aspergillussaitoi* Sakaguchi *et al.*)

Hosts: Army equipment, koji, *Welwitschia* sp. inflorescence and shelled corn.

Distribution: U.S.A., Brazil, South Pacific, Japan, South West Africa.

Specimens: **Japan:** Kuro-Koji, 1952, K. Sakaguchi (IMI 214827), 'type' of *Aspergillussaitoi* var. *kagoshimaensis*. – **S.W.**

Africa: ex *Welwitschia* sp. inflorescence, 1952, H.J. Swart (IMI 56824); – **Brazil:** 1955, A.C. Batista (IMI 60314), as *Aspergillus awamori* var. *hominis*. – **S. Pacific:** ex army equipment, 1944, Chemical Warfare Service (NRRL 1956), NRRL 4856, as *A. luchuensis* var. *rubeolus* Shih.

Notes: I concur with the numerous synonymies made by Raper & Fennell (1965) (see Fig.58).

Aspergillus niger* var. *ficuum (Reichardt) Kozakiewicz, **comb. nov.**

? *Ustilago ficuum* Reichardt, *Verhandl. Konigl. Zool. botan. Ges., Wien* **17**: 335 (1867).

Aspergillus ficuum (Reichardt) Henn., *Hedw.* **34**: 86 (1895).

Aspergillus batatae Saito, *Centr. Bak. Parasitenk., Abt. II*, **18**:34 (1907).

Description: As in *A. niger* var. *niger*.

Type: ? **The Netherlands:** 1909, J. Westerdijk (IMI 91881ii, neotype). Used by Raper & Fennell (1965) for the species description.

Host: Rotted fruit.

Distribution: Mostly from tropical countries.

Specimens: NRRL 4785 (as *A. batatae* Saito).

Notes: Al-Musallam (1980) included this isolate under those assigned to *Aspergillus niger* var. *usamii* (Sakaguchi *et al.*) Al-Musallam. However Raper & Fennell (1965) placed *A. usamii* in synonymy with *A. awamori*. Al-Musallam (1980) recognized *A. awamori* but reduced it to a variety of *A. niger*, with which I concur. I have not seen the 'type' strain of *A. usamii*.

Aspergillus niger* var. *tubingensis (Mosseray) Kozakiewicz, **comb. nov.**

Aspergillus tubingensis Mosseray, *La Cellule* **43**: 247 (1934), as "(Schöber) Mosseray comb. nov. on p. 245".

Aspergillus niger forma *tuebingen* Schöber, *Jahrb. wiss. botan.* **72**: 1 (1930), *nomen nudum*.

Description: As in *A. niger* var. *niger*.

Type: 1929, F. Oehlkers (IMI 172296), type of *A. niger* forma *tuebingen* Schöber.