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STAURONEMATOPSIS ABBAS, SUTTON AND GHAFFAR GEN.NOV., AN ADDITION TO COELOMYCETES

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Abstract

Study of isotype of *Pseudorobillarda sojae* Uecker & Kulik (IMI 1298796) revealed that it does not belong to *Pseudorobillarda* and differs from other Coelomycetous genera, therefore a new generic name *Stauronematopsis* Abbas, Sutton & Ghaffar and a new combination *S. sojae* (Uecker & Kulik) Abbas, Sutton & Ghaffar is proposed.

Introduction

During an examination of isotype of *Pseudorobillarda* present in herb. IMI, it was found that *P. sojae* Uecker & Kulik (IMI 1299796) was not congeneric to *Pseudorobillarda*. Furthermore this taxon was quite different from other Coelomycetous genera and warrants a separate generic name.

Uecker & Kulik (1986) described *Pseudorobillarda sojae* in the genus *Pseudorobillarda* (Cunnell) Morelet, on the grounds that conidiomata were pycnidial, ostiolate, carbonous, conidiophores absent, and conidiogenous cells proliferating, enterogenous and stationary (sensu Henneberts & Sutton, 1994) with prominent collarettes and cytoplasmic channels. The main and distinguishing characters of *Pseudorobillarda* reported by Nag Raj *et al.*, (1972, 1973), Sutton (1980), Punithalingam & Woodhams, (1986) are the presence of 1-septate hyaline conidia and paraphyses in the pycnidium. Paraphyses are not present in *P. sojae*. Uecker & Kulik (1986) argued that Morelet (1968) did not mention paraphyses in the original description of *Pseudorobillarda* and this is why they placed the taxon in this genus. They also pointed out that Pande (1981) added *Pseudorobillarda aquatica* with aseptate conidia bearing 4 basal appendages. The description and diagrams given by Pande (1981) were not good, since he drew only 2 conidia and a vertical section of a pycnidium, although in the description of *P. aquatica*, he did mention paraphyses. These were not shown in the illustration of the pycnidium. Similarly conidiogenous cells or conidia attached to any conidiogenous cells were also not shown in the illustration so the orientation of appendages is not certain. The appendages look like cellular, rather than tubular, without cytoplasm and nuclei found in *Pseudorobillarda* (Punithalingam, 1989). It therefore appears that *Pseudorobillarda* is also not the right place for *P. aquatica* Pande. The work of Punithalingam & Woodhams (1986) and Abbas *et al.*, (1998) showed that appendages in *Pseudorobillarda* spp., are apical, generally 3, or occasionally 4, without cytoplasm and nuclei, and conidial cells uninucleate.

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Examination by optical and scanning electron microscopy, showed that the appendages in *R. sojae* are not only apical but they also arise from all over the upper half of the conidia and are cellular and enucleate and are not formed by splitting of the conidial wall. By using the modified Leifson's staining technique of Punithalingam & Woodhams (1984), it is revealed that appendages are shown to be cellular. Using the Giemsa HCl nuclear staining technique (Hrushovetz, 1956; Punithalingam, 1983), the appendages failed to dissolve by hydrolysis in IN HCl at 58-59°C, whereas Uecker & Kulik (1986) reported that appendages dissolved in strong acid. In the present study, they become less visible and almost invisible in euparol mounts. This may be due to the similar refractive index or a thick layer of euparol. However their presence can more easily be shown by counterstaining with the modified Leifson's staining technique. Under scanning electron microscopy two disc-like structures were found to be present on both ends of the conidia. Cunnell (1958) also reported such types of refractive spots on distal ends of conidia in *Pseudorobillarda phragmitis* (=*Robillarda phragmitis*). The present study also shows that in *P. sojae* at the basal end of conidia, appendages are not present. This taxon also has some resemblence with *Stauronema* (Sacc.) Sydow & Butler (Sutton, 1980), therefore a new generic name *Stauronematopsis* is proposed for it and the new combination *S. sojae* is made for *Pseudorobillarda* sojae Uecker & Kulik.

Stauronematopsis Abbas, Sutton & Ghaffar gen.nov.
Figs. 1 & 2

Etym.: Stauronema et opsis (like) facies)

Conidiomata pycnidialia vel eustromatica, nigra, immersa, dispersa vel gregaria, ellipsoidea, unilocularia, ostiolum singulum, area circum ostiolum floccosa, parietes textura angulari ad strato duobus compositi. Stratum exterior atro-brunneum, stratum interior hyalinum. *Conidiophora* absentia. *Cellulae conidiogenae* discretae, determinatae, hyalinae, parvae, proliferationibus enterogenticis. *Paraphyses* nullae. *Conidia* primova formanali hologenitica cero enterogenitica, aseptata, elliptica vel fusiformia-elliptica, hyalina vel dilute viridia, uninucleata, apicem ad basim obtusa, appendices simplices vel ramosae, apicales vel subapicales, cellulares et enucleatae.

Sp.typ.: ***Stauronematopsis sojae*** (Uecker & Kulik) Abbas, Sutton & Ghaffar comb.nov.

Stauronematopsis Abbas, Sutton & Ghaffar gen.nov.

Conidiomata pycnidial, black, immersed, scattered or gregarious, ellipsoid, glabrous, unilocular, ostiolate, area around the ostiole floccose, wall of textura angularis, consisting of two layers, the outer dark brown and the inner hyaline. *Conidiophores* absent. *Conidiogenous* cells discrete, determinate, small, hyaline, proliferating enterogenously with collarettes and periclinal thickenings and wide cytoplasmic channels becoming narrower after each succession. *Conidia* formed first hologenous later one enterogenous, elliptic or fusiform, hyaline to pale yellow, uninucleate, appendages apical or sub-apical, cellular, simple or branched and enucleate.

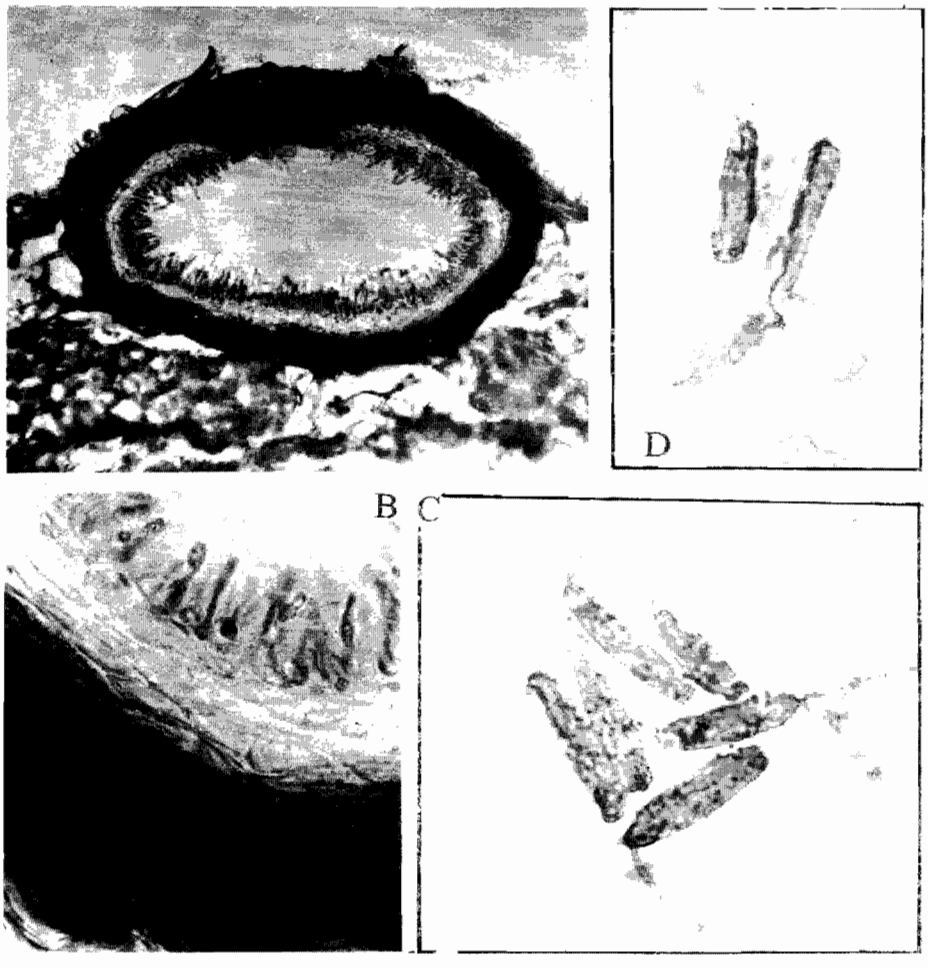

Fig. 1. *Stauronematopsis sojae* (A) V.S. of conidioma, 160X; (B) V.S. of conidioma with conidiogenous cells, 1000X; (C,D) conidia stained with Leifson's flagella stain, 1800X.

Sp.typ.: *Stauronematopsis sojae* (Uecker & Kulik) Abbas, Sutton & Ghaffar comb. nov.

The most obious affinity as the generic name implies, lies with *Stauronema* (Sacc.) H. Sydow, P. Sydow & Butler (Sutton 1980). However, the two genera differ markedly in structure of the conidiomata, conidiophores and some aspects of conidial morphology, especially the number of appendages and their position. *Stauronema* resembles *Stauronematopsis* in enterogenous, stationary conidiogenous cells and hyaline, unicellular, simple, appendaged conidia but differs in having setose cupulate conidiomata, conidiophores and aseptate conidia with 4 setulae, one apical one basal and two lateral. *Dinemasporium* Lév. (Sutton, 1980) also resembles *Stauronematopsis* in the enterogenous, stationary conidiogenous cells and aseptate hyaline or pale brown appendaged conidia. However it can easily be distinguished by the setose cupulate conidiomata, presence of hyaline simple or

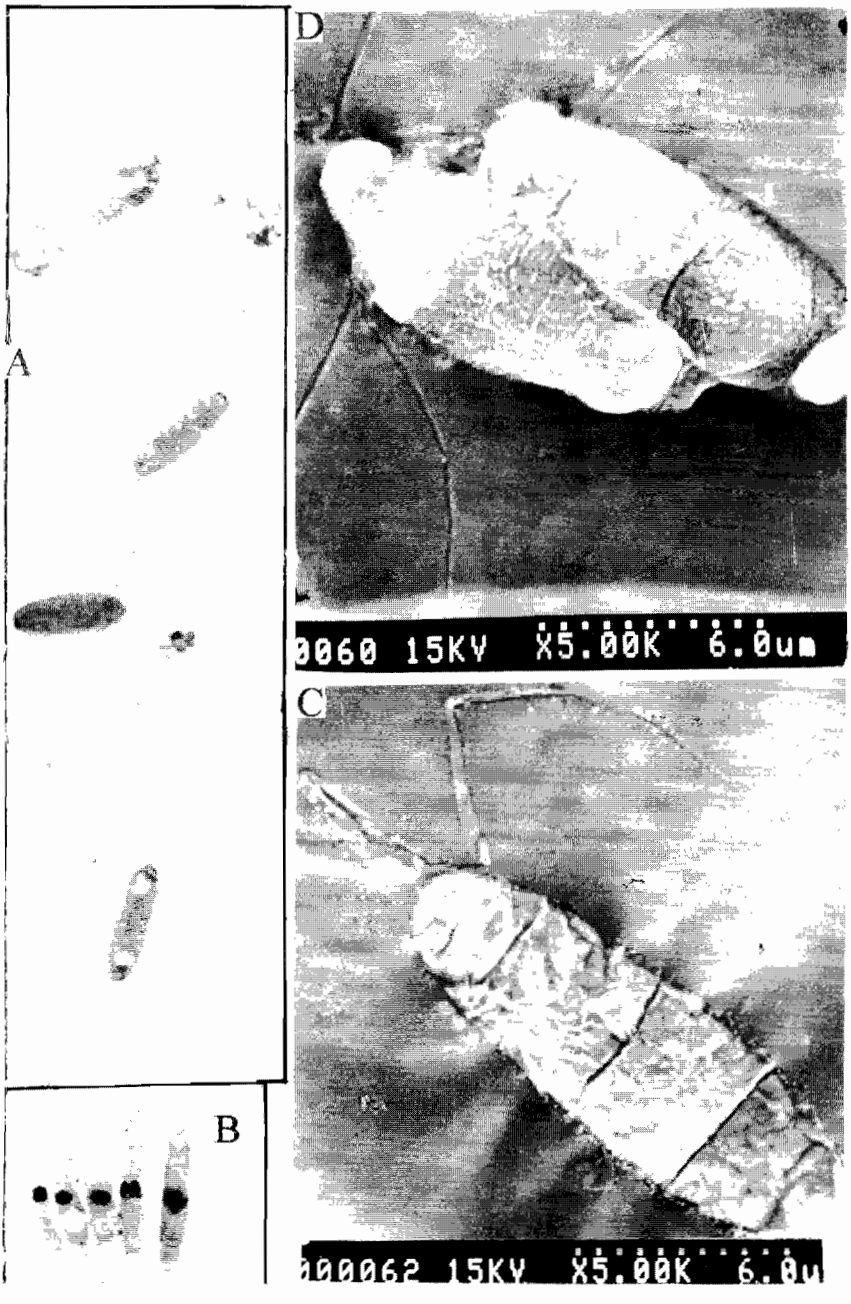

Fig. 2. *Stauronematopsis sojae* (A) Conidia stained in Lactophenol, 1800X; (B) Conidia stained in Geimsa HCl, 1800X; (C,D) Conidia in SEM.

branched conidiophores, aseptate, thin-walled, smooth, allantoid or fusiform conidia with one apical and one basal setula. *Diarimella* Sutton (Sutton, 1980) also shows some resemblance to *Stauronematopsis* in the absence of conidiophores, enterogenous stationary proliferating conidiogenous cells and aseptate hyaline appendaged conidia, but it can be distinguished by the setose unilocular hysteriform conidiomata, curved apices to the conidiogenous cells, and aseptate conidia with 1-3 simple, apical and basal appendages. *Annellolacinia* Sutton (Sutton, 1980), also resembles *Stauronematopsis* in the absence of conidiophores and aseptate pale brown appendaged conidia but it differs in having acervular conidiomata, enterogenous, 1-8 progressively proliferating conidiogenous cells and conidia with two simple cellular appendages, one at the apex and the other at the base on the lateral side. *Ajrekarella* Kamat & Kalani (Sutton, 1980) resembles *Stauronematopsis* in having aseptate appendaged conidia. However it can be separated by the setose conidiomata, hyaline branched conidiophores, enterogenous, 1-2 progressively proliferating conidiogenous cells and cylindrical conidia with 1-2 apical and 2-6 basal, cellular appendages. In *Stauronematopsis* several cellular, simple or branched appendages are confined to the upper half of the conidia and there is no basal appendage. *Tracyella* (Sacc.) Tassi (Nag Raj, 1975b) is another genus resembling *Stauronematopsis* in having enterogenous, stationary conidiogenous cells and aseptate hyaline appendaged conidia, but it differs in having pycnothyrial conidiomata, sub-cylindrical unicellular conidia with one apical, and one basal, simple, cellular appendage. *Chaetospermum* Sacc. (Sutton, 1980) is similar to *Stauronematopsis* in having aseptate appendaged conidia, but differs in the acervular conidiomata, hyaline, branched conidiophores and non-proliferating conidiogenous cells, and conidia with several cellular simple appendages at the apices and bases.

Brycekendrickia Nag Raj (1973) resembles *Stauronematopsis* in the pycnidial conidiomata, enterogenous and stationary proliferating conidiogenous cells with and aseptate hyaline appendaged conidia, but it differs in the presence of conidiophores, and conidia with a single basal and apical branched appendage. *Pestalozziella* Sacc. & Ellis (Nag Raj & Kendrick, 1972) shows some resemblance to *Stauronematopsis* in the absence of conidiophores and having hyaline or pale brown aseptate conidia but it can be separated by the pycnidial conidiomata, sympodial proliferating conidiogenous cells and conidia with a subapical dichotomously branched cellular appendage. *Mycotribulus* Nag Raj & Kendrick (Nag Raj & Kendrick, 1970; Sutton, 1980) is similar to *Stauronematopsis* in having aseptate appendaged conidia but differs in having pycnidial conidiomata, hyaline branched conidiophores with acrogenous conidia, non-proliferating conidiogenous cells, presence of septate, branched paraphyses and navicular conidia with one apical, simple or branched and 2-4 basal simple appendages. *Polynema* Lév. (Sutton, 1980) also resembles *Stauronematopsis* in enterogenous and stationary proliferating conidiogenous cells prominent periclinal thickenings and collarettes and 0-1 septate appendaged conidia, but differs in having setose acervular to cupulate conidiomata, conidiophores, and 0-3 septate, pale brown, verruculose guttulate conidia with one apical and 1-3 basal simple appendages.

Pullospora Faurel & Schotter (Nag Raj, 1974) can also be compared with *Stauronematopsis*, in having pycnidial conidiomata, no conidiophores and aseptate hyaline appendaged conidia, however, it differs in having pycnidial conidiomata with a cylindrical neck, reduced conidiophores, enterogenous and progressive proliferating conidiogenous cells and aseptate conidia with several cellular, simple appendages at each end. Further more

the base is annellate with a short sub-cylindrical process. *Crucellisporium* Farr (Farr & Horner, 1968; Nag Raj, 1974) also resembles *Stauronematopsis* in having aseptate appendaged conidia, but differs in the acervular conidiomata, presence of conidiophores, conidiogenous cells proliferating hologenous and sympodially, and hyaline aseptate conidia with 3 or 4 apical, simple cellular appendages. *Vasudevella* Chona, Munjal & Bajaj (Chona *et al.*, 1956; Nag Raj, 1974; Sutton, 1980) is similar to *Stauronematopsis* in having pycnidial conidiomata and hyaline appendaged conidia, but it differs in the presence of simple conidiophores, enterogenous and 7-8 progressively conidiogenous cells, false paraphysoids and 1-septate conidia with one or two simple or branched apical, cellular appendages.

Acarosporium Bubak & Vleugel (Nag Raj, 1974; Sutton, 1980) bears comparison with *Stauronematopsis* in the pycnidial conidiomata and hyaline appendaged conidia. However it differs because the innermost pycnidial layer is surrounded by mucilaginous material, branched conidiophores, conidiogenous cells proliferating sympodially and one septate conidia. The upper cell of each conidium has 1 to several simple, cellular appendages as found in *Stauronematopsis*. However, *Stauronematopsis* is characterized by conidiogenous cells which proliferate enterogenous and stationary, absence of conidiophores and aseptate conidia with several simple appendages on upper half of the conidial cell. *Plectronidiopsis* Nag Raj (1979) also resembles *Stauronematopsis* in having appendaged conidia, but clearly differs in having setose acervular conidiomata, enterogenous and progressive conidiogenous cells, 1-septate, cylindrical, guttullate conidia, apex acute, base truncate, more appendages at apical and basal ends of conidia than the sides. *Libartania* Nag Raj (1979) also differs from *Stauronematopsis* by having eustromatic pycnidioid conidiomata, sympodially proliferating conidiogenous cells, 3 septate, fusiform, hyaline conidia with one apical, simple or branched appendage and sometimes one simple very short basal appendage.

Ciliochora Höhnel (Nag Raj & Di Cosmo, 1978) is also a genus which resembles *Stauronematopsis* in absence of conidiophores and the hyaline appendaged conidia, however it differs in having eustromatic conidiomata which are irregularly loculate, with a well-developed clypeus, which occupies the entire thickness of the leaf, non-proliferating conidiogenous cells, conidia fusiform or ellipsoidal, 1- septate with the upper cell small and developed into a simple or branched cellular appendages. *Pseudoneottiospora* Faurel & Schotter (Nag Raj & Di Cosmo, 1978) can also be compared with *Stauronematopsis* in having pycnidial conidiomata and hyaline appendaged conidia. It differs in having branched, septate conidiophores, enterogenous and progressive conidiogenous cells and 0-2 septate cylindrical conidia with unequal cells and 2-4 simple cellular appendages on the upper smaller cell. *Gampsonema* Nag Raj (Nag Raj, 1975a; Sutton, 1980) also has some similarities with *Stauronematopsis* in having hyaline appendaged conidia but it differs in the eustromatic conidiomata, branched cylindrical conidiophores, sympodially proliferating conidiogenous cells and 2 septate cylindrical or slightly curved conidia with 2 apical divergent setulae. *Tiarosporella* Höhn. (Sutton, 1980; Punithalingam, 1981) resembles *Stauronematopsis* in having pycnidial conidiomata and hyaline aseptate appendaged conidia but clearly differs by the presence of conidiophores and two types of conidiogenous cell, temporary and permanent (Punithalingam, 1981). Temporary conidiogenous cells are non-proliferating, while permanent conidiogenous cells proliferate enterogenous and progressively. In *Tiarosporella* (Punithalingam, 1981), conidia are larger than *Stauronematopsis*, and the appendages are apical, acellular, mucilaginous, 2-many, tentacular or of various shapes. Appendages in *Stauronematopsis* are cellular, simple or occasionally branched and formed from the upper half of the conidial cell. Similarly *Alpakesa* Subramanian & Ramakr. (Sutton, 1980) resembles *Stauronematopsis* in having

pycnidial conidiomata, no conidiophores and 0-3 septate, hyaline conidia with several simple apical appendages. However, it differs in having non-proliferating conidiogenous cells, conidia with a very broad apex and the appendages originating from a small enucleate cell with few cytoplasmic contents (Abbas *et al.*, 1998). In *Stauronematopsis* the appendages are apical or subapical, simple, cellular and enucleate. *Giulia* Tassi (Pirozynski & Shoemaker, 1971; Sutton, 1980) also resembles *Stauronematopsis* in having pycnidial conidiomata, no conidiophores and aseptate appendaged conidia. It differs in non-proliferating conidiogenous cells and nature and position of conidial appendages. The appendages are acellular, mucilaginous and arise from a point and thus differ from those of *Stauronematopsis* which are cellular, simple or branched, and develop from the apical or subapical ends of conidia.

Stauronematopsis sojae (Uecker & Kulik) Abbas, Sutton & Ghaffar comb. nov.
Figs. 1&2

Pseudorobillarda sojae Uecker & Kulik, Mycologia 78: 450 (1986)

Conidiomata pycnidial to eustromatic, black, immersed, separate or aggregated, spherical to ellipsoid, papillate and ostiolate, 195-316 X 150-195 µm. Wall of textura angularis, 3-8 cells thick, composed of two layers, an outer one, dark and thicker than the inner one which gradually becomes hyaline towards the centre. *Conidiophore* absent. *Conidiogenous* cells discrete, hyaline, smooth, enterogenous and proliferating stationary with large collarettes and narrow channels. *Conidia* formed first hologenous later one entegrogenous aseptate, uninucleate, elliptic or fusiform, hyaline or pale yellowish, both ends obtuse, with or without guttules, (12-) 13-18 (9) X (3-) 3.5-4.5 (-5) µm. At the apex 2-7 apical or sub-apical hyaline, simple or branched appendages are present.

In optical and SEM studies, no definite gelatinous sheath around the conidia was observed, presumably because it quickly dissolves in water. Appendages did not dissolve in 1N HCl at 58-59°C. In euparol mounts, they were not visible, presumably because they are of the same refractive index or because the euparol was thick, since they become evident when counter stained by modified Leifson's stain. In the scanning electron microscope, at each end, a disc-like structure was also observed.

Specimen examined

Stauronematopsis sojae (Uecker & Kulik) comb. nov.

On twigs of soybean (*Glycine max*), Beltsville, Maryland, Isotype of *Pseudorobillarda sojae* (IMI 1299796).

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