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ADDITIONS TO COELOMYCETES FROM PAKISTAN - *CAMAROSPORIOPSIS* ABBAS, SUTTON & GHAFFAR GEN. NOV., AND *C. CAPPARIDIS* (AHMAD) ABBAS, SUTTON & GHAFFAR COM. NOV.

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Abstract

Camarosporiopsis Abbas, Sutton & Ghaffar gen.nov., and *C. capparidis* (Ahmad) Abbas, Sutton & Ghaffar com.nov., on *Capparis decidua*, based on *Camarosporium capparidis* Ahmad are described, illustrated and compared with related taxa.

CAMAROSPORIOPSIS Abbas, Sutton & Ghaffar gen. nov.

Etym.: Camarosporium et opsis = like (facies)
Fig. 1, 2 & 3

Conidiomata pycnidialia vel eustromatica, immersa, nigra, separata vel aggregata, globosa vel oblonga vel irragularia. Ostiolum singulum, circulare, centrale, papillate. Parietes multus cellulis crassis, pallidisslime brunneis ex textura prismaticis, gradutescene pallidioribus ad tenuioribus versus centrum conidimata. Conidiophora absentia. Cellulae conidiogenae ampulliformes vel lageniformes, laevaes, hyalinae, enterogenibus prograssivis. Conidia primovo formanali hologenitica cero enterogenitica muriforma, brunnea, prominente verruculosa, globosa vel oblonga vel triangularia vel irragularia forma, apicem ad basim obtusa, in vaginam mucilaginosum inclusis ad quae interdum cellulae conidiogenae inclusis.

Sp. typ.: ***Camarosporiopsis capparidis*** (Ahmad) Abbas, Sutton & Ghaffar Comb. nov.

Camarosporiopsis Abbas, Sutton & Ghaffar gen. nov.

Conidiomata pycnidial to eustromatic, immersed, black, solitary to aggregated, globose to oblong to irregular, *ostiole* single, circular, central and papillate, wall many cells thick, pale brown, of textura prismatica, not differentiated into two layers but the cells becoming gradually paler and thinner towards the center of conidiomata. *Conidiophores* absent. *Conidiogenous cells* ampulliform to lageniform, smooth, hyaline, proliferate enterogenous and progressively. *Conidia* hologenous, brown, muriform, prominently verruculose, globose to oblong to triangular to irregular in shape, both ends obtuse, enclosed in a thick mucilaginous sheath which sometimes also encloses the conidiogenous cells.

Camarosporiopsis shows some resemblance to *Camarosporium* Schulz., *Dichomera* Cke., *Avettaea* Petrak & Sydow, *Tunicago* Sutton & Pollack, *Camarographium* Bub., *Myxocyclus* Riess, *Amarenographium* (Trail) Eriksson, *Verrucariella* Ahmad, *Camarosporellum* Tassi and *Piringa* Spegazzini.

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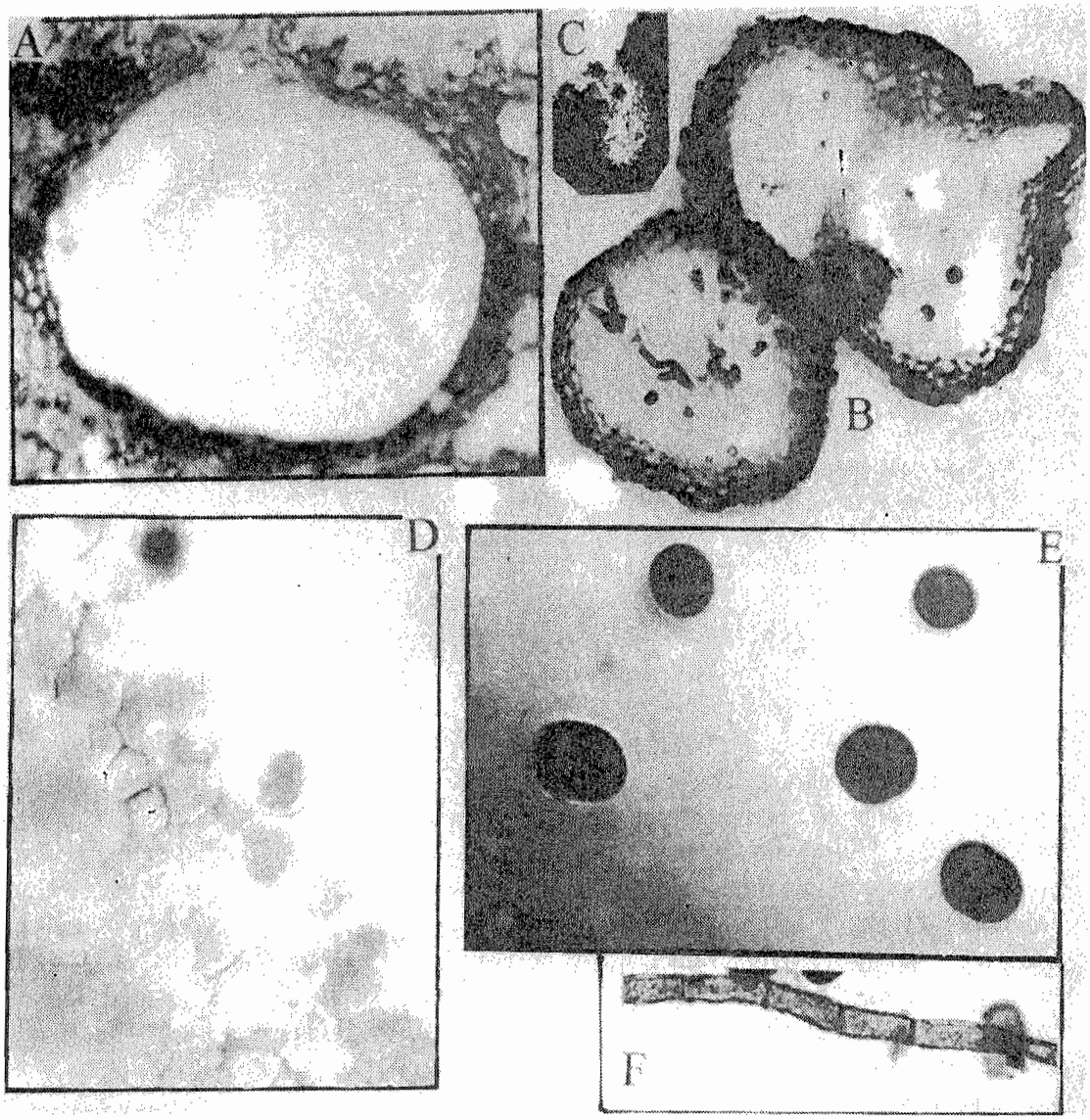

Fig. 1. *Camarosporiopsis capparidis* IMI 246218.
(A) V.S. of conidioma, 40X; IMI 188523. (B) V.S. aggregated condiomata, 16X; IMI 138587. (C) Ostiole, 40X; IMI 133336. (D) Conidiogenous cells; IMI 182523. (E) Conidia enclosed in mucilaginous sheath, 1800X; IMI 246219. (F) mycelium, 1800X.

Camarosporium is the closest genus to *Camarosporiopsis* in having euseptate muriform brown conidia but differ in having pycnidial conidiomata and absence of mucilagenous sheath around the conidia, similarly *Dichomera* is another genus which resembles to *Camarosporopsis* in having eustromatic conidiomata, absence of conidiophores, and euseptate muriform conidia. In *Dichomera* conidiogenous cells are non-proliferating and conidia are smooth-walled and without mucilaginous sheath (Sutton, 1980). *Piringa* differs in having pycnidial conidiomata with setae and absence of mucilaginous sheath around conidia. *Avettaea* Petrak & Sydow is another genus resembling *Camarosporiopsis* in conidiomata and conidiogenous cells (Sivanesan & Sutton, 1985; Abbas & Sutton, 1988), but differing by the aseptate brown conidia enclosed in a mucilaginous sheath. *Tunicago* Sutton & Pollack (Sutton & Pollack, 1977; Sutton, 1980) is an unusual genus with conidia formed in a mucilaginous sheath like

Camarosporiopsis, but differs in having pycnidial conidiomata, conidiogenous cells enterogenous and stationary, 1-septate perprolate, brown, smooth-walled, guttulate conidia, enclosed in a mucilaginous sheath which becomes rigid and granular at maturity. *Myxocyclus* Riess (Sutton, 1975; 1980) also resembles *Camarosporiopsis* in having muriform, brown conidia enclosed in a mucilaginous sheath, but differs by having acervular conidiomata, long septate, brown, branched, verruculose conidiophores, non-proliferating conidiogenous cells and long distoseptate cylindrical conidia with an obtuse apex and tapering base.

Similarly *Camarographium* (Sutton, 1980) resembles *Camarosporiopsis* in having pycnidia or linear conidiomata, no conidiophores, and muriform brown conidia, however it differs in having enterogenous and stationary conidiogenous cell and in the absence of mucilaginous sheaths around distoseptate conidia. *Amarenographium* (Eriksson, 1982) is another genus which resembles with *Camarosporiopsis* in having brown muriform conidia, but it differs in the conidiomata being pycnidial, presence of conidiophores and distoseptate conidia. The conidial appendages and mucilaginous sheaths around the conidia are of a peculiar nature. The apical appendage is globose while basal appendage is quadrangular, umbilicate and hyaline. Both these appendages are surrounded by a mucilaginous sheath of irregular outline whereas in *Camarosporiopsis* it is only the mucilaginous sheath that surrounds the conidium completely. *Verrucariella* Ahmad is another genus described by Ahmad (1967) from *Capparis decidua* (as *C. aphylla*). It resembles *Camarosporiopsis* in having pycnidial conidiomata and brown verruculose conidia but differs in the 1-septate, ovoid to oblongo-ovoid conidia with an obtuse apex and truncate base and no enclosing mucilaginous sheath. *Camarosporellum* Tassi (Sutton, 1980) also resembles *Camarosporiopsis* in having brown muriform conidia and no conidiophores, but differs in the absence of a mucilaginous sheath and the presence of distoseptate conidia.

Camarosporiopsis capparidis (Ahmad) Abbas, Sutton & Ghaffar comb. nov.

Camarosporium capparidis Ahmad, Sydowia 5: 393 (1951).

Conidiomata pycnidial to eustromatic, solitary to black, globose to pyriform to oblong, to triangular, unilocular to trilocular (83-396x34-50 µm), *ostioles* circular 32-56 µm diam. Walls of textura prismatica, pale yellow, 4-11 cells thick and 12-40 wide, not differentiated into outer and inner layers, cells gradually becoming thinner and paler towards the centre of conidiomata. In the ostiolar region the wall is black and thicker. *Conidiophores* absent. *Conidiogenous cells* ampulliform to lageniform, smooth, hyaline, 4.5-8x3-9.5 µm, enterogenous and progressive. *Conidia* hologenous, yellowish brown to dark brown, muriform, globose or ovoid to oblong to squarish to curved, cylindrical to irregular in shape, outer wall thick, minutely verruculose, with 2 to many longitudinal, transverse and or oblique septa, but the cruciately 3 septate form is common, 8.5-25x6.5-13.5 µm. The majority of conidia are 11-16x 9.5-13.5 µm, enclosed in a mucilaginous, hyaline sheath which is 0.8-1.5 µm thick.

On stem of *Capparis decidua*, Ladhur, Shaikhupura, Pakistan, 18 July 1947, S. Ahmad 1935. (= holotype of *Camarosporium capparidis* Ahmad), holotype.

The present study is based on many collections of specimens of *Capparis decidua* from Karachi, Lahore, Changa Manga, Kharian, Jehlum, Kohat, Lachi, Sahiwal (Pakistan) and Jodhpur (India). Due to the different climatic and ecological conditions of these

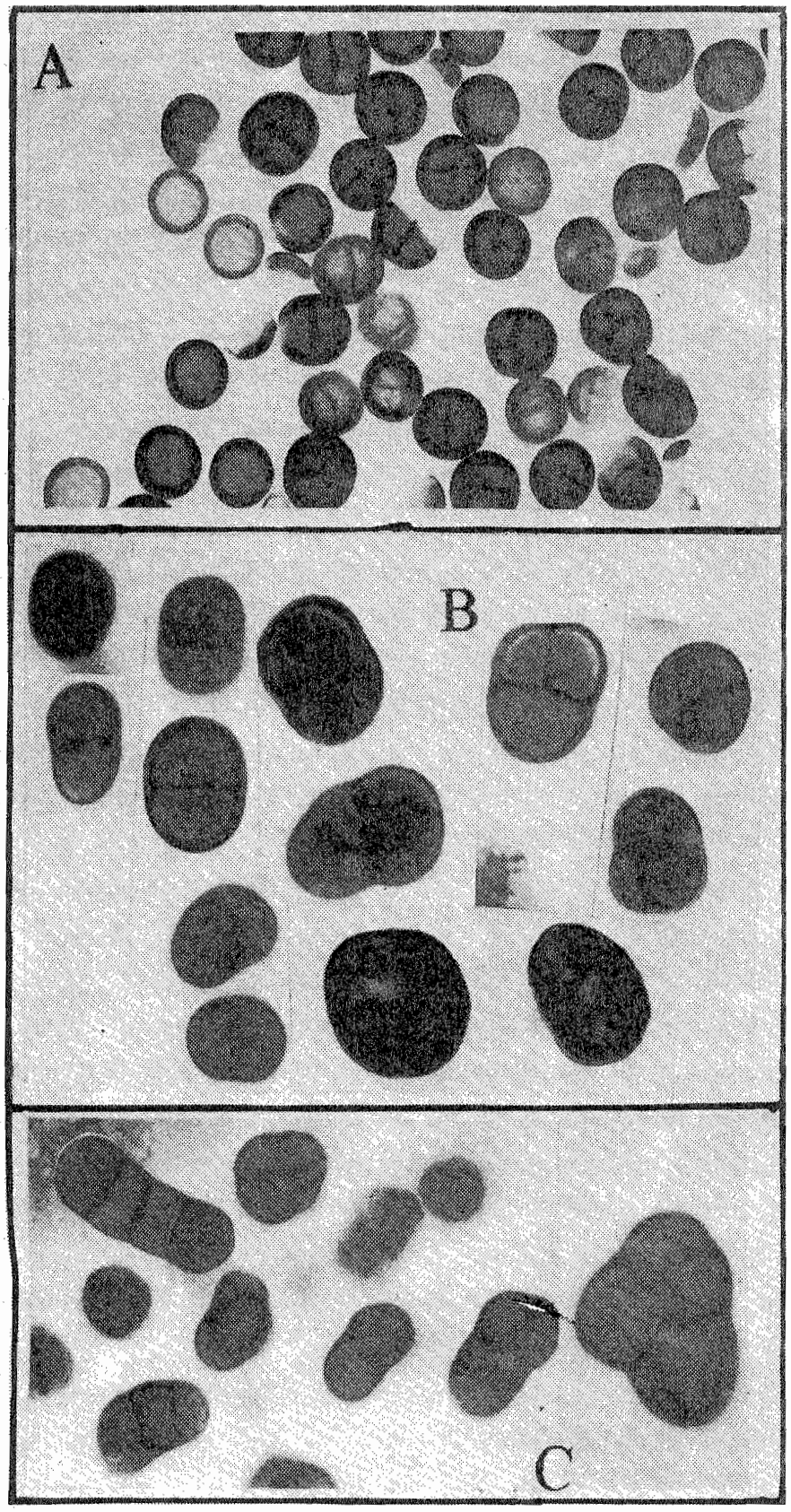

Fig. 2. *Camarosporiopsis capparidis*, (A) Cruciate conidial arrangement, IMI 188523 (B) IMI 246219 (C) Irregular septal arrangement, IMI 133336.

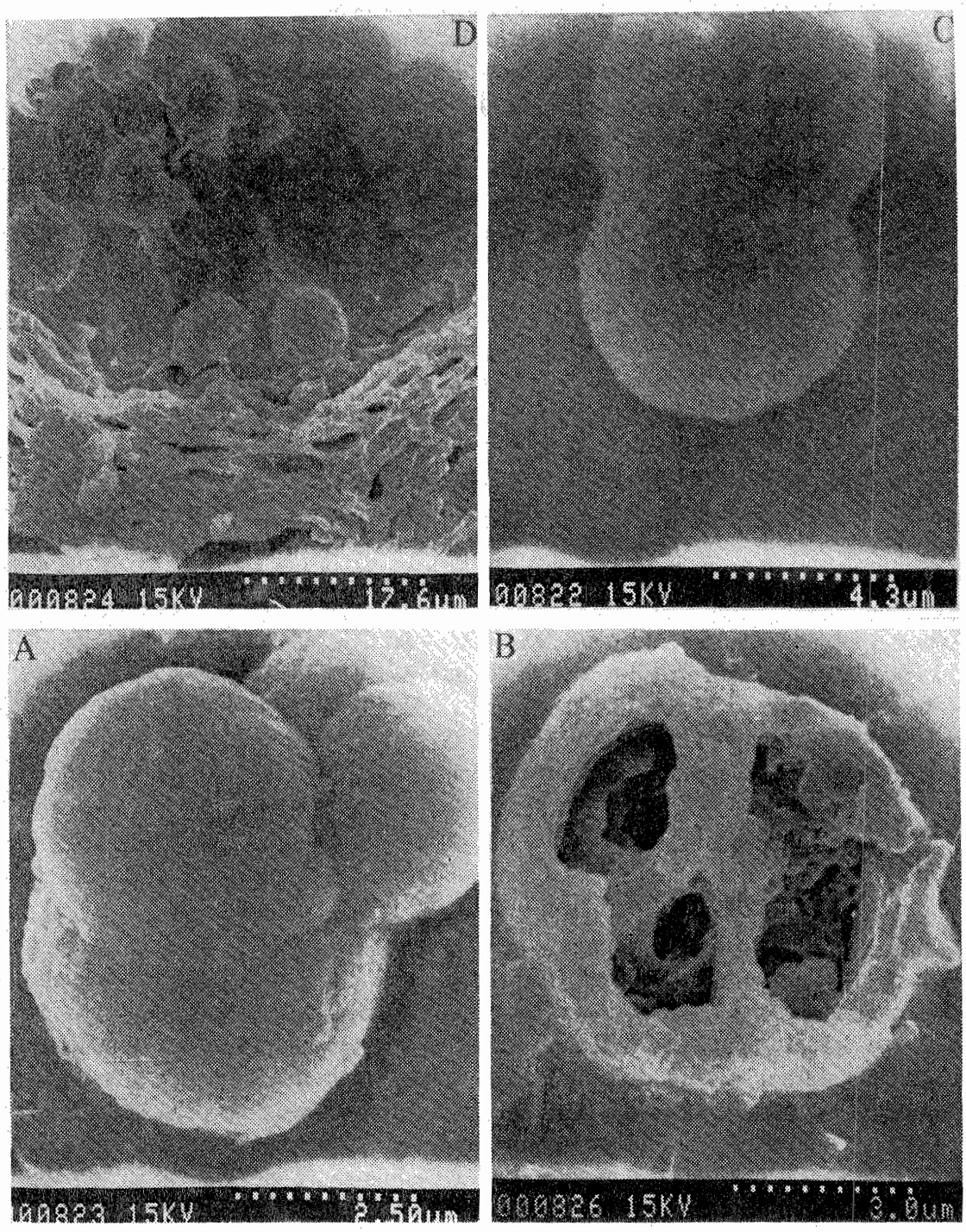

Fig. 3. *Camarosporiopsis capparidis*, IMI 133336 in SEM. (A) Mature conidium. (B) Conidium with ruptured wall. (C) Conidium with transverse septum. (D) V.S. of conidioma, wall and conidiogenous cells.

places, there has been found a wide variation in conidial shape, size and septation. Specimens (IMI 81989, 192997, 138510, 194282, 199880, 158523, 152210, 314934, 315401, 314981, 345491), have globose to ovoid, yellow to brown conidia with the cruciate form of septal arrangement, whereas in specimens (IMI 133336, 138587, 133431, 93028) the conidia are squarish to irregular, dark brown with an irregular type of septal arrangement. Based solely on these differences in conidial variation, it is possible

to differentiate two populations. However, since in some collections mixtures of these types of conidia are found, it is concluded that there is one variable species.

Septa formation in conidia were also studied. The first septum is always transverse and median and slightly constricted at the end, whereas the second and third septa are always at right angles to first one, one in the upper cell and the other below. In this way the resulting septal arrangement looks to be cruciform. The irregular type of septal arrangement arises in two ways: i) up to the 3 septal stage it follows the cruciate pattern, thereafter various longitudinal, oblique and transverse septa are laid down, ii) up to the 3 or 4 septal stage only transverse septa are laid down and then various longitudinal, transverse and oblique septa are formed.

A number of *Camarosporium* spp., have been described from *Capparis* spp., but all of them differ from *Camarosporiopsis capparidis*. *Camarosporium suseganense* Sacc. & Speg., (Saccardo, 1884) was described from *Capparis rupestris* with conidiomata 100-150 µm and muriform, 2-4 septate conidia 15-20x 8-10 µm. There is no description of a mucilaginous sheath, therefore this clearly differentiates it from *Camarosporiopsis capparidis*. *Camarosporium quaternatum* (Hazsl.) Sacc. (Saccardo, 1884; Sutton & Pollack, 1974) was reported by Mundkur & Ahmad (1946) on *Capparis decidua* (*as C. aphylla*) from Ladhur (Punjab, India, now in Pakistan). Ahmad (1951) re-examined the specimens of *C. quaternatum* on *Capparis* and admitted that the fungus described as *Camarosporium quaternatum* by Mundkur & Ahmad (1946) was actually *Camarosporium capparidis*. Sutton & Pollack (1974) redescribed *Camarosporium quaternatum* with pycnidial conidiomata, no conidiophores, lageniform conidiogenous cells with flared annellations and brown, muriform, club-shaped conidia generally with 4 transverse and 2-3 longitudinal eusepta, lacking any mucilaginous sheath. As such the species also clearly differs from *Camarosporiopsis capparidis*. *Camarosporium capparidicola* Koshkelova & Frolov (1973) was described from *Capparis spinosa*, but was published invalidly because no Latin diagnosis was given. Its conidia are much bigger (17-37x15.5-24 µm) than *Camarosporiopsis capparidis* and there is no mention of any mucilaginous sheath. *Camarosporium capparidis* Ahmad was described by Ahmad (1951) from *Capparis decidua* (as *C. aphylla*) from Ladhur, Sheikhupura, Pakistan. The type was not available inspite of several requests made for the loan of specimen no reply being received. Studies on *Camarosporiopsis* based on a large number of specimens from various parts of Pakistan and India showed a great morphological variability, whereas the description of *Camarosporium capparidis* is based only on one collection. However this description does fit the range in variability for *Camarosporiopsis*. Conidiomata in *Camarosporium capparidis* are reported as pycnidial, globose, ostiolate, solitary to aggregated, 85-100 µm, whereas in *Camarosporiopsis* the conidiomata are morphologically similar but the size is greater (122-307x105-301 µm). Similarly pycnidial walls in both are pale yellow, only 2-3 cells thick in *Camarosporium capparidis* and 4-11 cells thick in *Camarosporiopsis*. Conidiophores in *Camarosporium capparidis* were reported by Ahmad (1951) as obsolete, whereas they are absent in *Camarosporiopsis*. Presumably the distinction between conidiophores and conidiogenous cells was not made by Ahmad (1951) so it is possible that conidiogenous cells were referred to as conidiophores, due to their small size and shape. Conidial shape, size, number of septa and their orientation in both taxa are similar. In *Camarosporium capparidis* conidia are yellow 8.5-9.5x12-13 µm, 2-3 septate, of cruciate form, globose

to oval, yellowish to dark brown. Conidia in *Camarosporiopsis capparidis* are yellowish to dark brown, globose to oval to squarish, 8.8-25x6.5-13.5 µm, but majority of conidia have cruciform arrangement of septa and 11-16x9.5-13.5 µm. From the above comparision and illustration it would appear that both taxa are congeneric and conspecific. Munjal & Kapoor (1962) reported *Dichomera capparidis* from *Capparis decidua*. It resembles *Camarosporiopsis capparidis* in having brown muriform conidia, but differs in having small (6-10 µm) conidia, without a mucilaginous sheath. *Hendersonia capparidis* Gucevicz (1969), reported from *Capparis spinosa* can easily be differentiated from *Camarosporiopsis capparidis* by its cylindrical and 7 transversly septate conidia, not enclosed in a mucilaginus sheath.

Specimens examined

Camarosporiopsis capparidis (Ahmad) Abbas, Sutton & Ghaffar comb. nov.

On twigs of *Capparis decidua* (as *C. aphylla*).

From Punjab Pakistan

(In folder of *Camarosporium capparidis*) Khewra salt range, Apr. 1951, S. Ahmad 14788 (IMI 81989); Changa Manga, 23 Feb. 1962, S. Ahmad 15424 (IMI 192997); Changa Manga, 24 Feb. 1962, S. Ahmad 15468 (IMI 93028); Kharian, 17 July 1964, S. Ahmad 18117 (IMI 133336a); Jehlum, 21 July 1964, S. Ahmad 18131 (IMI 138510); Kohat, 21 Aug. 1967, S. Ahmad 20220 (IMI 133431); Lachi, 22 Aug. 1967, S. Ahmad 20337 (IMI 133503); Kharian, 26 Aug. 1964, S. Ahmad 18584 (IMI 138587); Sahiwal, 18 Feb. 1975, S. Ahmad 24557 (IMI 194282); Lahore, 5 Nov. 1975, S. Ahmad 255053 (IMI 199880).

From Sindh Pakistan

Karachi 20 Sept. 1970, S.Q. Abbas KUMH 1287 (IMI 152210); Karachi, 29 Dec. 1984, S.Q. Abbas UCMH 136 (IMI 314934); Karachi, 12 Mar. 1986, S.Q. Abbas UCMH 617 (IMI 31540); Karachi, 14 Nov. 1986, S.Q. Abbas UCMH 186 (IMI 314981); Karachi, 28 Feb. 1987, S.Q. Abbas UCMH 133 (IMI 314931); Karachi, 12 Mar. 1987, S.Q. Abbas UCMH 721 (IMI 315497).

From India

Capparis decidua Jodhpur, 12 Mar. 1971, (HI 81/71 YI2 (IMI 158523); Host not mentioned, Kurukshetra Univ., 5 Mar. 1980, R.S. Mehrotra (IMI 246219).

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