

## FURTHER STUDIES ON *SEIMATOSPORIOPSIS* SUTTON, GHAFFAR & ABBAS

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### Abstract

Detailed studies on additional hosts of *Seimatosporiopsis* viz., *Salvadora persica*, *Acacia senegal*, *Prosopis juliflora*, *Citrullus colocynthes*, *Calotropis procera* and *Capparis decidua* belonging to different angiospermic families and collected from different climatic regions of Pakistan showed significant variation from the original description of the genus, therefore generic description has been amended.

### Introduction

Sutton *et al.*, (1972), described the monotypic genus, *Seimatosporiopsis* with the single species *S. salvadorae* on *Salvadora oleoides* from Karachi, Pakistan. Later Ghaffar & Abbas (1972) added a second host, *Salvadora persica* from Karachi. As a result of extensive collections, fungi tentatively assigned to *Seimatosporiopsis salvadorae* were found to occur on many different hosts viz., *Acacia senegal* (L.) Willd. (Mimosaceae), *Prosopis juliflora* Swartz. (Mimosaceae), *Capparis decidua* (Forssk.) Edgew. (Capparidaceae), *Citrullus colocynthes* (L.) Schrad. (Cucurbitaceae) and *Calotropis procera* (Willd) R. Br. (Asclepiadaceae). Due to the addition of these various hosts of different families, critical studies of the morphological characters of *S. salvadorae* were made. The fungus showed morphological variations on various hosts and as a result the generic description has been amended.

*Seimatosporiopsis* Sutton, Ghaffar & Abbas, *Trans. Br. mycol. Soc.* 59: 295-300 (1972). Abbas, Sutton & Ghaffar, *Pak. J. Bot.*, 30: 51-68, (1998); Fig. 3 (I, II, III) Abbas *et al.*, 1998 [Description amended.].

*Conidiomata* pycnidial to eustromatic, when pycnidial then solitary, immersed, black, globose to applanate-globose to lageniform to irregular, glabrous, *ostiolate*, when eustromatic, 2-many conidiomata loosely or compactly aggregated, multilocular, applanate-globose to irregular; wall composed of several cells thick of *textura angularis*, dark brownish black, differentiated into two layers an outer thick-walled layer darker than the inner layer which gradually becomes hyaline and thinner towards the centre of the conidiomata. *Conidiophores* absent, *conidiogenous cells* arising from the innermost layer of the conidiomatal wall, hyaline to brown, smooth ampulliform, cylindrical to lageniform, enterogenous and progressively proliferating, with several percurrent proliferations, sometime secondary conidiogenous cells may arise from the primary conidiogenous cells.

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Paraphyses may or may not be present, when present then simple, hyaline, multiseptate. Conidia initially hogenous later enterogenous, dark brown, smooth, cylindrical, slightly curved, transversely 3-4 (5) euseptate, apex obtuse, base truncate, with one or more apical or sub apical and basal or lateral appendages. Appendage enucleate, cellular simple or occasionally branched, filiform.

**Sp. typ.: *Seimatosporiopsis salvadorae* Sutton, Ghaffar & Abbas**

The number of pycnidial and acervular genera with pigmented septate conidia bearing apical and basal appendages is relatively small, and *Seimatosporiopsis* differs quite significantly from them (Sutton *et al.*, 1972). Morphological and nuclear studies of conidia and appendages of *Seimatosporiopsis* was carried out by Abbas *et al.*, (1998).

*Seimatosporiopsis salvadorae* Sutton, Ghaffar & Abbas. *Trans. Br. mycol. Soc.* 59: 295-298 (1972); Abbas, Sutton & Ghaffar *Pak. J. Bot.*, 30: 51-68 (1998).

Fig. 3 (I, II, III) Abbas *et al.*, (1998). [Description amended].

*Conidiomata* pycnidial to eustromatic, when pycnidial then separate, immersed, black, globose to applanate-globose to lageniform, unilocular, when eustromatic then 2-8 conidiomata loosely or compactly aggregated, applanate-globose to irregular multilocular, *ostiolate*, each locule with its own ostiole, 63- 650 x 88-720  $\mu\text{m}$ , wall of *textura angularis*, 5-10 (25) cells thick and 5.6 x 48 (60)  $\mu\text{m}$  wide, clearly differentiated into two layers, the outer layer consists of 2-5 cells, darker and thicker than the inner layer which is 3-8 cells thick, the innermost layer function as conidiogenous cells with no supporting *conidiophores*. *Conidiogenous cells* cylindrical to lageniform to ampulliform to obpyriform, smooth, hyaline, but sometimes brown with 1-4 enterogenous progressively with 1-4 proliferations, wide cytoplasmic channels and minute periclinal thickenings. Sometimes primary conidiogenous cells proliferate into secondary conidiogenous cells with a cylindrical extension forming *conidia*. In this way two collarete regions are distinctly visible; 3.5-19.4 x 2.4-7.2 (12)  $\mu\text{m}$ . Paraphyses present or absent, when present then multicellular, 1-4 septate, simple, hyaline, tubular, sometimes, bulbous at base, apex gradually tapered 18-70 x 1-3.4  $\mu\text{m}$ . *Conidia* initially hogenous later on enterogenous, cylindrical to straight, slightly curved at one or both ends, dark brown, thick-walled, smooth, 3-4 (-5)-euseptate. Cells uninucleate, central cells smaller than the apical and basal cells, 12.5-26 x 5.3-11 (12)  $\mu\text{m}$ , apex obtuse, base initially truncate, but later becoming obtuse, with 1-2 apical or sub-apical, simple or branched filiform cellular, enucleate appendages, and 1-2 basal or lateral cellular, enucleate appendages, 18-40 x 0.8  $\mu\text{m}$ .

On twigs of *Salvadora oleoides*, Karachi, Pakistan 22 Apr. 1970, S.Q. Abbas (IMI 148620a), holotype.

Studies of the fungus on various hosts showed that, though there is considerable variation in conidiomatal shape, size, texture of wall, conidial length and breadth, presence or absence of paraphyses, this is a variable species. In the original description of *Seimatosporiopsis*, Sutton *et al.*, (1972) described conidiomata as pycnidial, separate, immersed, globose, unilocular, ostiolate, 177-279  $\mu\text{m}$  diam., whereas the present study showed that conidiomata are not only pycnidial but there is a tendency for aggregation to form eustromatic conidiomata. The type specimen of *S. salvadorae* (IMI 148620a) and also

*Calotropis procera* (IMI 319169) Fig. 3 IIB. Abbas *et al.*, (1998) showed loose aggregations of 2-3 pycnidia, whereas on *Salvadora* sp. (IMI 178114) and on *Capparis decidua* (IMI 319160) conidiomata are compactly aggregated and eustromatic in nature (Fig. 3 IIC). The shape of conidiomata also varies in different collections, globose in IMI 148620a, holotype of *S. salvadorae*, applanate-globose on *Salvadora oleoides* (IMI 319166) from Mirpursakro, and on *Salvadora oleoides* (IMI 319262) from Karachi, lageniform on *Calotropis procera* (IMI 319159) from Karachi, but irregular on *Salvadora oleoides* (IMI 319164) from Khadeji Fall. There is also variation in size of conidiomata in different collections. Most collections show the same size as described in the type specimen by Sutton *et al.*, (1972). On *Calotropis procera* (IMI 319159) from Karachi conidiomata are smaller 99-132x 99-126  $\mu\text{m}$ , than the type specimen. On *Capparis decidua* (IMI 319160) from Karachi, conidiomata are 150-340 x 166-596  $\mu\text{m}$ , and on *Salvadora oleoides* (IMI 178114) from Lasbella, conidiomata are 159-560 x 108-720  $\mu\text{m}$ , more or less double in size of the type specimen. The texture of the conidiomatal wall is more or less the same as described by Sutton *et al.*, (1972), however wall thickness varies in different collections, 15.5  $\mu\text{m}$  thick in the type specimens (IMI 148620 a) whereas it is 16-32  $\mu\text{m}$  thick in IMI 319164, 6.5-32  $\mu\text{m}$  thick in IMI 178184, 8-48  $\mu\text{m}$  thick in (IMI 319160) and 16-32  $\mu\text{m}$  thick in IMI 319166. Optical and scanning microscopy was also carried out (Fig. 3 IB, Sutton *et al.*, 1972; Fig. 3 IIC, Abbas *et al.*, 1998). There is no variability in shape of the conidiogenous cells between the type specimen and other collections. Conidiogenous cells proliferate enterogenous and progressively with 1-4 percurrent proliferations. Similarly there are some differences in size of conidiogenous cells. Sutton *et al.*, (1972) reported conidiogenous cells 3.5-13 x 4-5.5  $\mu\text{m}$  from the type, whereas in the present study the measurements are 6.5-12x4-5.5  $\mu\text{m}$ , i.e., the lengths of conidiogenous cell are more or less the same, but wider conidiogenous cells have been found in other collections such as 4.8-12  $\mu\text{m}$  wide in IMI 319165, 8-9.6  $\mu\text{m}$  wide in IMI 319166 and 5.6-8  $\mu\text{m}$  wide in IMI 319162. In IMI 178113, longer, wider, conidiogenous cells 9.6-19.5 x 4.8-12  $\mu\text{m}$ , are found. Conidiogenous cells are hyaline in the type specimen and other collections, but they are brown in IMI 319165. Similarly secondary conidiogenous cells are present in IMI 139160 but absent in the type and all other collections. Paraphyses are present in all specimens, including the type 148620a (Fig. 3 IID; Abbas *et al.*, 1998), except for *Calotropis procera* IMI 319159. It is mentioned that in this caption, the number given is 1486209 which a typographical mistake. Sutton *et al.*, (1972) did not describe the paraphyses from the type specimen. There are no differences in conidial morphology, but slight differences in conidial measurements were observed from the type specimen. The conidia measured 12.5-21.5 x 6-8  $\mu\text{m}$  in the type (Sutton *et al.*, 1972). In the present study conidia from the type specimen measure 20-25 x 6.4-7.2  $\mu\text{m}$ . From all other collections conidia are slightly larger (12.5-26 x 5.3-11 (-12)  $\mu\text{m}$ ) than in the type. Sutton *et al.*, (1972) described distosepta in conidia from the type. They appear more correctly to be eusepta as suggested by Sutton (1980). Sutton *et al.*, (1972) mentioned that conidia are generally 3 septate, however occasionally 4 septa are also found. In almost all the collections, conidia are 3-4 septate except (IMI 139165) where not only 3-septate conidia are present but a large number of conidia have 4 and 5 septa. Conidia are uninucleate (Fig. 3 IIIB; Sutton *et al.*, 1998). Appendages are 1-2 simple or branched on apical and basal cells of conidia (Fig. 3 IIE; Abbas *et al.*, 1998). This agrees with the description given by Sutton *et al.*, (1972) from the type, but they did not describe branched appendages from the conidial apex. In IMI 319160,

1-2 simple, branched apical and basal appendages are present. Appendages are cellular, enucleate, without septa separating them from conidia and measure 0.8  $\mu\text{m}$  diam., (Abbas *et al.*, 1998). The cellular nature of the appendages was described by Sutton *et al.*, (1972) and they also mentioned that they differ from the appendages of *Urohendersonia* spp., described by Nag Raj & Kendrick (1971) which are extracellular and develop from the outer mucilaginous sheath covering the conidia. However, the work of Roux (1985) and Roux & Wermelo (1989) on *Urohendersonia platensis* under transmission electron microscopy shows that appendages are of a cellular nature, and are comprised of an inner and outer wall (Abbas *et al.*, 1998). Conidia have an osmiophilic layer, which surrounds the conidia but does not extend beyond the base of appendage. In conidia of *Seimatosporiopsis salvadorae*, there is confusion as to whether septa are present at the base of appendage or not. Appendages arise from the mid-central point of the apical and basal cell and due to the heavy pigmentation of the outer conidial wall, gives the impression of septum at the base of the appendage. In young and mature conidia of IMI 319164 Fig. 3 IIID (Abbas *et al.*, 1998), the optical and scanning electron microscopy revealed that appendages are cellular in nature and there is no septum at the base of appendages separating the conidium and appendage.

The genus *Seimatosporiopsis* has only been reported from the province of Sindh and Balochistan, Pakistan (Ghaffar & Abbas, 1972; Mirza & Qureshi, 1978). Sutton *et al.*, (1972) not only described *Seimatosporiopsis* from Karachi (Pakistan) but in the same paper they pointed out that *Urohendersonia subterranea* Panwar & Bilgrami had priority as the valid and effective name over *U. mysorensis* Nag Raj & Kendrick. Mathur (1979) misunderstood Sutton *et al.*, (1972) and considered *Urohendersonia* as synonymous with *Seimatosporiopsis* and therefore *S. salvadorae* was mistakenly reported from India with *Uroherdrosonia subterranea* in synonymy.

### Specimens examined

#### *Seimatosporiopsis salvadorae* Sutton, Ghaffar & Abbas

On twigs of *Salvadora oleoides* Karachi, Pakistan, 22 Apr. 1970, S.Q. Abbas (IMI 148620a), holotype; on the twigs of *Acacia senegal*, Khadejji Fall, Pakistan, 9 Mar. 1987, S.Q. Abbas UCMH 639; on twigs of *Calotropis procera*, Khadejji Fall, Pakistan, 14 Mar. 1987, S.Q. Abbas UCMH 698 (IMI 319159); on twigs of *Capparis decidua*, Karachi, Pakistan, Apr. 1980, S.Q. Abbas (IMI 319160); on twigs of *Citrullus colocynthes*, Monghopir, Karachi, Pakistan, S.Q. Abbas UCMH 670; on twigs of *Prosopis juliflora*, Karachi, Pakistan, 24 June 1976, S.Q. Abbas (IMI 319163); on twigs of *Salvadora oleoides*, Karachi, Pakistan, 4 Apr. 1972, S.Q. Abbas (IMI 319161); Karachi, Pakistan, 12 Dec., 1972, S.Q. Abbas (IMI 319177); Karachi, Pakistan, 25 Dec., 1972, S.Q. Abbas (IMI 319171); Karachi, Pakistan, 13 Mar. 1974, S.Q. Abbas (IMI 319178); Karachi, Pakistan, 14 Apr. 1974, S.Q. Abbas (IMI 319167); Karachi, Pakistan, 13 Apr. 1975, S.Q. Abbas (IMI 319174); Karachi, Pakistan, 14 Apr. 1975, S.Q. Abbas (319172); Karachi, Pakistan, 22 Apr. 1975, S.Q. Abbas (IMI 319162); Karachi, Pakistan, Apr. 1976, S.Q. Abbas (IMI 319173); Karachi, Pakistan, 13 Apr. 1976, S. Q. Abbas (IMI (319179); Karachi, Pakistan, 14 Apr. 1976, S.Q. Abbas (IMI 319168); Mirpursakro, Sindh, Pakistan, 14 Nov. 1978, S.Q. Abbas (IMI 319166); Karachi, Pakistan, 8 Aug. 1979, S.Q. Abbas (IMI 319176); Karachi, Pakistan, 8 Aug. 1979, S.Q. Abbas (IMI 319169); on *Salvadora persica*, Karachi, Pakistan, 8 Sept. 1972, S.Q.

Abbas (IMI 319175); Karachi, Pakistan, 13 Mar. 1973, S.Q. Abbas (IMI 319180); Karachi, Pakistan, 4 Apr. 1974, S.Q. Abbas (IMI 319165).

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(Received for publication 31 December 2001)