

## Studies on some *Septoria* species from India-II

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In continuation of our previous studies on species of *Septoria* from India (Sukapure & Thirumalachar, 1964), further collections of *Septoria* were made on various hosts from different parts of Maharashtra State and studies. An account of these studies is presented in this paper. The Type materials of the new species are deposited in Herb. Crypt. Ind. Orient, New Delhi, India, National Fungus Collections, Plant Industry Station, Beltsville, Maryland, U.S.A. and Herb. C.M.I. Kew, England.

### 1. A new *Septoria* species on *Colebrookia oppositifolia* Sm.

*Colebrookia oppositifolia* Sm. is a tall aromatic shrub belonging to the family Labiatae. The leaves are large and conspicuous. A variety of leaf spot fungi usually occur on the leaf surface. The rust fungus *Olivea colebrookiae* (Barclay) Thirum. et al. forms dense powdery sori. *Sphaceloma colebrookiae* Wani & Thirum. incite small anthracnose spots. In addition to these, a *Septoria* species was collected in Panhala (Kolhapur) causing severe leaf infection. The infection spots were more than a centimeter in diameter and due to coalescence often covered the entire leaf surface. Comparative studies indicated that the disease was incited by an undescribed species of *Septoria*. Following diagnostic characters are given:—

#### *Septoria colebrookiae* Sukapure & Thirum. Sp. Nov.

Infection follicolous, spots 2—12 mm. in diameter very often 5—10 mm, covering the entire leaf surface and presenting a polygonal pattern due to their sharp delimitation by veins, infection spots brown to chocolate coloured on the upper surface and bottle green or sepia colour on the lower side, margin diffuse. Pycnidia abundant, scattered all over the leaf spots, amphigenous, brown to black, more or less spherical, measuring  $46-80 \times 50-80 \mu$ , ostiole small, circular,  $4-6 \mu$ , in diameter, pycnidial wall thin, composed of layers of light brown rectangular cells; pycnidiospores flexuous. Pycnidiospores hyaline, straight or slightly curved, 1—3 septate, measuring  $25-60 \times 1-2.5 \mu$  chiefly  $36-43 \times 1.5-2.0 \mu$ , tapering at one end and truncate at other.

Habit — on leaves of *Colebrookia oppositifolia* Sm. Panhala 16/8/

1957, H.A.C.C. 1123 (Type) and 26/9/1958; — Kolhapur 21/8/1958 and 2/7/1959; Khandla 2/9/1960 Leg. R.S. Sukapure.

Maculae 2—12 mm, plerumque 5—10 mm diam., amphigenae, irregulariter angulosae, nervis bene limitatae, in epiphylo brunneae, in hypophyllo olivaceo-viridulae vel obscure brunneae, margine diffuso; pycnidia amphigena, dense dispersa, brunnea vel nigrescentia, plus minusve globosa, 40—80 × 50—80  $\mu$ , ostiolo minuto 4—6  $\mu$  diam. metiente praedita; pariete tenuiter membranaceo, pseudoparenchymatico, e cellulis pallide brunneis, irregulariter angulosis composito; sporae filiformes, rectae vel curvulae, 1—3-septatae, 25—60 × 1—2.5  $\mu$ , plerumque 36—43 × 1.5—2  $\mu$ , antice subacuminatae, postice truncatulae.

## 2. An undescribed species of *Septoria* on *Grewia tiliaefolia* Vahl.

*Grewia tiliaefolia* Vahl. is a tree belonging to the family *Tiliaceae* with small umbellate flowers. The species is common throughout the deciduous forests of the State. Spotting of the leaves due to infection by a species of *Septoria* was observed in several places near Khandala, Maharashtra State. The fungus represented an undescribed species of *Septoria*. The description is as follows: —

### *Septoria grewiae* Sukapure & Thirum. Sp. Nov.

Infection foliicolous, spots varying in size usually 5—10 mm, in diameter, distinct, rarely coalescent, light brown along the margin and whitish at centre. Pycnidia sparsely distributed, amphigenous, immersed in the leaf tissue with ostiolo protruding out, 62—80 × 58—81  $\mu$ . Pycnidiospores indistinct; pycnidiospores acicular to cylindric, hyaline, 2—3 septate, measuring 25—45 × 2—3  $\mu$ .

Habit: On leaves of *Grewia tiliaefolia* Vahl. — Khandala 20/7/1958 H.A.C.C. 1124 (Type), Khandala 21/8/1959 and 20/7/1960 Lonavala 21/8/1959 and 15/8/1960. Leg. R. S. Sukapure.

Maculae amphigenae, quoad magnitudinem variables, plerumque 5—10 mm diam., discretae, raro confluentes, ad marginem pallide brunneae, in centro albidae; pycnidia laxae dispersa, amphigena, omnino innata, ostiolo tantum erumpentia, 62—80 × 58—81  $\mu$ ; sporae aciculares vel angustissime cylindraceae, hyalinae, 2—3-septatae, 25—45 × 2—3  $\mu$ .

3. *Septoria launaeae* Khan on *Launaeae nudicaulis* Hook (Mycopathol. Mycol. Appl. 18: 115—116, 1962 Syn. *S. launaeae* Rao Mycopathol. Mycol. Appl. 18: 280—284, 1962).

*Launaea nudicaulis* Hook, a member of the Compositae is a perennial herb bearing deep root stock and pull roots. The leaves are runcinate forming spreading flat growth on ground. A systemic rust fungus *Puccinia butleri* Syd. known to incite morphological deformities such as changing the habit of plants from prostrate to erect condition was described by Butler (1918). On some *Launaea* plants collected at Katraj

Ghats a *Septoria* species inciting circular spots often forming shot-holes was observed. Detailed examination of the fungus and comparative studies with other *Septoria* species indicated that it is identical with *S. launaeae* Khan. The description is as follows: —

Infection foliicolous, spots variable in size and shape, 2—8 mm in diameter circular to irregular, at first brown, later turning grayish-white with a dark brown margin. The infected area as a whole dries up. Shrivels, and drops off leaving a shot-hole. Pycnidia abundant in older spots, prominent, scattered, epiphyllous,  $60\text{--}100 \times 80\text{--}120 \mu$ ; spherical or flattened with a broad well defined ostiole composed of dark cells, pycnidial wall composed of loosely grouped parenchymatous cells, pycnidioophores indistinct, pycnidiospores filiform, blunt at base, sub-acute at apex, straight or less often slightly curved, 2—3 septate,  $15\text{--}24 \times 1\text{--}1.5 \mu$ .

Habit: On leaves of *Launaea nudicaulis* Hook. — Katraj 26/10/1958 H.A.C.C. 1126 (Type). Katraj 29/7/1959 and 15/8/1960. Poona 15/8/1959 and 20/7/1960. Pimpri 26/9/1958, 2/8/1959 and 19/7/1960. Leg. R. S. S u k a p u r e.

#### 4. Septoriosi s of *Phlox drummondii* Hook.

During autumn of 1957, a *Septoria* species inciting severe blotching of leaves of phlox plants was noticed in Pimpri. The disease has been noticed in successive years, widely distributed in various parts of Maharashtra. Infection first appears on leaves as leaf spots followed by necrosis of diseased portion. In case of severe infection the infected spots coalesce and cause extensive leaf blotches and thereby inducing premature defoliation and making the plant look blighted. In general, the disease is of some economic importance. Microscopic examination of the diseased leaves indicated that the fungus is identical with *S. drummondii* Ell. & Ev.

Infection spots foliicolous, spots mostly circular, 5—10 mm. in diameter, at first olivaceous green then withish or bright ochraceous, sometimes with white centre and raised brown margin giving appearance of a frog-eye spots. The spots were variable in form, often confluent and then occupying greater part of the leaf. Pycnidia  $50\text{--}100 \times 50\text{--}80 \mu$ , amphigenous, more on upper surface, densely gregarious, sub-globose, brown, pseudo-parenchymatous, at first with small circular ostiole later opening widely at maturity, surrounded by cells which are much darker than the rest of the cells of the pycnidium; pycnidial wall thin composed of compactly grouped oblong to polyhedral cells  $1\text{--}3 \mu$  in diameter. Pycnidiospores  $2\text{--}3 \mu$ , narrowly bulbous, cylindric, bearing pycnidiospores. Pycnidiospores hyaline, filiform, straight, or sometimes slightly curved with rounded ends;  $20\text{--}55 \mu$  long, averaging  $40 \mu$  mostly  $30\text{--}45 \mu$ , and about  $1\text{--}2 \mu$ , wide, at first continuous finally guttulate, later mostly 3 septate.

Survey of the literature shows that as many as five species of *Septoria* are recorded on *Phlox* species.

Species	Pycnidia in $\mu$	Spores in $\mu$	Septa	Host
Species under study	50—100	20—55 $\times$ 1—2	1—3	<i>Phlox drummondii</i>
<i>S. divaricatae</i> E 11 & Ev.	100—120	15—35 $\times$ 0.5—1	1—3	<i>Phlox divericata</i>
<i>S. phlogis</i> Sacc. & Speg.	150—200	40—60 $\times$ 1—2	1—3	<i>Phlox paniculata</i>
<i>S. drummondii</i> E 11 & Ev.	100	35—50 $\times$ 1.5—2	—	<i>Phlox drummondii</i>
<i>S. vogliniana</i> Sacc. & Trott.	100—150	70—80—120 $\times$ 3	5—9	<i>Phlox drummondii</i>

From the above table, it is evident that the species under study closely resembles *S. drummondii* and different from *S. phlogis* Sacc & Speg. or *S. divaricatae* Ell. & Ev. (= *S. phlogis* Ell. & Ev. non Sacc. & Speg.).

From India only *S. phlogis* was reported by Ramkrishnan (1951) from Sim's park Coonoor.

Habit — on leaves of *Phlox drummondii* Hook H.A.C.C. — 1136. — Pimpri 5/8/1957 & 19/7/1957. Leg. R. S. Sukapure.

5. *Septoria graminum* Desm. on *Digitaria marginata* Link.

*Digitaria marginata* is a fodder grass growing in moist situations. A *Septoria* species inciting leaf spots was collected near Pimpri. On comparative studies, it is found to be similar to *S. graminum* Desm. Ramakrishnan (1951) has reported it on the same host from Walayar, Madras State.

Infection usually foliicolous but sometimes leaf sheath are also attacked by the fungus. Lesions on the leaves linear, 3—5  $\times$  0.5—1 mm, spots light-green at first, later becoming brownish, and finally turning white in the centre and brown at periphery with numerous pycnidia interspersed in the centre. The infected leaves turn yellow and show premature drying up. In case of severe infection the entire plant appears blighted. Pycnidia are few, prominent, arranged in a linear row, moderately erumpent, pale brown, strongly flattened to somewhat flask-shaped, ostiole small, circular, 6—8  $\mu$  in diameter but later opening widely 65—115  $\times$  60—100  $\mu$  in diameter, wall composed of closely knitted cells. Pycnidioophores indistinct or absent. Pycnidiospores hyaline, strongly curved, scoleospores, narrowly obclavate, 28—57  $\times$  1—1.5  $\mu$ , indistinctly 1—2 septate.

Habit — On leaves of *Digitaria marginata* Link H. A. C. C. 1138. — Pimpri 5/6/1959 and 7/7/1960; Koyana Valley 19/9/1960. Leg. R. S. Sukapure.

The organism was isolated in pure culture from pycnidiospores. The spores exuding through the ostioles were spread on potato-dextrose agar and upon germination were transferred aseptically to culture tubes for growth.

In cultures on potato-dextrose agar the fungus produced a conspicuous cushion like heaped-up growth. The surface of the colony was much folded, black with some white aerial mycelium. It was extremely slow growing and a colony seldom exceeded a diameter of 10 mms. even after four weeks at 25° C. Pycnidia of irregular shape were produced in large numbers, appearing as minute raised pin points on the surface, bearing pycnidiospores. The size and shapes of pycnidiospores in artificial culture are the same as found naturally on the host.

6. *Septoria ecliptae* Hirayama on *Eclipta alba* Hask. (Mem. Coll. Agri. Kyoto Imp. Uni. 13, p. 37; 1931).

*Eclipta alba* Hask. is an annual herb belonging to the family Compositae with ligulate ray florets and tubular disk florets. There are two varieties of the plant, one erect and other prostrate, both being common in Maharashtra State. On some *Eclipta* plants in neighbourhood of Pimpri a *Septoria* species inciting circular leaf spots was observed. Comparative studies indicated that the fungus agrees closely with *Septoria ecliptae* described by Hirayama (1931) from Japan. This species has not been recorded previously from India.

Infection foliicolous, spots variable in size and shape, 2—7 mm. in diameter, circular to irregular, following the veins or along the midrib, limited by larger veinlets, light-brown, with well differentiated periphery and sharply demarcated infected region.

Pycnidia inconspicuous, hardly visible macroscopically, few, widely scattered, epiphyllous, moderately erumpent, brown, flattened or somewhat flask-shaped, 40—50 × 43—55 μ in diameter, ostiole small and late to open, wall moderately thick, formed of irregular, oblong, polyhedral parenchymatous cells. Pycnidioophores indistinct; pycnidiospores slender, filiform 20—36 × 1.5—2.0 μ, 2—3 septate, straight, or slightly curved, somewhat pointed at apex and rounded at base but blunt at the apex.

Habit — on leaves of *Eclipta alba* Hask H. A. C. C. — 1137. — Pimpri 10/7/1958 & 17/8/1960; Khandala 20/7/1958, Khandala 20/7/1958, Leg. R. S. Sukapure.

7. *Septoria bakeri* Syd. a new record for Maharashtra State. (Phillip. Jour. Sci. 8; 281; 1930).

*Leucas stelligera* Wall. is an erect herbaceous plant belonging to the family Labiatae. It is common in Deccan, particularly in Mahabaleshwar hills at an altitude of 4800 ft. A species of *Septoria* inciting leaf spot was noticed on the plants growing in Koyna Valley. The fungus was found to be identical with *Septoria bakeri* Syd. previously reported from Pusa on *Leucas* sp.

Infection spots foliicolous, spots circular to irregular, varying in size from 2—5 mm in diameter, usually coalescent, at first pale brown, later white with brown margin, small black dots of pycnidia contrast strongly against the white spots.

Pycnidia  $60-80 \times 50-76 \mu$ , abundant in older spots, scattered, prominent, epiphyllous, very rarely hypophyllous, strongly erumpent, "creosote-brown"; ostiole small, circular to oval,  $6-10 \mu$  in diameter surrounded by much darker cells than the rest of the cells of the pycnidia, outer pycnidial wall composed of one to two layers of light brown, parenchymatous, closely interwoven cells,  $4-10 \mu$ , thick. Pycnidioophores hyaline, flexuous, somewhat filiform to subulate bearing spores. Pycnidiospores filiform, straight or slightly curved, pointed at apex and broad at base with 1—2 septa,  $20-30 \times 1-1.5 \mu$ .

This species is similar to *S. bakeri* Syd. on *Leucas* species.

Habit — on leaves of *Leucas stelligera* Wall H. A. C. C. — 1132. Koyna Valley 20/9/1958. Leg. R. S. Sukapure.

8. *Septoria cynodontis* Fuck. on Bermuda grass. (Sacc. Syll. Fung. III, 562).

*Cynodon dactylon* Pers. popularly known as Dhup grass or Bermuda grass is used for lawns and for forage. A *Septoria* species inciting linear leaf streaks was collected in several places. Morphological studies indicated that the fungus is identical with *S. cynodontis*. The description is as follows: —

Spots linear, brown or gray, variable in size, often confluent, pycnidia not prominent, minute, few, seriatly arranged in a black thin stroma, usually on upper surface, globose to subglobose, opening on the upper side by a very small protrusion of the papilliform ostiole,  $40-50 \times 1.5-2 \mu$ . Pycnidiospores hyaline, filiform,  $50-70 \times 1.5-2 \mu$ , number of septa indistinct.

Habit — on leaves of *Cynodon dactylon* (L.) Pers. H. A. C. C. 1135. Pimpri 20/8/1960, Leg. R. S. Sukapure. — Khandala 20/7/1960, Leg. P. N. Mathur.

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