



New record of genus *Pseudocercospora* from forest flora of North Zone in India

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Abstract- Seven new record of *Pseudocercospora* Speg., viz., *Ps.atromarginalis* on *Solanum nigrum* (Solanaceae), *P. cinerea* on *Vermonia cinerea* (Asteraceae), *Ps. cryptolepidis* on *Cryptolepis buchanani* (Asclepiadaceae), *Ps.meynae-laxiflorae* on *Meyna laxiflora* (Rubiaceae), *Ps. serpentinae* on *Rauwolfia serpentina* (Apocynaceae), *Ps. tagetes-erectae* on *Tagetes erecta* (Asteraceae) and *Ps. urticacearum* on *Urtica* sp. (Urticaceae) are described, illustrated and compared with allied species.

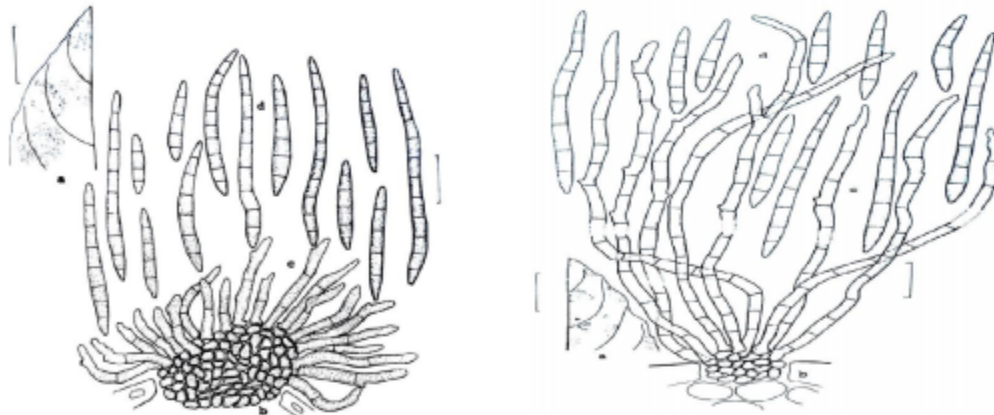
Introduction- *Pseudocercospora* was established by Spegazzini (1910) to accommodate fungi in the *Cercospora* complex characterized by well developed conidiophores intergrated, sympodial, polyblastic and more or less denticulate conidiogenous cells and pale or deeper brown, usually obclavato-cylindric, non-catenate conidia tapering at the base towards an unthickened hilum. According to Deighton (1976) there are probably 300 species described in *Cercospora* which should be transferred to *Pseudocercospora*. The genus is particularly common in the tropics and sub-tropics. In this paper, seven new records of species of *Pseudocercospora* collected from terai belt of North India, are described and illustrated.

Material and Methods- Specimens were collected from terai belt of North Eastern Uttar Pradesh. Infected leaves with distinct symptoms were taken in separate polythene bags. The specimens were dried by the method used for preparing herbarium of phanerogamic plants. A part of each specimen was sent in HCIO (Herbarium Cryptogamiae Indiae Orientalis, New Delhi) for accession. Microscopic slides were prepared and examined under microscope and camera lucida drawing were prepared under 15 x eye piece and 45 x objective combinations. The taxonomic determinations were made with the help of literature and experts.

Results and discussion- On comparing the illustration, description and measurements of the fungi under study with the allied taxa, they were found to be new record from the forest flora of India. These are being described and discussed as follows:

Pseudocercospora atromarginalis (Atk.) Deighton (1976) (Fig. 1)

Leaf spots amphigenous, circular, necrotic, upper whitish gray lower olive brown, upto 12 mm diam., coalescing and spreading on the whole leaf surface with age; Colonies hypophyllous, effuse and finely velvety; Mycelium of hyphae



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Fig. 1. *Pseudocercospora atromarginalis* (Atk.) Deighton (1976)

- a. leaf spots, b. stroma, c. conidiophore,
d. conidia. Scales: a- 20 mm; b, c, d : 20 µm

internal and superficial, branched, septate, smooth walled, sub-hyaline ; Stromata well developed, superficial, pseudoparenchymatous, dark brown, 30.0-47.0 µm in diam., Conidiophores arising from superficial stroma or secondary mycelium, macronematous, mononematous, unbranched, 1-2 septate, smooth walled, geniculate at distal region, erect, straight or slightly sinuous, cylindrical, sub- hyaline, 20.5-45.0 x 3. 0- 5.5 µm; Conidiogenous cells integrated, terminal, polyblastic, sympodial, denticulate, scars-unthickened; Conidia solitary, dry, acropleurogenous, holoblastic, sub- cylindrical to obclavocylindrical, straight to slightly curved, unbranched, 3-11 transversely septate, thin and smooth walled, sub- hyaline, apex acute to obtuse, base obconicotruncate, hilum absent, 24.0-90.5 x 4.5 -6.5 µm.

On living leaves of *Solanum nigrum* L. (Solanaceae); leg. H.S.G. Rao; June, 1993; Bhinga Forest, Bahraich (U.P.); GPU Herb. No. HK 80/2680.

Several *Pseudocercospora* species have been described earlier on the host genus *Solanum* viz., *Ps. atromarginalis* (Atk.) Deighton (1976), *Ps. fasciculata* (Speg.) Deighton (1976), *Ps. modesta* (H.Syd.) Deighton, *Ps. solani-asperi* (Baker & Dale) Deighton (1976), *Ps. solani- longispora* (Yen) Yen (1978), *Ps. solani-melongenicola* Goh & Hsieh in Hsieh & Goh (1990), *Ps. solani-torvicola* Goh & Hsieh (1989), *Ps. trichophila* (Stev.) Deighton (1976) and *Ps. venezuelae* (Chupp) Deighton (1976). A comparison of morphotaxonomic features of our collection with these species of *Pseudocercospora* shows that the former corresponds to *Ps. atromarginalis*. This fungus was originally described by Baker & Dale as *Cercospora atromarginalis*. Later, Deighton recombined the same into *Pseudocercospora*. Our collection shows slight differences with those of *Ps. atromarginalis*. These differences may be due to the eco-climatic variations.

Pseudocercospora cinereae (Pavgi & Singh) Deighton (1976) (Fig. 2)

Leaf spots hypogenous, sub- circular to irregular, discrete, sometimes coalescing, spreading on the whole leaf surface, light brown, 2- 10 mm diam.,

Colonies hypophyllous, effuse; Mycelium of hyphae internal, branched, septate, smooth walled, light olivaceous; Stromata developed, sub- epidermal, pseudoparenchymatous, dark brown, 15.0-23.0 µm in diam.; Conidiophores arising from erumpent or slightly superficial stroma in fascicles, macronematous, mononematous, unbranched and slightly branched at distal region, septate, smooth, geniculate, erect, straight, flexuous or sinuous, cylindrical, pale olivaceous, 160- 400 x 4. 0 -6.5 µm; Conidiogenous cells integrated, terminal, polyblastic, sympodial, denticulate, scars- unthickened; Conidia solitary, dry, holoblastic, acropleurogenous, cylindrical to obclavocylindrical, straight and rarely slightly curved, unbranched, 3-8 transversely septate, thin and smooth walled, apex acute to sub-acute and obtuse, base sub-truncate to obconicotruncate, hilum unthickened, hyaline to sub-hyaline, 41. 0 - 108. 5 x 4.5-7.0 µm.

Fig. 2. *Pseudocercospora cinereae* (Pavgi & Singh) Deighton (1976)

- a. leaf spots, b. stroma, c. conidiophore,
d. conidia. Scales : a- 20 mm; b, c, d : 20 µm

On living leaves of *Vernonia cinerea* Less. (Asteraceae) ; leg. H.S.G. Rao; September, 1992; Jarwa Forest, Gonda (U.P.); GPU Herb. No. HK 88/2688.

Several species of *Pseudocercospora* have been described earlier on the host genus *Vernonia* viz., *Ps. cinereae* (Pavgi & Singh) Deighton (1976), *Ps. vernonacearum* Shukla and al. (1982) and *Ps. noveboracensis* Goh & Hsieh in Hsieh & Goh (1990). A comparison of morphotaxonomic features of our collection with these species of *Pseudocercospora* shows that the former corresponds to *Ps. cinereae*. This fungus was originally described by Pavgi & Singh as *Cercospora cinereae*. Later, Deighton (1976) recombined it into *Pseudocercospora*. The morphotaxonomic features of our collection mostly correspond



to those of *Ps. cinereae*. The slight variations in these features which are notable in our fungus may be due to differences in eco- climatic conditions.

Pseudocercospora cryptolepidis (Pand. & Gangl.) Deighton (1976) (Fig. 3)

Leaf spots amphigenous, primarily very small, angular and vein limited, light brown, later coalescing with each other, dark brown to black, spreading on the whole leaf surface, upto 13 mm wide.; Colonies epiphyllous, effuse, sometimes velvety; Mycelium of hyphae internal, branched, septate, light olivaceous, smooth walled; Stromata developed, immersed, sub-stomatal, pseudoparenchymatous, light to dark brown, 17 - 20 µm in diam.; Conidiophores arising solitary to in loose groups from stromata, macronematous, mononematous, branched to unbranched, septate, smooth, erect to flexuous, slightly geniculate, cylindrical,

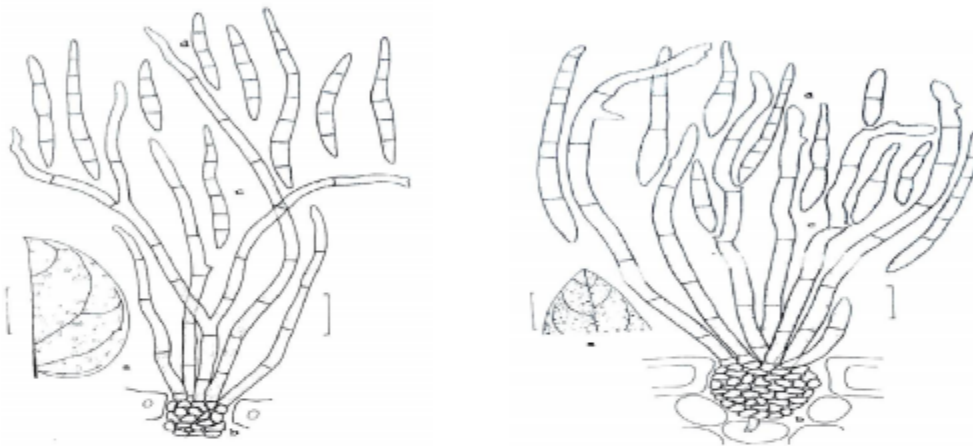


Fig. 3. *Pseudocercospora cryptolepidis* (Pand. & Gangl.) Deighton (1976)

a. leaf spots, b. stroma, c. conidiophore,
d. conidia. Scales : a- 20 mm; b, c, d : 20 µm

pale olivaceous, 88.5 -200.0 x 2.5- 5.0 µm; Conidiogenous cells integrated, terminal, mono to polyblastic, slightly denticulate, scars unthickened; Conidia dry, solitary, acropleurogenous, holoblastic, sub-cylindrical to obclavate-cylindrical, straight to curved and sinuous, unbranched, 3- 7 transversely septate, thin and smooth walled, light olivaceous, apex acute to obtuse, base obconicotruncate, 28.5 - 88.0 x 3.5 - 6.5 µm.

On living leaves of *Cryptolepis buchanani* R. & S. Syst. (Asclepiadaceae); leg. H.S.G.Rao; January, 1990; Raniapurwa Sohelwa West, Bahraich (U.P.); GPU Herb. No. Hk 50/2650.

Comparison of morphotaxonomic features of our collection with the *Pseudocercospora* species already described shows that the former corresponds largely to *Ps. cryptolepidis* (Pand. & Gangl.) Deighton (1976) on the same host. This species was originally described by Pandotra and Ganguly as *Cercospora cryptolepidis*. Later, Deighton (1976) recombined it into *Pseudocercospora*. Our collection shows slight differences in morphotaxonomic features, in comparison with those of *Ps. cryptolepidis*. These differences may be due to the ecoclimatic variations.

Pseudocercospora meynae-laxiflorae Kamal and al. (1985) (Fig. 4)

Leaf spots hypogenous, primarily small (2- 4 mm wide), angular and vein limited, afterwards coalescing and spreading on the whole leaf surface, dark brown; Colonies hypophyllous, effuse, finally velvety; Mycelium of hyphae internal, branched, septate, smooth walled, light olivaceous; Stromata well developed, immersed and sub-stomatal, pseudoparenchymatous, light brown, 31- 42 µm in diam.; Conidiophores fasciculate, unbranched, septate, smooth, macronematous, mononematous, geniculate, erect, straight to flexuous or sinuous, cylindrical, dark olivaceous, 48- 513 x 6- 8 µm; Conidiogenous cells integrated, terminal, polyblastic, sympodial, denticulate, with conical to blunt denticles, scars-unthickened;



Conidia solitary, dry, holoblastic, acropleurogenous, sub-cylindrical to obclavate cylindrical, straight to slightly curved, unbranched, 1-7 transversely septate, smooth, thin walled, apex sub-acute to obtuse, rarely rounded, base obconicotruncate with unthickened hila, sub-hyaline, 34-123 x 7-8 μ m.

On living leaves of *Meyna laxiflora* Robyns. (Rubiaceae); leg. H.S.G.Rao; March, 1992; Purnagiri Hill, Nainital (U.P.); GPU Herb. No. HK 86/2686.

This fungus was originally described by Kamal and al. (1985) on the same host. The morphotaxonomic features of our collection are mostly similar to those of *Ps. meynae-laxiflorae*. The slight variations in these features which are notable in our fungus may be due to variation in eco-climatic conditions.

Fig. 4. *Pseudocercospora meynae-laxiflorae* Kamal and al. (1985)

- a. leaf spots, b. stroma, c. conidiophore,
d. conidia. Scales : a- 20 mm; b, c, d: 20 μ m.

Pseudocercospora serpentinae (Pand. & Hus.) Deighton (1976) (Fig. 5)

Leaf spots amphigenous, circular to sub-circular, upper dark brown and lower light brown, coalescing and spreading on the whole leaf surface later on, 12-20 mm in diam.; Colonies amphiphylous, effuse and velvety; Mycelium of hyphae internal, septate, branched, smooth walled, sub-hyaline; Stromata developed, partly immersed, sub-stomatal, loosely composed, pseudoparenchymatous, 17-21 μ m in diam.; Conidiophores arising singly or in fascicles of 3-7, macronematous, unbranched, rarely branched, septate, smooth walled, geniculate mostly at the tip region, erect, straight or sinuous, cylindrical, brownish olivaceous, 57.5-201.0 x 3.5-5.7 μ m; Conidiogenous cells integrated, terminal, polyblastic, sympodial, denticulate, scars-unthickened; Conidia solitary, dry, holoblastic, acropleurogenous, sub-cylindrical to obclavate cylindrical, straight to curved, unbranched, 4-8 transversely septate, thin and smooth walled, apex acute or slightly obtuse, base obconicotruncate, hilum unthickened, sub-hyaline, 37.5 - 67.5 x 2.5 - 4.5 μ m.

On living leaves of *Rauwolfia serpentina* Benth. (Apocynaceae); leg. H.S.G. Rao; November, 1989; Khatema, Nainital (U.P.); GPU Herb. No. HK 72/2672.

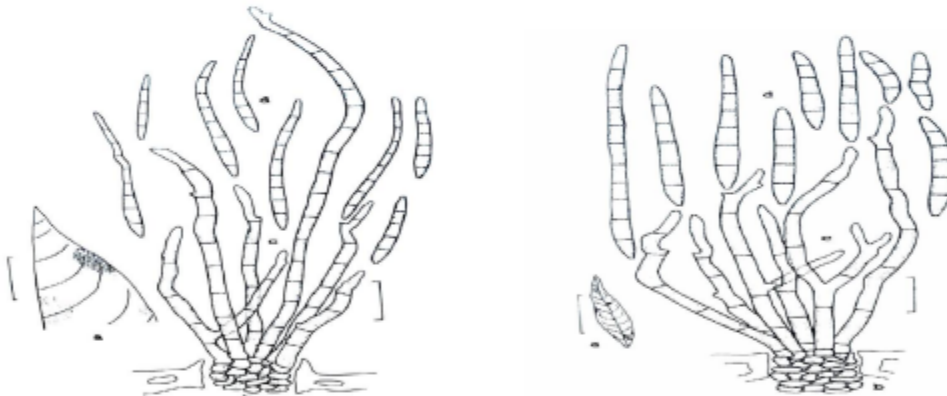


Fig. 5. *Pseudocercospora serpentinae* (Pand. & Hus.) Deighton (1976)

- a. leaf spots, b. stroma, c. conidiophore.
d. conidia. Scales : a- 20 mm; b, c, d: 20 μ m

Three *Pseudocercospora* species have been described earlier on the host genus *Rauwolfia*, viz. *Ps. liebenbergii* (H. Syd.) Deighton (1976), *Ps. rauwolfiae* Deighton (1983) and *Ps. serpentinae* (Pand. & Hus.) Deighton (1976). A comparison of morphotaxonomic features of our collection with these species of *Pseudocercospora* shows that the former corresponds to *Ps. serpentinae*. Thus fungus was originally described by Pandotra & Husain as *Cercospora serpentinae*. Later, Deighton (1976) recombined it into *Pseudocercospora*. The slight variations in these features which are notable in our fungus may be due to

differences in eco-climatic conditions.

Pseudocercospora tagetes- erectae Goh & Hsieh (1989) (Fig. 6)

Leaf spots amphigenous, circular to sub-circular, 1-2 mm wide, discrete, sometimes coalescing with each other, light brown; Colonies hypophyllous, effuse; Mycelium of hyphae internal, branched, septate, smooth, thin walled, light olivaceous to sub- hyaline; Stromata moderately developed, immersed, sub-stomatal, pseudoparenchymatous, light brown, 18 - 24 μm in diam. ; Conidiophores arising in fascicles of 4- 8 from stromata, macronematous, mononematous, sparingly branched, septate, smooth, geniculate, erect, straight to flexuous, cylindrical, mid to light olivaceous, 84.0-145.0 x 3.0-5.0 μm ; Conidiogenous cells integrated, terminal, polyblastic, denticulate, sympodial, scars-unthickened; Conidia solitary, dry, acropleurogenous, holoblastic, sub- cylindrical to obclavate-cylindrical, mostly straight, slightly curved, unbranched, 3- 10 transversely septate, smooth and thin walled, light olivaceous, apex acute to obtuse, base obconicotruncate, hilum unthickened, 29.50 - 123.50 x 3. 5- 6 0 μm .

On living leaves of *Tagetes erecta* L. (Asteraceae); leg. H.S.G.Rao; September, 1992; Harriya Forest, Gonda (U.P.); GPU Herb. No. HK 56/ 2656.

Pseudocercospora tagetes-erectae was initially described by Goh & Hsieh (1989) on the same host from Taiwan. The morphotaxonomic features of our collection mostly correspond to those of this fungus. The slight differences in these features which are notable in our fungus may be due to variation in eco-climatic conditions.

Fig. 6. *Pseudocercospora tagetes- erectae* Goh & Hsieh (1989)

- a. leaf spots, b. stroma, c. conidiophore,
d. conidia. Scales : a- 20 mm; b, c, d: 20 μm

Pseudocercospora urticacearum Verma and al. (1989) (Fig. 7)

Leaf spots amphigenous, irregular, light gray to dark gray, 3- 8 mm in diam. coalescing with each other; Colonies hypophyllous, effuse, velvety; Mycelium of hyphae external and superficial, branched, septate, smooth walled, sub- hyaline; Stromata poorly developed or absent; Conidiophores arising from superficial stroma or secondary mycelium, macronematous, mononematous, much branched, smooth walled, septate, not geniculate, sub-erect, slightly flexuous and sinuous, cylindrical, light olivaceous, 250 - 630 x 4. 0 -7.0 μm .; Conidiogenous cells integrated, terminal, polyblastic, sympodial, cylindrical, less denticulate, scars-unthickened; Conidia solitary, dry, holoblastic, acropleurogenous, obclavate-cylindrical, straight to curved, unbranched, 4- 8 transversely septate, thin and smooth walled, light olivaceous, apex sub- acute to obtuse, rarely rounded, base obconicotruncate, hilum unthickened, 43.5- 101.0 x 3.7 -6.5 μm . On living leaves of *Urtica* sp. (Urticaceae); leg. H.S.G. Rao; October, 1990; Purnagiri Hill, Nainital (U.P.); GPU Herb. No. HK 78/2678. This fungus was originally described by Verma and Kamal in Budathoki and al. (1989) on the same host from Nepal. The morphotaxonomic features of our collection are mostly similar to those of *Ps. urticacearum*. The slight variations in these features which are notable in our fungus may be due to variation in eco-climatic conditions.

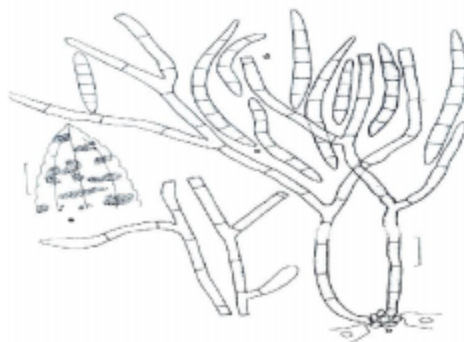




Fig. 7. *Pseudocercospora urticacearum* Verma and al. (1989)

- a. leaf spots, b. stroma, c. conidiophore,
d. conidia. Scales : a- 20 mm : b, c, d, : 20 μ m

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