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# REMARKS ON SPECIES OF PHOMA REFERRED TO PEYRONELLAEA—III

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Additional data are given on synonymy and hosts. The ubiquitous species commonly known as *Phoma prunicola* (Opiz) Wollenw. & Hochapf., a later homonym of *Phoma prunicola* Schw., is renamed *Phoma pomorum* Thüm. *Phoma indianensis* (Deshpande & Mantri) Boerema *& al.* appears to be conspecific with *Phoma glumarum* Ell. & Tracy described earlier; its occurrence on rice seed is widespread.

The dictyochlamydospore-producing species of *Phoma*, also known under the generic name *Peyronellaea* (Boerema *& al.*, 1965, 1968), are 'polyphagous', weakly parasitic fungi. Our comparative study of *Phoma*-like fungi in culture has revealed some new data on the synonymy and hosts of these dictyochlamydospore-producing species of *Phoma*.

In contrast with our earlier publications author's names in the present paper are abbreviated according to the European lists compiled by Ainsworth (1961: 37–41) and Grummann (1963: 59–74).

## Phoma glomerata (Corda) Wollenw. & Hochapf.

*Phoma monocytogenetica* Curzi *apud* Curzi & Barbaini *in* Atti Ist. bot. Univ. Lab. crittogam. Pavia III, **3**: 169. 1927.
*Phoma polymorpha* (Planchon) Verona *in* Cellulosa **1939**: 27. 1939 ("n. nom.").

To the numerous synonyms listed in our previous papers (Boerema *& al.*, 1965, 1968) the two cited above can be added.

*Phoma monocytogenetica*, collected near Pescara (Abruzzi, Italy) and described from dry branches of lemon, was studied in vitro (CBS 235.28; deposited March 1928, Prof. Pollacci, PAV). It produces *Alternaria*-like dictyochlamydospores, typical of *P. glomerata*. The pycnidiospores are described as "oblongo ellipsoideis, continuis, guttulatis, 5,5–7 × 2,5 $\mu$, hyalinis, nebulosis"; this is also in agreement with the characteristics of the spores of *P. glomerata*.

Planchon (1900) in his diagnosis of *Alternaria polymorpha* indicated that the species possessed a pycnidial form. Verona, however, held the opinion that the species was obviously a *Phoma*, also capable of producing *Alternaria*-like spores. When therefore

Verona introduced *Phoma polymorpha* he proposed not, like he thought, a new name, but a new combination.

*Alternaria polymorpha* was synonymized with *P. glomerata* (Boerema & *al.*, 1965).

ADDITIONAL DATA.—It is interesting to note that Chantarasnit (1969) recorded the isolation of *P. glomerata* from three Nigerian samples of rice seed. In South Africa this fungus has been isolated from rice seed grown in The Philippines (personal communication Dr. W. F. O. Marasas, Plant Protection Research Institute, Pretoria).

The host plants from which we have isolated *Phoma glomerata* are listed in Table I.

TABLE I

HOST PLANTS FROM WHICH PHOMA GLOMERATA HAS BEEN ISOLATED

| | | | | | |
|---|---|---|---|---|---|
| Cactaceae | 4 | Liliaceae | 4 | *Pyrus* (1) | |
| *Cereus* (1) | | *Hyacinthus* (1) | | Rutaceae | 1 |
| *Montagnella* (2) | | *Allium* (3) | | *Citrus* (1) | |
| *Zygocactus* (1) | | Palmae | 1 | Salicaceae | 1 |
| Caryophyllaceae | 1 | *Phoenix* (1) | | *Salix* (1) | |
| *Dianthus* (1) | | Papilionaceae | 2 | Solanaceae | 5 |
| Compositae | 6 | *Lupinus* (1) | | *Lycopersicum* (3) | |
| *Chrysanthemum* (6) | | *Phaseolus* (1) | | *Solanum* (2) | |
| Cucurbitaceae | 1 | Pinaceae | 2 | Umbelliferae | 1 |
| *Cucumis* (1) | | *Cedrus* (1) | | *Daucus* (1) | |
| Gramineae | 3 | *Pinus* (1) | | Valerianaceae | 1 |
| *Avena* (1) | | Ranunculaceae | 2 | *Valerianella* (1) | |
| *Phragmites* (1) | | *Ranunculus* (2) | | Violaceae | 1 |
| *Triticum* (1) | | Rosaceae | 6 | *Viola* (1) | |
| Juglandaceae | 1 | *Fragaria* (1) | | Vitaceae | 1 |
| *Juglans* (1) | | *Malus* (4) | | *Vitis* (1) | |

The ciphers in the table refer to the number of isolates we made of *Phoma glomerata*. In the period 1958–1969, 44 isolates were made from diseased or dead plant material distributed over 19 families and 29 genera of Phanerogams. The isolates were obtained from stems (20), leaves (5), roots (4), and seeds or fruits (15).

## PHOMA POMORUM Thüm.

*Phoma prunicola* (Opiz) Wollenw. & Hochapf. *in* Z. ParasitKde **8**: 595. 1936; not *Phoma prunicola* Schw. *in* Trans. Am. phil. Soc. II, **4**: 249. 1832 ("1834"; = Synopsis Fung. Am. bor.).

*Phoma pomorum* Thüm., Fungi pomicoli 105. 1879.

*Phoma bismarckii* Kidd & Beaumont *in* Trans. Br. mycol. Soc. **10**: 104, 105. 1924.

In none of all the papers dealing with this ubiquitous fungus it has been noted that the combination *Phoma prunicola* made by Wollenweber & Hochapfel is illegitimate since it has been preoccupied by Schweinitz in 1832. According to its type in

Schweinitz's herbarium (PH) the binomium *Phoma prunicola* Schw. (later renamed *Phyllosticta prunigena* Grove; misapplied) refers to a species of *Asteromella* (small pycnidia with bacilliform spores; cf. Rupprecht, 1959: 12, 13).

For the synonymy of the present fungus (Boerema & *al.* 1965, 1968) the next name available appears to be *Phoma pomorum* Thüm. (1879). There is an older synonym, *Phyllosticta pyrina* Sacc. (1878), but the transfer to *Phoma* would result in a later homonym. *Phoma pyrina* (Fr.) Cooke is the name given to a pycnidial fungus without ostiole that is apparently identical with *Myxofusicoccum mali* (Bres.) Weindlmayr (1965).

TABLE II

HOST PLANTS FROM WHICH PHOMA POMORUM HAS BEEN ISOLATED

| | | | | | |
|---|---|---|---|---|---|
| Aceraceae | 1 | *Chamaecyparis* (1) | | *Robinia* (1) | |
| *Acer* (1) | | *Juniperus* (1) | | *Vicia* (1) | |
| Amaryliidaceae | 1 | Ericaceae | 11 | Pinaceae | 1 |
| *Galanthus* (1) | | *Calluna* (6) | | *Pinus* (1) | |
| Araucariaceae | 1 | *Erica* (5) | | Polygonaceae | 1 |
| *Araucaria* (1) | | Geraniaceae | 1 | *Fagopyrum* (1) | |
| Berberidaceae | 3 | *Pelargonium* (1) | | Ranunculaceae | 2 |
| *Berberis* (2) | | Guttiferae | 1 | *Clematis* (2) | |
| *Mahonia* (1) | | *Hypericum* (1) | | Rosaceae | 40 |
| Boraginaceae | 1 | Hydrophyllaceae | 1 | *Fragaria* (19) | |
| *Borago* (1) | | *Nemophila* (1) | | *Malus* (13) | |
| Campanulaceae | 1 | Iridaceae | 3 | *Prunus* (4) | |
| *Campanula* (1) | | *Gladiolus* (2) | | *Pyrus* (1) | |
| Caryophyllaceae | 2 | *Iris* (1) | | *Rosa* (2) | |
| *Dianthus* (1) | | Liliaceae | 5 | *Sorbus* (1) | |
| *Lychnis* (1) | | *Allium* (1) | | Salicaceae | 1 |
| Chenopodiaceae | 1 | *Convallaria* (1) | | *Populus* (1) | |
| *Beta* (1) | | *Dracaena* (1) | | Saxifragaceae | 1 |
| Compositae | 2 | *Lilium* (1) | | *Philadelphus* (1) | |
| *Chrysanthemum* (2) | | *Ornithogalum* (1) | | Solanaceae | 3 |
| Corylaceae | 2 | Oleaceae | 2 | *Lycopersicum* (1) | |
| *Alnus* (1) | | *Ligustrum* (1) | | *Solanum* (2) | |
| *Betula* (1) | | *Syringa* (1) | | Umbelliferae | 2 |
| Cruciferae | 1 | Palmae | 1 | *Daucus* (2) | |
| *Lunaria* (1) | | *Phoenix* (1) | | Urticaceae | 1 |
| Cucurbitaceae | 2 | Papilionaceae | 4 | *Urtica* (1) | |
| *Cucumis* (2) | | *Phaseolus* (1) | | | |
| Cupressaceae | 2 | *Pisum* (1) | | | |

The ciphers in the table refer to the number of isolates we made of *Phoma pomorum*. In the period 1961–1969, 101 isolates were made from diseased or dead plant material distributed over 31 families and 51 genera of Phanerogams. The isolates were obtained from stems (61), leaves (27), roots (5), and seeds or fruits (8).

The conspecificity of *Phoma bismarckii* with *P. pomorum* is taken from Boerema & Dorenbosch (1970). Wollenweber & Hochapfel (1936: 587) erroneously listed *P bismarckii*, described from "spotted apples", as a synonym of *Phoma striaeformis* Dur. & Mont., but the latter refers to a species of *Phomopsis*—*P. striaeformis* (Dur. & Mont.) Grove.

ADDITIONAL DATA.—With respect to the hosts of *P. pomorum* we note that apart from apple, pear, and species of *Prunus*, the fungus has often been isolated from different parts of stunted strawberry plants ("Black root rot complex"). The *Phoma* species isolated by Berkeley & Lauder-Thompson (1934) and Wilhelm (1952) from roots of strawberry probably also represents *P. pomorum*. Other "common" hosts appear to be species of *Erica* and *Calluna*. In this connection it is of interest to learn that Wilhelm (l.c.) indicated his *Phoma*-isolates from strawberry roots as "*P. radicis?*", a complex name referring to the different *Phoma*-species described by von Ternetz (1907) and Rayner (1922) from roots of Ericaceae, each with a second epithet relating to the plant from which it had been isolated (see Boerema, 1968). Further we note that *P. pomorum* represents one of the fungi repeatedly isolated by Hanlin (1969) from peanut fruits during their early stages of development.

A general review of the host plants from which we have isolated *Phoma pomorum* is given in Table II.

## PHOMA JOLYANA Pirozynski & Morgan-Jones

ADDITIONAL DATA.—Boerema *& al.* (1965), redescribing the present species as *Phoma musae* (Joly) Boerema, Dorenb. & Kest., recorded species of *Musa* and *Eriobotrya* as hosts. To these can now be added rice, *Oryza sativa*, mango, *Mangifera indica*, and pecan, *Carya pecan*. The rice isolate has been obtained from a lot of seed grown in India (cf. Chantarasnit, 1969), the other isolates are made from fruits of mango in India and developing pecan fruits in the U.S.A. (isolate obtained from Prof. R. T. Hanlin, University of Georgia). It is probable that *P. jolyana* is much more widely distributed in tropical and subtropical regions than is presently known.

## PHOMA GLUMARUM Ell. & Tracy

*Phoma glumarum* Ell. & Tracy *in* J. Mycol. **4**: 123. 1888. — *Phyllosticta glumarum* (Ell. & Tracy) Miyake *in* J. Coll. Agric. imp. Univ. Tokyo **2**: 252. 1910. — Neotype: on glumes of *Oryza sativa*, Ocean Springs, Mississippi, Sept. 1889, Tracy (BPI).

*Phoma glumicola* Speg. *in* Revta Mus. La Plata **15**: 36. 1908. — *Phyllosticta glumicola* (Speg.) Hara, Dis. Rice Plant 164. 1918. — Holotype: on glumes of *Oryza sativa*, São Paulo, Sept. 1905, Usteri (LPS-6021).

*Phyllosticta glumarum* Sacc. *in* Nuovo G. bot. ital. II, **23**: 207. 1916. — *Phyllosticta oryzina* Padw., Manual Rice Dis. 163. 1950 [as '*P. o.* (Sacc.) Padwick, nom. nov.']. — Holotype: on glumes of *Oryza sativa*, Los Baños, Philippines, Aug. 1914, Baker (Herb. Saccardo '3771', PAD).

*Phoma depressitheca* Bub. *in* Annln naturh. Mus. Wien **28**: 203. 1914. — Holotype: on leaves of *Eragrostis cynosuroides*, Kwerisch, April 1910, Handel-Mazzetti (No. 870, Herb. Bubák, BPI).

*Phoma chartae* Verona *in* Cellulosa **1939**: 27. 1939.
*Phoma indianensis* (Deshpande & Mantri) Boerema, Dorenb. & Kest. *in* Persoonia **5**: 203. 1968. — *Peyronellaea indianensis* Deshpande & Mantri *in* Mycopath. Mycol. appl. **30**: 341–344. 1966.

This species, whose characteristics in vitro have earlier been described in detail under the name *Phoma indianensis* (Boerema *& al.*, 1968), proves to be ubiquitous in tropical and subtropical regions.

It appears to occur in various parts of the world on seeds of rice, among other things; this was shown by isolates obtained for identification from Miss Chantarasnit, who worked at the Danish Government Institute of Seed Pathology for Developing Countries in Copenhagen. The isolates had been taken from rice seed samples from Ghana, India, Nigeria, The Philippines, and Thailand (Chantarasnit, 1969). The morphological characters of the pycnidia on the rice seeds agree completely with those of an original collection of *Phoma glumarum* Ell. & Tracy (designated as neotype, BPI, see above), and the holotypes of *Phyllosticta glumarum* Sacc. (PAD, see above) and *Phyllosticta glumicola* Speg. (LPS, see above).

In their description of *Phoma glumarum* Ellis & Tracy called the spores "smoky-hyaline" and gave the length as 3–4 $\mu$, which is rather shorter than the usual 3.5–6 $\mu$. It is now recognized as a typical feature of all *Phoma* species producing dictyochlamydospores that the colour of the pycnidiospores varies from hyaline to brown. Saccardo, who was probably unaware of the variability of the length and colour of the spores, supposed his species to be different from Ellis & Tracy's fungus (". . . differe sporulis longioribus, perfecte hyalinis . . ."). In the description of *Phoma glumicola* Spegazzini did not refer to the earlier described *Phoma glumarum*. Spegazzini suggested that his species represents the pycnidial state of the ascomycete *Didymella glumicola* Speg. Such a relation, however, has not been proved.

Miyake, Saccardo and Hara favoured the opinion that the present pycnidial fungus belonged to the form-genus *Phyllosticta* Pers. ex Desm. In true *Phyllosticta*,[1] however, the spores are considerably larger and often possess a slimy appendage (personal communication Mr. H. A. van der Aa, CBS). The various other *Phoma* and *Phyllosticta* species described from rice seem to be different from *Phoma glumarum*, cf. Padwick (1950).

In phytopathological literature the infection of rice seed by *Phoma (Phyllosticta) glumarum* is referred to as "glume blight", "grain blight", or "kernel blight". It is recorded from Argentina, Brazil, Ceylon, China, India, Japan, Uganda, and U.S.A. The infected kernels are said to develop poorly or not at all and they are frequently dark in colour and worthless (Padwick, 1950).

Through inoculation experiments with different strains of the fungus Chantarasnit (1969) obtained various disease symptoms on rice, such as reduced germination of

[1] Type species: *Phyllosticta cruenta* (Fr.) Kickx (Donk, 1964: 11, 12; Stafleu & Voss, 1969: 101); syn. *Phyllostictina* Syd.

seed, various degrees of root-rot, dying-off, and different kinds of spots on leaves and culms. Usually, however, the fungus only behaved like a weak parasite. The rice varieties tested showed some differences in susceptibility.

*Phoma depressitheca* has been described from dead leaves of *Eragrostis cynosuroidis* from the area of Kwerisch (Babylon). Its synonymy with *P. glumarum* is based on a comparative study of the holotype (BPI) and a living culture labelled *P. depressitheca* (IMI 109742, made in 1964 by Coady from leaves of *Eragrostis abyssinica* collected near Addis Ababa, Ethiopia). The epithet "*depressitheca*" refers to a lateral flattening of the pycnidia attributable to the anatomical structure of the leaves of *Eragrostis*.

In the culture description of *Phoma chartae*, isolated in Italy from paper, it was noted that the fungus only produces chlamydospores of various types on media with a high carbon-nitrogen ratio ("molte in via di differenziazione, di forma e dimensioni non constanti, intercalari o laterali"), whereas on media with a relatively low carbon-nitrogen ratio it forms mainly pycnidia. This relation between the C/N ratio of the media and the production of pycnidia or chlamydospores is a typical feature of the 'Peyronellaeas' (cf. Boerema & *al.*, 1965: 49). The type-culture of *P. chartae* deposited in the "Centraalbureau voor Schimmelcultures" (CBS) has been lost, but original notes on it made by Dr. T. H. van Beyma thoe Kingma indicate that the fungus is further characterized by the production of a conspicuous reddish pigment. These data, together with the description of pycnidia and pycnidiospores, have led us to conclude that *P. chartae* is the same as *P. glumarum*, which is known to grow well on paper (Boerema & *al.*, 1968: 203, as '*Phoma indianensis*').

Further we note that the fungus has recently been isolated from seed of wheat grown in India (isolate obtained from Miss Chantarasnit, see above), seed of *Citrus* in India (isolate obtained from Dr. S. B. Mathur, Institute of Seed Pathology for Developing Countries, Copenhagen), and developing peanut fruits in Georgia, U.S.A. (isolate obtained from Prof. R. T. Hanlin, 1969).

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