

ADDITIONAL NOTES ON PHOMA HERBARUM

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The sporogenesis of *Phoma herbarum* Westend., and *Phoma* species in general, is discussed. Additional data are given on the synonymy of *P. herbarum* and the status of its various infraspecific taxa is revised. Most of the 'varieties' and 'forms' appear to belong to the ubiquitous species *Phoma exigua*. *Phoma macdonaldii* is proposed as a new species and *Stagonospora samarorum* (Desm.) as a new combination.

In a preceding paper (Boerema, 1964) the diagnostic characteristics of the ubiquitous saprophyte *Phoma herbarum* Westend., type species of the form-genus *Phoma* Sacc., were amply discussed and provisional data were given on the synonymy of the fungus. The present paper presents a description of the sporogenesis of *P. herbarum*, based upon recent electron-microscopic observations on the spore development in this and other species of *Phoma*. The differences from the spore development of *Ascochyta pisi* Lib., type species of the form-genus *Ascochyta* Lib., are also discussed. Further information is supplied on the synonymy of the species, including confusing misinterpretations and misidentifications. Finally the identity of the numerous formae and varieties of *P. herbarum* is discussed in alphabetical order.

The names of authors are abbreviated first in accordance with Grummann's "Autorenliste" (1963: 59-74), and further with Ainsworth's list (1961: 37-41). Herbaria and culture collections are coded according to Lanjouw & Stafleu (1959) and the list of abbreviations in the catalogue of the American Type Culture Collection (Ed. 8, 1968). Titles of journals are abbreviated in accordance with the "World List of Scientific Periodicals", 1963-1965.

The spore-forming process

Recent electron-microscopic observations on the spore development and spore secession in *Phoma herbarum* and other *Phoma*-like fungi have furnished more precise information on the essential features of the sporogenesis in the form-genus *Phoma* (see also Boerema, 1965).

The first spores in a pycnidium make their appearance as soon as a cavity in the pycnidium-primordium develops. Electron-microscopic observations lend strength to the hypothesis that these first spores in the pycnidium are formed by budding or cleavage of the cytoplasm of the original central cells (Boerema, 1964: fig. 4; Boerema, 1965: fig. 31; compare also Madelin, 1966: fig. 6).

In mature pycnidia the spores arise successively at the top of somewhat cuspidate but otherwise undifferentiated cells lining the central pycnidial cavity (Sutton, 1964; Boerema, 1964). The first spore begins as a papilla arising from a broad base, secondarily acquiring the shape of a bud. The progressive thickening of the top of the parent cell as successive spores are formed and secede ('collarlette', see below) leads to the subsequent development of spores as buds (Brewer & Boerema, 1965: fig. 1, pls. 1-3; Boerema, 1965: figs. 1-27; Sutton & Sandhu, 1969: figs. 11-19). This kind of sporogenesis can be characterized as a 'monopolar repetitive budding process' (Boerema, 1965). The spore wall develops as a distinct layer within the papillate or bud-like initial, whose own primary wall is continuous with that of the parent cell (Brewer & Boerema, 1965: fig. 1A, pls. 1-3; Sutton & Sandhu, 1969: figs. 11-13). Concurrently with the differentiation of the spore wall the separation of the spore cytoplasm from that of the parent cell starts with the centripetal development of a wall-layer at the base of the spore, combined with the development of a wall-layer closing the parent cell (Brewer & Boerema, 1965: fig. 1D-E, pl. 2; Sutton & Sandhu, 1969: figs. 15-19). Disintegration of the continuous periclinal wall material completes the secession of the spore (Brewer & Boerema, 1965: fig. 1F; Sutton & Sandhu, 1969: fig. 18). Remnants of the periclinal layer remain on the parent cell, contributing to the 'collarlette' at the top of it. With each new spore secession this collarlette becomes wider, with an increasing series of wall remnants ('ridges' or 'annellations'; Boerema, 1965: figs. 15-27; Sutton & Sandhu, figs. 14-15). The processes of differentiation of the spore wall, development of the two separating transverse wall-layers, and the disintegration of the periclinal wall material are associated with an abundant production of mucilaginous substances (Brewer & Boerema, 1965: pls. 2, 3).

In our opinion it is not expedient to fit this spore-forming process into one of the modes of sporogenesis distinguished by Hughes (1953), Tubaki (1958), and others (compare Madelin, 1966) in their scheme for the conidial ontogeny in Hyphomycetes, their classifications being based primarily on observations with the light microscope only. To do so at present would only cause confusion because of possibly differing interpretations ['blastospores' (compare Madelin 1966: fig. 6), 'acrophialospores' (Sutton, 1964), 'porospores' (Boerema, 1964; compare also Campbell, 1968), 'annellospores', "where the points at which conidia secede are at approximately the same level" (Sutton & Sandhu, 1969)].

Sutton & Sandhu (1969) are of the opinion that the spore development in the type species of *Ascochyta*, *A. pisi* (see Brewer & Boerema, 1965), is probably identical with that of *Phoma*. In *A. pisi* and other related species of *Ascochyta* the separation of the spores indeed takes place by the development of two transverse walls and 'rupture' of the connecting wall parts, also leaving a 'collarlette' with ridges or annellations on the wall at the top of the parent cell (Brewer & Boerema, 1965: figs. 3D-E, pl. 5). However, it is characteristic of *A. pisi* for the spore-initial to be extremely thin-walled while the separating transverse walls are developing (Brewer & Boerema, 1965: pls. 5, 6). Against the innerside of the initial spore wall

a new wall-layer arises secondarily, simultaneously dividing the spores into two or more cells, 'distoseptation' (Brewer & Boerema, 1965: fig. 4, pl. 7). The septation of the spores in the species of *Ascochyta*, therefore, is an essential part of the 'finishing' (completion) of the spore-development. If *Phoma* species show septate spores (which happens very seldom with *P. herbarum*), this septation process, 'euseptation', occurs independently of the sporogenesis and completion of the spore wall (Brewer & Boerema, 1965). This may explain why genuine *Ascochyta* species also in vitro produce mainly 2- or more-celled spores, whereas pseudoforms—that is to say *Phoma* species, whose pycnidia in vivo may contain a variable percentage of septate spores—produce in culture mainly 1-celled spores. This offers a very simple method for distinguishing species of *Phoma*—including 'pseudo-Ascochyta'—from true *Ascochyta* species in culture.

In this paper electron-micrographs are intentionally omitted, as these will be published later. The above is therefore restricted to references to the electron-microscopy studies by Brewer & Boerema (1965) and Sutton & Sandhu (1969).

Synonymy

Previously (Boerema, 1964) much attention was paid to the synonymy of *P. herbarum*. Since then many new data have accumulated. In the following all the synonyms known at present are listed with reference to type material and to host or substratum.

PHOMA HERBARUM Westend.

Phoma herbarum Westend. in Bull. Acad. r. Belg. Cl. Sci. 19 (3): 118. 1852. — Lectotype: Herb. crypt. Belg., Ed. Beyaert-Feys, Fasc. 20, No. 965. 1854, on *Onobrychis viciifolia*, type locality, date and collector not known (Herb. Westendorp & Wallays, BR), see Persoonia 3: 10, 12, pl. 1, figs. 1, 2. 1964.

Phoma exigua var. ('b') *minor* Desm. in Anns Sci. nat. (Bot.) III, 11: 283. 1849; Pl. crypt. N. France, Ed. 1, Fasc. 38, No. 1869b. 1849. — *Phoma exigua* var. *ranunculorum* Desm. ex Sacc. in Sylloge Fung. 3: 134. 1884 (name change). — Lectotype: on *Ranunculus bulbosus*, Parc de Lébissey, July 1847, Roberge (Herb. Desmazières, PC), see Persoonia 5: 23, pl. 1-below. 1967 and the discussion below.

Phoma charticola Speg. in An. Soc. cient. argent. 10: 153, 154. 1880. — Type: not known to be in existence, on remnants of paper in a forest, type locality: Recoleta, Argentina, see discussion below.

Phoma urticae Schulzer & Sacc. in Hedwigia 23: 91. 1884; in Sylloge Fung. 3: 140. 1884. — *Leptophoma urticae* (Schulzer & Sacc.) Höhn. in Hedwigia 59: 262. 1918 (misapplied). — Type: not known to be in existence, on *Urtica dioica*, type locality: Vinkovce (manusc. Schulzer von Müggenburg, Schwämme Pilze Ung. Slav. 700. 1869); for specimens examined, see Persoonia 3: 12, 13. 1964.

Phoma oleracea Sacc. in Michelia 2 (1): 91. 1880; in Revue mycol. 3 / No. 9: 36. 1881; in Sylloge Fung. 3: 135. 1884. — Type: not known to be in existence, on *Brassica oleracea*, type locality: Quevilly near Rouen, for discussion of interpretation, see Persoonia 3: 13, 14. 1964.

Phoma oleracea var. *dipsaci* Sacc. in *Michelia* 2 (2): 337. 1881; in *Sylloge Fung.* 3: 135. 1884. — Holotype: on *Dipsacus sylvestris*, Rouen, no date, Malbranche (Herb. Saccardo '109' pro parte, PAD), see discussion below.

Phoma oleracea var. *helianthi-tuberosi* Sacc. in *Michelia* 2 (2): 337. 1881; in *Sylloge Fung.* 3: 135. 1884. — Holotype: on *Helianthus tuberosus*, Quevilly near Rouen, no date, Letendre (Herb. Saccardo '1311', PAD), see discussion below.

Phoma oleracea var. *scrophulariae* Sacc. in *Michelia* 2 (2): 337. 1881; in *Sylloge Fung.* 3: 135. 1884. — Holotype: on *Scrophularia nodosa*, type locality and date not known, Roumeguère (Herb. Saccardo '276', PAD), see discussion below.

Phoma oleracea var. *urticae* Sacc. in *Michelia* 2 (2): 337. 1881; in *Sylloge Fung.* 3: 135. 1884. — Holotype: on *Urtica urens*, type locality and date not known, Roumeguère (Herb. Saccardo '321', PAD), see discussion below.

Phoma herbarum var. *erysimi* Roum. in *Revue mycol.* 3 / No. 9: 30. 1881 ("crysimi"; nomen nudum). — Isotype: Roum., Fungi gall. exs., Cent. 11, No. 1011. 1881, on *Erysimum vulgare*, Toulouse, autumn, date and collector not known (Herb. Roumeguère, PC), see discussion below.

Phoma herbarum var. *sambuci* Roum. in *Revue mycol.* 3 / No. 9: 30. 1881 (nomen nudum). — Isotype: Roum., Fungi gall. exs., Cent. 11, No. 1014. 1881 ("f. sambuci"), on *Sambucus nigra*, Toulouse, autumn, no date, Roumeguère (Herb. Roumeguère, PC), see discussion below.

Phoma herbarum f. *chenopodii-albi* Roum. in *Revue mycol.* 5: 28. 1883 (nomen nudum). — Isotype: Roum., Fungi gall. exs., Cent. 25, No. 2484. 1883, on *Chenopodium album*, Quevilly near Rouen, spring 1882, Letendre (FH), see discussion below.

Phoma herbarum var. *tetragoniae* Sacc. & Berl. in *Revue mycol.* 8: 35. 1886; in *Sylloge Fung.* 10: 180. 1892 (in both cases "*Phoma herbarum* **Ph. Tetragoniae*"). — Holotype: on *Tetragonia expansa*, Algeria, no date, Trabut (Herb. Saccardo '68', PAD), see discussion below.

Aposphaeria violacea Bertel in *Öst. bot. Z.* 54: 205, 233, 288. 1904. — *Phoma violacea* (Bertel) Eveleigh in *Trans. Br. mycol. Soc.* 44: 577. 1961. — Neotype: on white paint, Kew, 1911, Massee (= type specimen of *Phoma pigmentivora*, K), see *Trans. Br. mycol. Soc.* 44: 577. 1961, *Persoonia* 3: 14. 1964, and discussion below.

Phoma oleracea f. *bryoniae* Sacc. in *Annls mycol.* 7: 435. 1909. — Holotype: on *Bryonia alba*, Tamsel, Brandenburg, May 1909, Vogel (Herb. Saccardo '73', PAD); isotype: Syd., Mycoth. germ., Fasc. 17, No. 809. 1909 (M, PAD); see discussion below.

Phoma pigmentivora Massee in *Bull. misc. Inf. R. bot. Gdns Kew* 8: 326. 1911. — Holotype: on white paint, Kew, 1911, Massee (K), see under *Aposphaeria violacea*.

Phyllosticta ruscigena Sacc. in *Nuovo G. bot. ital.* II, 22: 45. 1915. — Holotype: on *Ruscus hypophyllum*, Ta Braxia, Malta, Dec. 1913, Caruana-Gatto (Herb. Saccardo '369', PAD), see discussion below.

Phoma herbarum f. *humuli* Gonz.-Frag. in *Trab. Mus. nac. Cienc. nat., Madr., Ser. bot.* 12: 30. 1917. — Holotype: on *Humulus lupulus*, Bot. Garden, Madrid, Aug. 1916, Caballero (MA-2084), see discussion below.

Phoma herbarum f. *minor* Unamuno in *An. Jard. bot. Madr.* 2 ('1941'): 56. 1942. — Holotype: non-existent (information Dr. E. Paunero, MA), on *Digitalis obscura*, type locality: Hoz de Beteta, see discussion below.

Phoma herbarum var. *lactaria* Sutton in *Trans. Br. mycol. Soc.* 47: 501. 1964. — Holotype: on rubber tubing of milking machine, Leicester, Derbyshire, no date, Pyman (IMI-104608); see discussion below.

Phoma hibernica Grimes, O'Connor & Cummins in *Trans. Br. mycol. Soc.* 17: 99-101. 1932. — Type: dried culture from cream, Cork, no date, Grimes (K), see *Persoonia* 3: 14, 15. 1964 and discussion below.

Phoma lignicola Rennerfelt in *Svenska SkogsvFör. Tidskr.* 35: 60. 1937. — Type: culture from woodpulp, Sofiechem, April 1937, Rennerfelt (CBS-276. 37), see *Persoonia* 3: 15. 1964.

The oldest known name for the ubiquitous saprophytic species *Phoma herbarum* seems to be *Phoma exigua* var. *minor*. The handwritten annotations accompanying the lectotype material of this infraspecific taxon (see Boerema & Höweler, 1967: pl. 1-below) suggest that the fungus is a specific parasite of *Ranunculus* species. Its microscopical characters (spores $3.4-5.1 \times 1.7-3.4 \mu$, usually $4.8 \times 2.6 \mu$), however accord reasonably well with those of the saprophytic *P. herbarum*, whereas no similar pycnidial parasite is known from *Ranunculus* species. Its identity with *P. herbarum* also agrees with Desmazières' view; he was of the opinion that it represents only a small-spored variant of a ubiquitous fungus; compare Boerema & Höweler (1967), who also provided documentation on other specimens of *P. exigua* var. *minor*. Although *P. exigua* var. *minor* antedates *P. herbarum*, the epithet '*minor*' cannot have priority (Edinburgh-code: Art. 60) because of its being a varietal epithet.

Nearly all the specimens preserved in Saccardo's herbarium under the name *Phoma herbarum* and generally filed as forms or varieties appear to belong to fungi quite different from *P. herbarum* s.s.; see the following chapter. As previously (Boerema, 1964: 13) noted, the explanation is that Saccardo's idea of the spore dimensions of *P. herbarum* differs from the present concept of this fungus as based on the characteristics of the lectotype at Brussels. '*Phoma herbarum* **Ph. Tetragoniae*' is the only variety described by Saccardo & Berlese that can be considered to be a true synonym of *P. herbarum* s.s. The holotype of this infraspecific taxon, consisting of six stem pieces and with the same annotations on the label as those cited in the protologue, shows numerous pycnidia, whose characteristics agree completely with those of *P. herbarum*. In the index of Sylloge Fung. 10 it is cited as 'var.', in Sylloge Fung. 13 as 'subsp.' and on the label of the type as 'f'.

Phoma herbarum var. *erysimi* Roum., var. *sambuci* Roum., and f. *chenopodii-albi* Roum. are nomina nuda, as the names were published without descriptions. The isotypes, consisting of various stem parts with numerous pycnidia, reveal morphological characters identical with those of *P. herbarum* s.s. on stems and twigs. Apparently Roumeguère as well found them morphologically identical with *P. herbarum* s.s., so that the names are of value only in so far as they record the hosts.

The identity of *Phoma herbarum* f. *humuli* Gonz.-Frag. with *P. herbarum* s.s. was established by examining the holotype, which is composed of various stem pieces with many pycnidia. Gonzáles Fragoso noted that it differs from the 'tipo', i.e. *P. herbarum* f. *humuli* Sacc., in its spore dimensions. He did not know, however, that the form described by Saccardo actually represents a different fungus, namely the ubiquitous weak- and wound-parasitic *Phoma exigua* Desm. The latter is very probably identical with the '*Phoma herbarum*' in south- and mid-England observed in association with a wilting of hop bines (Wormald, 1939: 261); it is dealt with in the next chapter under f. *humuli* Sacc.

The original material of *Phoma herbarum* f. *minor*, described by Unamuno from dead stems of *Digitalis obscura* in Spain, has not been preserved. The identity of this '*minor*' form with *P. herbarum* s.s. is based on its spore dimensions, $4-5.5 \times 2.5 \mu$, which agree completely with the usual spore size of *P. herbarum*.

Phoma herbarum var. *lactaria*, recently described by Sutton from the rubber parts of a milking machine, was studied in vitro (culture made from a dried culture of the type). It shows the characteristics, including pigment formation, typical of the numerous isolates of *P. herbarum* that were examined. Sutton compared the characteristics of his isolate with those of the lectotype of *P. herbarum*, but it should be pointed out that this lectotype cannot possibly cover the variability of the characteristics in vitro.

The type of *Phoma oleracea* Sacc., collected by Letendre at Quevilly (near Rouen) on *Brassica oleracea*, has not been found in Saccardo's herbarium. The identity of *P. oleracea* with *P. herbarum* and the confusion in literature between it and *Phoma* (*Plenodomus*) *lingam* Tode ex Fr. has already been amply discussed (Boerema, 1964: 13, 14). Since type specimens of the infraspecific taxa of *P. oleracea* are represented in Saccardo's herbarium it was possible to check their identity with *P. herbarum*.

The original specimen (three stem pieces) on which Saccardo based the variety *Phoma oleracea* var. *dipsaci* ("sperm. $5 \times 1\frac{1}{2}$ ") also contains the type of *P. herbarum* f. *dipsaci* ("sperm. $8-9 \times 3-4$ "), which appears to be identical with *Phoma exigua* (see next chapter), while the characteristics of the small-spored *P. oleracea* var. *dipsaci* agree fairly well with *P. herbarum* s.s. The saprophyte *P. herbarum* is often found on dead plant material in association with weak-parasitic or true parasitic pycnidial fungi (cf. Boerema, 1964: 13).

The type material of *Phoma oleracea* var. *helianthi-tuberosi*—previously (Boerema, 1964) listed as a synonym on account of its spore dimensions ($5 \times 2 \mu$)—consists of three stem pieces bearing, among other things, a pycnidial fungus agreeing completely with *P. herbarum* (spore dimensions $5-5.5 \times 2-2.5 \mu$). It should be noted that McDonald (1964) applied the name *P. oleracea* var. *helianthi-tuberosi* to the pycnidial stage of the causal organism of a disease of the commercial sunflower, *Helianthus annuus*, known as 'black stem'. Recently Frezzi (1968) pointed out that this stage belongs to a species of *Leptosphaeria*, viz. *L. lindquistii* Frezzi. Through the kind cooperation of Dr. McDonald we were in a position to study a typical isolate of this 'black stem' fungus. The microscopic characteristics of its pycnidia appear to be very different from those of both *P. herbarum* and the type specimen of *P. oleracea* var. *helianthi-tuberosi*. Its growth-characters in vitro show some similarity with those of *Phoma* (*Plenodomus*) *lingam*, which also belongs to a *Leptosphaeria*, viz. *L. maculans* (Desm.) Ces. & DNot. (see Boerema & van Kesteren, 1964). McDonald's interpretation of *P. oleracea* var. *helianthi-tuberosi*, therefore, seems to us unacceptable.¹

¹ As no older name appears to be available for the pycnidial state of *Leptosphaeria lindquistii*, I propose to name it after Dr. W. C. McDonald, who was the first to study the 'black stem' parasite of sunflowers. The Latin diagnosis is a translation of McDonald's characterization of the pycnidial stage (compare also Frezzi, 1964):

***Phoma macdonaldii* Boerema, spec. nov.**

Pycnidiis subglobosis, leniter papillatis, brunneis pallidis, nigrescentibus, $155-308 \mu$ diam.

The type material of *Phoma oleracea* var. *scrophulariae* (a single stem piece glued to a sheet of paper) appears to contain two *Phoma*-like fungi. One of these has spore dimensions different from those given in the diagnosis of var. *scrophulariae*; it has not been more closely investigated and is not dealt with here. The other, on which the diagnosis appears to have been founded, proved to have the characteristics typical of *P. herbarum*; its spore-description had already led me to make this assumption (Boerema, 1964: 10, 14). It should be noted that *P. oleracea* var. *scrophulariae* differs from the fungus-isolate described by Dennis (1946: 35, 36) as '*P. oleracea* var. *scrophulariae*' (*Phoma*-'Group XII'), which does not agree with *P. herbarum*.

The holotype of *Phoma oleracea* var. *urticae*—on the grounds of the spore dimensions previously listed as a synonym of *P. herbarum* (Boerema, 1964: 10, 14)—consists of a single stem piece (glued to a sheet of paper) bearing a pycnidial fungus whose characteristics fully confirm its identity with *P. herbarum*. Not only the spore characters but also the shape and structure of the pycnidia are in full agreement with it. *Phoma herbarum*, it may be recalled, is repeatedly found on stems of nettle, the paratype having been collected on *Urtica dioica* as well (BR; Boerema, 1964: 12; Sutton, 1964: 501); see also Dennis (1946: 34), who described an isolate of *P. herbarum* from nettle under its synonym *Phoma urticae* (Boerema 1964: 13).

The type of *Phoma oleracea* f. *bryoniae* now preserved in Saccardo's herbarium (PAD) was collected in 1909 by P. Vogel. Duplicates were later distributed by Sydow. The type and two copies of these duplicates were studied. They are composed of various stem pieces bearing numerous pycnidia with 1-celled spores identical in shape and size with those of *P. herbarum* on herbaceous stems, leading to the conclusion that *P. oleracea* f. *bryoniae* is another synonym of *P. herbarum*. Later Petrak distributed exsiccata of *Phoma oleracea* collected on *Bryonia alba* (Petr., Mycoth. gen. No. 376; leg. P. Vogel, May 1920). Examination of a copy received on loan from the 'Staatsherbarium' at München (M) shows this fungus to be a different species, viz. the ubiquitous *Phoma exigua*.

The synonyms *Aposphaeria violacea* (= *Phoma violacea*), *Phoma pigmentivora*, and *P. hibernica* listed above have already been amply discussed (Boerema, 1964: 14, 15). At that time, however, no attention was paid to the paper by Mrs. Nicot-Toulouse (1952) in which she had concluded that *A. violacea*, which occurs on paint, is a species different from the ubiquitous *P. hibernica* (= *P. herbarum*).

The differential character was assumed to lie in the pycnidia, which in *A. violacea*

Sporulis hyalinis, continuis, reniformibus vel oblongis, utrinque obtusis, 4.3–7.2 × 1.4–2.9 μ. In foliis, caulibus, petiolis et capitulis *Helianthi annui*, Manitoba.

A dried culture on a sterile lemon leaf made in 1964 by Dr. McDonald and deposited in the Herbarium of the Department of Botany, University of Manitoba, Winnipeg (WIN) is indicated as the type of *Phoma macdonaldii*. A culture of the type is deposited in the 'Centraal-bureau voor Schimmelcultures' (CBS-381.67) at Baarn.

tiation is also denied by the behaviour of cultures of *P. herbarum* which, when isolated from plants and transferred to paint, produce symptoms similar to those of the original paint strains (Boerema, 1964).

The description of *Phoma charticola*, found in "charta stercorata putrescente" would seem to suggest *P. herbarum* which is known to grow well on decaying paper. The original material of *P. charticola* is not preserved.

Phyllosticta ruscigena was described from small circular dark-rimmed spots on the cladodia of *Ruscus hypophyllum* and *R. aculeatus*. In addition to an examination of the characters of a living culture (CBS-212.57) made by Bertini (1957) from similar spots on the cladodia of *Ruscus hypoglossum* a study of the characteristics of the holotype revealed the identity of *P. ruscigena* with *P. herbarum*. In both cases the fungus occurred on the spots together with typical *Ruscus*-fungi, like *Phyllosticta hypoglossi* (Mont.) Allesch. ("hippoglossi") = *Phyllostictina hypoglossi* (Mont.) Petr. & H. Syd. (type material; compare Petrak & Sydow, 1927: 203) and *Leptosphaeria rusci* (Wallr.) Sacc. with its conidial state *Coniothyrium ruscicola* (Dur. & Mont.) Sacc. (type material and the material studied by Bertini, l.c.; compare Curzi & Barbaini, 1927: 179; Müller & Tomašević, 1957²; and Lacoste, 1965). It is evident that the dark-rimmed spots described are not caused by *P. herbarum*, which is only a secondary invader.

Identity of the forms and varieties described

The information newly obtained on the characters of *Phoma herbarum* makes it desirable to reconsider the status of its various forms and varieties. In agreement with Westendorp's concept of *P. herbarum* as a necrotrophic species ("sur les tiges mortes d'un grand nombre de plantes herbacées"), all these infraspecific taxa are also found on dead plant material, especially herbaceous stems. Since *Phoma exigua* is the pycnidial fungus most frequently met with on herbaceous plants (compare Boerema & Höweler, 1967), many of the forms and varieties assigned to *P. herbarum* prove to belong to *P. exigua*.

They are treated here in alphabetical order.

absinthii. — *P. herbarum* f. *absinthii* Sacc. in *Michelia* 1 (5): 523. 1879; in *Sylloge Fung.* 3: 133. 1884. — Holotype: Quevilly near Rouen, no date, Letendre (Herb. Saccardo '746', PAD). — Host: *Artemisia absinthium*.

The holotype is a single stem piece which, to judge from the annotations on the label and from its origin, was clearly used by the author for the description of

² These authors, referring to a study by Brefeld & von Tavel (1891) on *Leptosphaeria rusci*, erroneously cite *Phyllosticta ruscicola* Dur. & Mont. [≡ *Coniothyrium ruscicola* (Dur. & Mont.) Sacc.] as '*Phyllosticta ruscigena* Dur. & Mont.', which would suggest the existence of an earlier homonym of *P. ruscigena* Sacc.

the spores of this infraspecific taxon.³ It contains many pycnidia with hyaline 1- and 2-celled spores. It agrees with the characteristics of *Phoma exigua* as isolated in the Netherlands from all kinds of Compositae (cf. Boerema & Höweler, 1967: Table II).

a c h i l l e a e. — *P. herbarum* f. *achilleae* Thüm. in Fungi austr., Cent. 9, No. 883, 1874 (nomen nudum). — Lectotype: (Fungi austr. No. 883) Krems, 1871, von Thümen (W). — Host: *Achillea millefolium*.

The label accompanying the exsiccata only gives information on the provenance of the material, but it lacks a description.

The lectotype in Vienna contains only scolecosporous pycnidia, the microscopical characters of which agree with those of *Rhabdospora pleosporoides* (Sacc.) Sacc., a species occurring on dead stems of all kinds of plants, among others *Achillea millefolium* (see Jørstad, 1965: 78, 79). Allescher (1899: 329) also noted that the copy (B?) he saw contains a species of *Rhabdospora*.

The copy at Torino (TO), on the other hand, appears to contain a species of *Diplodia* which cannot be further identified.

a n e t h i. — [*P. herbarum* var. *anethi* Westend. apud Thüm. in Fungi austr., Cent. 10, No. 982, 1874 (nomen nudum). —] *Phoma anethicola* Allesch. in Rab. KryptogFlora, Pilze 6: 265, 1898 ("1901"). — Lectotype: (Fungi austr. No. 982) Teplitz, 1872, von Thümen (Herb. Winter, B); isotype (Herb. Saccardo, PAD). — Host: *Anethum graveolens*.

The exsiccata of *P. herbarum* var. *anethi* distributed by von Thümen lacked a diagnosis, but Allescher, using the copy in Winter's herbarium (five stem pieces) and raising the variety to specific level, gave a short description.

This copy, which we designate as lectotype (one selected stem piece), contains numerous typical thick-walled pycnidia of *Phoma complanata* (Tode ex Fr.) Desm. which is a ubiquitous species on Umbelliferae, compare Grove (1935: 59, 60). For a description in vitro, see Dennis (1946: 31, 32). The isotype in the herbarium of Saccardo, consisting of four stem pieces, contains the same fungus.

³ The original specimens of the various forms and varieties of *P. herbarum* described by Saccardo are generally accompanied by annotations on the spore dimensions and/or by drawings of the spores and provided with numbers, as sometimes noted in Michelia.

The manner in which the material was packed or glued to a piece of paper, the kind of paper used, and the handwriting often made it possible also to check whether the identity of the collectors corresponds with those noted by Saccardo in Michelia for the various forms of *P. herbarum* [indicated by capital letters, explained in Michelia 1 (5): 500, 1879 and 2 (1): 39, 1880].

ansoniae-salicifoliae. — *P. herbarum* f. *ansoniae-salicifoliae* Berl. & Roum. in *Revue mycol.* **9**: 178 ("162"). 1887 (nomen nudum). — Isotype: Roum., *Fungi sel. exs.*, Cent. 43, No. 4218. 1887, Bot. Garden, Coimbra, autumn 1885, Moller (FH). — Host: *Ansonia salicifolia*.

This form was introduced without a description. The isotype in FH consists of two stem pieces and contains many small pycnidia with irregular fusoid spores, usually somewhat curved and attenuate at one end. Most of these spores are 1-celled, $5.5-10 \times 2-3 \mu$, but several larger ones, $17-25 \times 2.5-3.5 \mu$, show 1-3 septa. Spores of this kind are characteristic of a saprophytic species, first described as *Phoma samarorum* Desm. [*in* *Pl. crypt.* N. France, Ed. 1, Fasc. 7, No. 349. 1828; matrix: key-fruits (samarae) of *Fraxinus excelsior*; Holotype: Herb. Desmazières, PC]. For illustration of the spores, see Wollenweber & Hochapfel (1936: 604), who considered the species to belong to the genus *Septoria*, *S. samarorum* (Desm.) Wollenw. & Hochapf. ("*S. samarorum*"). As it is neither a *Phoma* nor a true *Septoria* species we assign it provisionally to the form-genus *Stagonospora* (Sacc.) Sacc., although we fully realize that this genus is urgently in need of a revision: ***Stagonospora samarorum*** (Desm.) Boerema, *comb. nov.* (basionym, *Phoma samarorum* Desm., l.c.). In vitro this slow-growing fungus is characterized by a yellow-brownish to greenish discoloration of the agar media, while the mycelial mat may also show yellow-greenish tinges. The isolates studied were obtained from soil and necrotic tissue of species of *Aubrietia*, *Delphinium*, *Hedera*, *Lavas*, *Sambucus*, *Tradescantia*, *Urtica*, and *Viburnum*.

antherici. — *P. herbarum* f. *antherici* Hollós in *Annls hist.-nat. Mus. natn. hung.* **8**: 3. 1910. — Type: non-existent (information Museum of Natural History at Budapest); Type locality: Nagy-Körös. — Host: *Anthericum liliago*.

The description is in accordance with the characteristics of *Phoma exigua* on material of *Anthericum liliago* from the Netherlands (tested by isolation).

anthirrhini. — *P. herbarum* f. *anthirrhini* Sacc. in *Michelia* **2** (2): 337. 1881; in *Sylloge Fung.* **3**: 133. 1884. — Type: Alençon, Orne, no date, Gillet (Herb. Saccardo '7', PAD). — Host: *Anthirrhinum majus*.

The holotype comprises three stem pieces and contains numerous pycnidia which agree with those of *Phoma exigua*. The latter was also isolated from dead stems of *Anthirrhinum majus* in the Netherlands.

aristolochiae-siphonis. — *P. herbarum* f. *aristolochiae-siphonis* Sacc. in *Michelia* **2** (2): 337. 1881; in *Sylloge Fung.* **3**: 133. 1884. — Holotype: Dép. de l'Eure, no date, Malbranche (Herb. Saccardo '89', PAD). — Host: *Aristolochia durior* (= *A. siphon*).

The holotype, composed of three stem pieces, contains many pycnidia which correspond fully with those of *Phoma exigua* on indigenous material of *Aristolochia durior* (tested by isolation).

artemisiae-campestris. — *P. herbarum* f. *artemisiae-campestris* Thüm. in *Fungi austr.*, Cent. 7, No. 700. 1873 (nomen nudum); ex Allescher in Rab. *KryptogFlora*, Pilze 6: 329. 1899 (“1901”, “f. *Artemisiae* Thüm.”). — Isotype: (*Fungi austr.* No. 700) Krems, 1871, von Thümen (W). — Host: *Artemisia campestris*.

The exsiccata of this form are not accompanied by a diagnosis, but Allescher subsequently gave a description of the spores of the isotype (B?) he has seen. The isotype we examined (W) contains a *Phomopsis* species with only α -spores ($6.8-12.5 \times 2.5-3.5 \mu$). Possibly it represents the conidial stage of the ‘*Artemisia*-hostform’ of *Diaporthe arctii* (Lasch) Nitschke, see Wehmeyer (1933: 26, 27).

blattariae. — *P. herbarum* f. *blattariae* Sacc. in *Michelia* 2 (1): 93. 1880; in *Sylloge Fung.* 3: 133. 1884. — Type: not known to be in existence; type locality: Quevilly near Rouen. — Host: *Verbascum blattaria*.

In Saccardo’s herbarium no material of this form was found. It may be inferred from Sydow’s ‘*Index universalis*’ to the ‘*Sylloge Fung.*’ (Sydow, 1898) that the host was *Verbascum blattaria*. The description reads: “sperm. $10-12 \times 4$, rectiuscula 2-4-guttulata; perithecia globoso-depressa 90-100 micr. d.,” which does not correspond with the characteristics of any ubiquitous *Phoma*-like fungus known to us. Perhaps it is a fungus specific of *Verbascum blattaria* and related species, but thus far we have failed to find or isolate such a fungus.

brassicae. — *P. herbarum* f. *brassicae* Sacc. in *Sylloge Fung.* 3: 133. 1884. — Type: not known to be in existence; type locality not known. — Host: *Brassica* sp.

Material of this form is not present in Saccardo’s herbarium. According to Boerema & Höweler (1967) *P. herbarum* f. *brassicae* may be considered to be a synonym of *Phoma exigua*. The latter frequently occurs on the dead stems of various species of *Brassica*, where it is sometimes confused with the cabbage parasite *Phoma lingam*, also known as *Plenodomus lingam*, see Maas (1965: 116).

calystegiae. — *P. herbarum* f. *calystegiae* Sacc. in *Michelia* 2 (1): 93. 1880; in *Sylloge Fung.* 3: 133. 1884. — Holotype: Rouen, no date, Malbranche (Herb. Saccardo ‘64’, “f. *convolvuli*”, PAD). — Host: *Calystegia sepium* (*Convolvulus sepium*).

The holotype contains four stem pieces bearing many pycnidia. Their charac-

teristics accord with those of *Phoma exigua*, which in the Netherlands is also found on other Convolvulaceae (tested by isolation).

cannabis. — *P. herbarum* f. *cannabis* Allesch. in Rab. KryptogFlora, Pilze **6**: 330. 1899 ("1901"). — *Plenodomus cannabis* (Allesch.) Moesz & Smarods *apud* Moesz in Bot. Közl. **38**: 70. 1941. — Holotype: Altenmarkt in Oberbayern, Aug. 1882, Allescher (Herb. Allescher, Forstbot. Inst. München⁴). — Host: *Cannabis sativa*.

The holotype material contains many stem pieces with numerous pycnidia, the latter being similar to those of *Phoma exigua* on material of *Cannabis sativa* occurring in the Netherlands (tested by isolation).

capparis. — *P. herbarum* f. *capparis* Sacc. in Michelia **2** (1): 93. 1880; in Sylloge Fung. **3**: 133. 1884. — Lectotype: Roum., Fungi gall. exs., Cent. 3, No. 280. 1879 ("*Pleospora capparis* Spegaz."), near Toulouse, winter 1878, collector not known (FH). — Host: *Capparis spinosa*.

The specimen on which Saccardo based the description of *P. herbarum* f. *capparis* is not present in his herbarium. Boerema & al. (1968) pointed out that the copy of Fungi gall. exs. No. 280 in the Farlow Herbarium (two stem pieces) contains a pycnidial fungus identical with that described by Saccardo. This specimen is therefore indicated as lectotype. According to its microscopical characteristics *P. herbarum* f. *capparis* appears to be conspecific with ubiquitous *Phoma prunicola* (Opiz) Wollenw. & Hochapf. (cf. Boerema & al., 1968). For a description of that species in vitro, see Boerema & al. (1965a) and Morgan-Jones (1967b).

catalpae-capsularum. — *P. herbarum* f. *catalpae-capsularum* Sacc. in Michelia **2** (1): 93. 1880; in Sylloge Fung. **3**: 133. 1884. — Holotype: Quevilly near Rouen, no date, Letendre (Herb. Saccardo '819', PAD). — Host: *Catalpa* sp.

The type-material of this form consists of a part of the capsule of a species of *Catalpa* that bears many pycnidia. As established by Boerema & Dorenbosch (1970) the characteristics of these pycnidia agree with those of *Phoma macrostomum* Mont., a species frequently occurring on the necrotic tissue of all kinds of trees and shrubs. For a description of *P. macrostomum* in vitro, see also Boerema & Dorenbosch (1965) under the synonym *P. limitata* (Peck) Boerema.

chenopodii-albi. — *P. herbarum* f. *chenopodii-albi* Roum. in Revue mycol. **5**: 28. 1883 (nomen nudum). — Isotype: Roum., Fungi gall. exs., Cent. 25,

⁴ Not listed by Lanjouw & Stafleu (1959); address: Amalienstrasse 52, München.

No. 2484. 1883, Quevilly near Rouen, autumn 1882, Letendre (FH). — Host: *Chenopodium album*.

This agrees with *Phoma herbarum* s.s., see this paper under 'Synonymy'.

chrysanthemi-corymbosi. — *P. herbarum* f. *chrysanthemi-corymbosi* Allesch. in Rab. KryptogFlora, Pilze 6: 330. 1899 ("1901"). — *Peyronellaea herbarum* f. *chrysanthemi-corymbosi* (Allesch.) Goid. in Atti Accad. naz. Lincei R. VIII, 1: 455. 1946 (not validly published). — Holotype: Angerlohe-Allach near München, April 1882, Allescher (Herb. Allescher, Forstbot. Inst. München⁵). — Host: *Chrysanthemum corymbosum*.

This form was listed as a synonym of *Phoma glomerata* (Corda) Wollenw. & Hochapf. by Wollenweber & Hochapfel (1936: 592). The characteristics of the type material of f. *chrysanthemi-corymbosi* agree with this interpretation. This type is composed of various stem pieces and contains, apart from other fungi, pycnidia associated with multicellular chlamydosporal structures similar to those of *P. glomerata* in vivo. The shape and dimensions of its spores (mostly: $6.8 \times 3.4 \mu$) are also in accordance with those of *P. glomerata*. For the cultural characteristics of this fungus of world-wide distribution, see Boerema & al. (1965a) and Morgan-Jones (1967a).

dahliae. — *P. herbarum* f. *dahliae* Sacc. in Michelia 2 (1): 93. 1880; in Sylloge Fung. 3: 133. 1884. — Holotype: Quevilly near Rouen, no date, Letendre (Herb. Saccardo '726', PAD). — Host: *Dahlia* sp.

The holotype consists of three stem pieces and contains many pycnidia showing the same characteristics as those of *Phoma exigua*, which in the Netherlands is also repeatedly isolated from dead stems of dahlias; besides it is often associated with a black dry rot of dahlia-tubers.

datiscae-cannabinae. — *P. herbarum* f. *datiscae-cannabinae* Berl. & Roum. in Revue mycol. 9: 178 ("162"). 1887 (nomen nudum). — Isotype: Roum., Fungi sel. exs., Cent. 43, No. 4217. 1887, Bot. Garden, Coimbra, autumn, no date, Moller (FH). — Host: *Datisca cannabina*.

This form was published without a description. The material of the isotype examined consists of two stem fragments, bearing a pycnidial fungus which corresponds well with *Phoma exigua*.

⁵ See note 4 on p. 27.

daturae. — *P. herbarum* var. *daturae* Poteb. in *Annls mycol.* 5: 14. 1907. — Lectotype: Charkow, no date, Potebnia (Herb. Saccardo, Mycoth. Sacc. No. 221, PAD). — Host: *Datura stramonium*.

Probably the exsiccatum examined, a split stem piece with many pycnidia, represents the specimen used by Potebnia for the description of *P. herbarum* var. *daturae*, although this could not be proved. As it was definitely studied by the author in the period that the name of this taxon was published, it is here designated lectotype. The characteristics of this pycnidial fungus agree with those of *P. exigua* on material of *Datura stramonium* from the Netherlands (tested by isolation).

dianthi. — *P. herbarum* f. *dianthi* Gonz.-Frag. in *Boln R. Soc. esp. Hist. nat.* 18: 373. 1918. — Holotype: Robledo de Chavela, Madrid, Oct. 1916, Vicioso & Planas (MA-2897). — Host: *Dianthus lusitanicus*.

The holotype, made up of various stem pieces, contains numerous pycnidia with spatulate or ellipsoid, septate spores, similar to those of *Ascochyta dianthi* (Alb. & Schw. ex Fr.) Lib., a species frequently occurring on living or fading leaves of *Dianthus* and other Caryophyllaceae; compare Grove (1935: 298). In vivo it is somewhat similar to *Stagonospora samarorum*, see under *P. herbarum* f. *ansoniae-salicifoliae*.

dianthi-caryophylli. — *P. herbarum* var. *dianthi-caryophylli* D. Sacc. in *Mycoth. ital.* No. 1686. 1913 (nomen nudum). — Isotype: (Mycoth. ital. No. 1686) Selva, Treviso, Oct. 1904, collector not mentioned (PAD). — Host: *Dianthus caryophyllus*.

The label accompanying the exsiccatum of this variety gives only information on the source of the material but no description.

The isotype in Saccardo's herbarium, one small stem fragment, contains the same pycnidial fungus as the holotype of *P. herbarum* f. *dianthi* (which see), i.e. *Ascochyta dianthi*.

dipsaci. — *P. herbarum* f. *dipsaci* Sacc. in *Michelia* 2 (2): 337. 1881; in *Sylloge Fung.* 3: 133. 1884. — Holotype: Rouen, no date, Malbranche (Herb. Saccardo '109' pro parte, PAD). — Host: *Dipsacus sylvestris*.

The material numbered '109' in Saccardo's herbarium, consisting of three stem pieces, contains two different pycnidial fungi representing the types of *P. herbarum* f. *dipsaci* ("sperm. 8-9 × 3-4") and *P. oleracea* var. *dipsaci* ("sperm. 5 × 1½"). The characteristics of the large-spored fungus accord completely with those of *Phoma exigua* on indigenous material of *Dipsacus sylvestris* (tested by isolation). The small-spored fungus agrees with *Phoma herbarum* s.s.; see this paper under 'Synonymy'.

dulcamaricola. — *P. herbarum* var. *dulcamaricola* Bubák in Bot. Közl. 1915: 63. 1915. — Type: not known to be in existence; type locality: Srablje-Jezero, Zabljak, Montenegro. — Host: *Solanum dulcamara*.

Boerema & Höweler (1967) listed this variety as a synonym of *Phoma exigua*. This interpretation is supported by the characteristics of a specimen named *P. herbarum* var. *dulcamaricola* in Sydow's Mycotheca germanica (No. 2734, Lichtenrade near Berlin, May 1918, BPI). *P. exigua* is also repeatedly isolated from material of *Solanum dulcamara* in the Netherlands.

dysoxyli. — *P. herbarum* var. *dysoxyli* Sacc. in Atti Accad. scient. veneto-trent-istriana III, 10: 71. 1919 ("Disoxyli"); in Sylloge Fung. 25: 117. 1931. — Holotype: Los Baños, Philippines, Sept. 1913, Baker (Herb. Saccardo '1713', PAD). — Host: *Dysoxylum decandrum*.

The holotype, composed of many stem pieces, contains numerous pycnidia of a *Phomopsis* species with α -spores only (produced on inconspicuous filiform conidiophores).

Another specimen of *P. herbarum* var. *dysoxyli* in Saccardo's herbarium, also numbered '1713' and from the same locality and date, but collected by Raimundo (see Saccardo, 1914: 306), contains the same species of *Phomopsis*.

erysimi. — *P. herbarum* var. *erysimi* Roum. in Revue mycol. 3 / No. 9: 30. 1881 ("crysimi"; nomen nudum). — Isotype: Roum., Fungi gall. exs., Cent. 11, No. 1011. 1881, near Toulouse, autumn, date and collector not known (PC). — Host: *Erysimum vulgare*.

Appears to be identical with *Phoma herbarum* s.s.; see this paper under 'Synonymy'.

eupatorii-sessilifolii. — *P. herbarum eupatorii-sessilifolii* Berl. & Roum. in Revue mycol. 9: 178 ("162"). 1887 (nomen nudum). — Isotype: Roum., Fungi sel. exs., Cent. 43, No. 4219, Bot. garden, Coimbra, autumn 1886, Moller (FH). — Host: *Eupatorium sessilifolium*.

This form was introduced without a description. Examination of one of the isotypes, which contains two stem pieces, showed numerous pycnidia with 1- and 2-celled spores similar to those of *Phoma exigua* on other Compositae.

euphorbiae-guyoniana. — *P. herbarum* var. *euphorbiae-guyoniana* Pat., Cat. rais. Pl. cell. Tun. 116. 1897. — Holotype: Tozeur, Tunis, Jan. 1893, Patouillard ("Phoma Euphorbiae Guyoniana", PC). — Host: *Euphorbia guyoniana*.

Boerema & al. (1968) have pointed out that this variety is identical with the ubiquitous fungus *Phoma glomerata*. *P. glomerata* is characterized by the production of multicellular chlamydosporal structures; these have also been found in the holotype (one stem piece) of var. *euphorbiae-guyoniana*e. For a description of *P. glomerata* in vitro, see Boerema & al. (1965a) and Morgan-Jones (1967a).

euphrasiae. — *P. herbarum* f. *euphrasiae* Sacc. in *Sylloge Fung.* 3: 133. 1884. — Type: not known to be in existence; type locality unknown. — Host: *Euphrasia* sp.

No material of this form is present in Saccardo's herbarium. The spore dimensions given by the author ("6-7 × 2½-3") agree with the average spore size of *Phoma exigua* on indigenous material of *Euphrasia officinalis* and other species of *Euphrasia*. It should be noted that *P. exigua* on *E. officinalis* is also capable of producing pycnidia with much larger spores, a high percentage of which then prove to be 2-celled, see under *P. herbarum* f. *euphrasiae* Bres.

euphrasiae. — *P. herbarum* f. *euphrasiae* Bres. *apud* Bres. & Sacc. in *Malpighia* 11: 305. 1897. — Holotype: Riva-Valsesia, 1891, Caresti (Herb. Carestia, Mic. Alp. penn. No. 689, TO). — Host: *Euphrasia officinalis*.

The holotype is made up of several stem pieces with seed capsules and contains many pycnidia with relatively large spores (6-11 × 3-4 μ) which are mostly 2-celled. Cultures made from pycnidia with similarly large 2-celled spores found on indigenous material of *Euphrasia officinalis* always showed the fungus to be *Phoma exigua*.

On the same host this fungus can also produce pycnidia with much smaller 1-celled spores; see under *P. herbarum* f. *euphrasiae* Sacc. This is a striking example of the extremely large variability in spore dimensions of *P. exigua* in vivo.

foeniculi. — *P. herbarum* f. *foeniculi* Sacc. in *Michelia* 2 (1): 93. 1880; in *Sylloge Fung.* 3: 133. 1884. — Holotype: Roum., *Fungi gall. exs.*, Cent. 2, No. 117. 1879 ("*Diplodia perpusilla* Desm."), Perpignan, winter 1877, collector not known (Herb. Saccardo, PAD). — Host: *Foeniculum vulgare* (= *Anethum foeniculum*).

The specimen of Roum., *Fungi gall. exs.* No. 117, on which Saccardo based this form includes three short stem fragments with *Diplodia*-pycnidia and one longer stem piece with *Phoma*-pycnidia. The spore size of the latter varies between 6.8-13.6 × 3.4 μ and 5.1-7.6 × 3.4 μ (Saccardo gives 6-7 × 3.5-4 μ). Isolates from similar large- and small-spored *Phoma*-pycnidia on *Foeniculum vulgare* from the Netherlands always revealed typical cultures of *Phoma exigua*.

galiorum. — *P. herbarum* f. *galiorum* Sacc. in *Michelia* 1 (5): 523. 1879; in *Sylloge Fung.* 3: 133. 1884. — Holotype: Quevilly near Rouen, no date, Letendre (Herb. Saccardo '687', PAD). — Host: *Galium* sp.

The holotype, consisting of one stem piece, contains many pycnidia of a *Phomopsis* species with only α -spores. This is in accordance with the drawing on the label showing biguttulate fusoid spores with filiform sporophores. Possibly the material represents the conidial stage of the 'Galium-hostform' of *Diaporthe arctii*, see Wehmeyer (1933: 32).

glycyrrhizae. — *P. herbarum* f. *glycyrrhizae* Hollós in *Annl. hist.-nat. Mus. natn. hung.* 5: 457. 1907. — Type: non-existent (information Museum of Natural History in Budapest); type locality: near Kecskemét. — Host: *Glycyrrhiza echinata*.

The description suggests a *Phomopsis* with α -spores only. Possibly it is the conidial stage of *Diaporthe eres* Nitschke, a polyphagous species occurring among others on the Leguminosae related to *Glycyrrhiza*.

helianthella. — *P. herbarum* var. *helianthella* Sacc. in *Nuovo G. bot. ital.* II, 27: 81. 1920. — Holotype: Sheridan, Wyoming, June 1917, Simmons (Herb. Saccardo "No. 10730 ex herb. James R. Weir", PAD). — Host: *Helianthus* sp.

The holotype material of *P. herbarum* var. *helianthella* consists of various split stem pieces with very different pycnidial fungi. The fungus, the spore-dimensions of which correspond with the description ("8-9 \times 4.7-6"), looks like a true *Ascochyta* species: spores after detachment 1-celled, later generally 2-celled (see this paper under 'The spore-forming process'). Probably it is identical with what used to be known as *Diplodina helianthi* Fautr., *Diplodina* sensu Sacc. being the same as *Ascochyta* (compare Grove, 1935: 335). In our opinion, however, additional study of the fungus in vitro is necessary before its status can be decided on.

helichrysi. — *P. herbarum* f. *helichrysi* Sacc. in *Sylloge Fung.* 3: 133. 1884. — Type: not known to be in existence; type locality: not known. — Host: *Helichrysum* sp.

Material of this form is not present in Saccardo's herbarium. The spore dimensions ("6-7 \times 2½-3") given by the author agree with the usual spore size of *Phoma exigua* frequently found on species of *Helichrysum* from the Netherlands.

humuli. — *P. herbarum* f. *humuli* Sacc. in *Michelia* 2 (1): 92. 1880; in *Sylloge Fung.* 3: 133. 1884. — Lectotype: Quevilly near Rouen, no date, Letendre (Herb. Saccardo '806', PAD). — Host: *Humulus lupulus*.

In Saccardo's herbarium only the exsiccatum here designated as lectotype contains *Phoma*-pyncidia; the other specimens represent a species of *Phomopsis*. On the label of the lectotype, which is made up of three stem pieces, the spore dimensions are noted as "6-3"; we measured $5.9-6.8 \times 2.5-3.4 \mu$, while the diagnosis mentions " $6-7 \times 2\frac{1}{2}-3$ ". Judging by the handwriting and the kind of wrapping paper used the selected specimen was collected by Letendre, whom Saccardo also mentioned as the collector of one of the original specimens of *f. humuli*.

Microscopically the fungus shows the same characteristics as *Phoma exigua* on material of hop from the Netherlands (identity tested by isolation). *P. exigua* is often associated with die-back symptoms and is very probably identical with '*Phoma herbarum*' mentioned by Wormald (1939: 261) as the causal organism of the wilting of hop bines occasionally observed in south- and mid-England. With this '*Phoma-wilt*' the upper parts of the bines die back, showing brown streaks and grey areas on which the *Phoma*-pyncidia appear. Its usual spore sizes are given as $6 \times 3 \mu$ (Wormald, l.c.), while the entire range of the spore dimensions is actually $4.5-9 \times 2-4 \mu$ (Wormald, 1928: 85; Salmon & Ware, 1936: 19). On the one side these measurements accord with the spore characters of the selected type of *P. herbarum f. humuli* Sacc. (see above); on the other they agree with the usual spore sizes and entire range of spore dimensions of *P. exigua* (Boerema & Höweler, 1967: tab. I). Dr. P. W. Talboys of the East Malling Research Station kindly informed us that the material studied by Wormald & al. has not been preserved, while the disease is "an exceedingly uncommon one and has not been seen for many years." Consequently comparison with old or fresh material of the '*Phoma-wilt*' of hop is not possible.

h u m u l i. — *P. herbarum f. humuli* Gonz.-Frag. in Trab. Mus. nac. Cienc. nat., Madr., Ser. bot. 12: 30. 1917. — Holotype: Bot. Garden, Madrid, Aug. 1916, Caballero (MA-2084). — Host: *Humulus lupulus*.

Agrees with *Phoma herbarum* s.s.; see this paper under 'Synonymy'.

h y o s c y a m i. — *P. herbarum f. hyoscyami* Sacc. in Sylloge Fung. 3: 133. 1884. — Type: not known to be in existence; type locality unknown. — Host: *Hyoscyamus* sp.

According to Boerema & Höweler (1967) identical with *Phoma exigua*.

i p o m o e a e. — *P. herbarum f. ipomoeae* Gonz.-Frag. in Trab. Mus. nac. Cienc. nat., Madr., Ser. bot. 10: 123. 1916. — Type apparently not preserved; type locality: near Hispalis, Sevilla, Spain. — Host: *Ipomoea coccinea*.

González Frago's herbarium contains one collection named '*P. herbarum f. ypomeae* Trav.' (MA-1269), but this is apparently not the specimen mentioned in

the original diagnosis. Furthermore, in this material, made up of three stem pieces, no pycnidia are to be found. The description, however, clearly points to a *Phomopsis* species; this was also suggested by the author ("Probabiliter ad gen. *Phomopsis* spectat"). Probably it is the conidial stage of *Diaporthe arctii*, compare Wehmeyer (1933: 48).

L a c t a r i a. — *P. herbarum* var. *lactaria* Sutton in Trans. Br. mycol. Soc. 47: 501. 1964. — Holotype: Leicester, Derbyshire, no date, Pyman (IMI-104608). — Substratum: rubber tubing of milking machine.

Appears to be indistinguishable from *Phoma herbarum* s.s.; see this paper under 'Synonymy'.

L a c t u c a e. — *P. herbarum* f. *lactucae* Sacc. in Michelia 1 (5): 523. 1879 (nomen nudum); ex Sacc. in Sylloge Fung. 3: 133. 1884. — Holotype: near Alençon, Orne, no date, Gillet (Herb. Saccardo '13', PAD). — Host: *Lactuca sativa*.

The holotype material, composed of two stem pieces, contains many pycnidia agreeing completely with those of *Phoma exigua*. In the Netherlands *Phoma exigua* is also often isolated from lettuce (compare Boerema & Höweler, 1967: Table II), on which it usually occurs in association with symptoms of footrot.

L a p p a e. — *P. herbarum* var. *lappae* P. Karst. in Meddn Soc. Fauna Flora fenn. 11: 141. 1884. — Holotype: Helsingfors, no date, Karsten (Herb. Karsten, H). — Host: *Arctium* (= *Lappa*) sp.

The holotype, which contains several stem pieces, shows many pycnidia agreeing with those of *Phoma exigua* on species of *Arctium* from the Netherlands (tested by isolation).

L a p s a n a e. — *P. herbarum* f. *lapsanae* Roum. in Revue mycol. 15: 22. 1893 ("f. *laptanae*"). — Isotype: Roum., Fungi sel. exs., Cent. 63, No. 6261. 1893, Broglie, 1892, Niel (FH). — Host: *Lapsana communis*.

This form has been introduced with the annotation "spores plus petites que celles du *Phoma Lactucae*," which can be regarded as a description. The isotype examined, which shows stem pieces with seed capsules, contains many immature perithecia and small pycnidia with bacilliform spores. Therefore *P. herbarum* f. *lapsanae* probably represents the spermatogonial stage of an Ascomycete and may be a species of *Asteromella*.

L e p i d i i. — *P. herbarum* f. *lepidii* D. Sacc. in Mycoth. ital. No. 941. 1902 (nomen

nudum). — Isotype: (Mycoth. ital. No. 941), Rome, Gianicolo, Febr. 1902, collector not known (PAD). — Host: *Lepidium graminifolium*.

The label of the exsiccatum gives information on the source of the material but no description; hence it is a nomen nudum. The isotype examined, containing one stem piece, bears many pycnidia of a *Phomopsis* species with only α -spores ($6.8-8.5 \times c. 3.5 \mu$). Possibly it represents the conidial stage of *Diaporthe eres*, a polyphagous species occurring among others on Cruciferae.

lilacis. — *P. herbarum* f. *lilacis* Sacc. in *Michelia* 2 (1): 93. 1880; in *Sylloge Fung.* 3: 133. 1884. — Type: not known to be in existence; type locality: Dép. de l'Eure. — Host: *Syringa* (= *Lilac*) sp.

The material on which Saccardo based this form was collected by Malbranche, but was not found in Saccardo's herbarium (PAD). Boerema & Dorenbosch (1970) listed this form in the synonymy of the ubiquitous species *Phoma macrostomum*. In the Netherlands *P. macrostomum* is repeatedly isolated from dead branches of *Syringa*. For a description of this fungus in vitro, see also Boerema & Dorenbosch (1965).

loti-cretici. — *P. herbarum* var. *loti-cretici* Nannizzi in *Atti Accad. Fisiocr.* Siena X, 2: 11. 1927. — Holotype: Taranto, island of S. Nicolichio, Aug. 1926, Nannizzi (SIENA). — Host: *Lotus creticus*.

The holotype material, consisting of several stem pieces with leaf fragments, contains a fungus whose characteristics agree completely with those of *Phoma loticola* Died., described from dead stems of *Lotus corniculatus*. *Phoma loticola* has also been found in the Netherlands on various species of *Lotus*, and proves to be a species in its own right.

lycopi. — *P. herbarum* f. *lycopi* Hollós in *Annls hist.-nat. Mus. natn. hung.* 5: 457. 1907. — Type: non-existent (information Museum of Natural History in Budapest); type locality: near Kecskemét. — Host: *Lycopus exaltatus*.

The description suggests a *Phomopsis* species with α -spores only. Possibly it is the conidial stage of *Diaporthe arctii*, which is also reported from other Labiatae, mostly under the synonym *Diaporthe tulasnei* Nitschke; compare Oudemans (1919-24) and Wehmeyer (1933: 23).

marrubii. — *P. herbarum* f. *marrubii* Sacc. in *Michelia* 1 (5): 523. 1879; in *Sylloge Fung.* 3: 133. 1884. — Holotype: near Alençon, Orne, no date, Gillet (Herb. Saccardo '10', PAD). — Host: *Marrubium* sp.

The holotype comprises a single stem piece bearing numerous pycnidia, the characteristics of which agree well with those of *Phoma exigua*. In the Netherlands *Phoma exigua* is also found on Labiatae.

medicaginea. — *P. herbarum* f. *medicaginis* Sacc. in *Michelia* 2 (1): 93. 1880. — *P. herbarum* f. *medicaginea* Sacc. in *Sylloge Fung.* 3: 133. 1884. (name change). — Holotype: Quevilly near Rouen, no date, Letendre (Herb. Saccardo '790', PAD). — Host: *Medicago* sp.

The holotype consists of four stem fragments bearing many pycnidia that agree with those of *Phoma exigua* on species of *Medicago* in the Netherlands (compare Boerema & Höweler, 1967: Table II).

medicaginis. — See under *medicaginea* and *medicaginum*.

medicaginum. — *P. herbarum* f. *medicaginum* Westend. in *Fungi europ. exs./Klotzschii* Herb. mycol. cont. (Ed. Rab.), Cent. 5, No. 455b. 1862 (nomen nudum); *ex* Fuck. in *Jb. nassau. Ver. Naturk.* 23–24: 134. 1870 ("1869"; "f. *medicaginis*"; listed by Saccardo in *Sylloge Fung.* 3: 133. 1884 as "f. *medicaginis* Fuck."). — Isotype: (*Fungi europ.* No. 455b) near Termonde, no date, Westendorp (B, BR, M). — Host: *Medicago sativa*.

The distributed copies of *Fungi europ.* No. 455b are not accompanied by a diagnosis, but Fuckel validated the name of this infraspecific taxon by giving a description of the spores. Moreover Fuckel distributed specimens of the fungus in his *Fungi rhen.*, Fasc. 6, No. 580. 1863 (BR, FR). It is an independent species, well known as the causal organism of the 'black stem' of lucerne. Boerema & al. (1965b) pointed out that the correct name on the specific level is *Phoma medicaginis* Malbr. & Roum. (compared with the isotype of *Fungi gall. exs.*, Cent. 37, No. 3675. 1886, BR). For a description of the characteristics of this fungus, see also Rössner (1968).

melampyri. — *P. herbarum* f. *melampyri* Westend. in *Herb. crypt.* (Ed. Beyaert), Fasc. 23, No. 1133. 1857 ("a *Melampyri*", nomen nudum). — Isotype: (*Herb. crypt.* No. 1133) near Namur, no date, Belynyck (*Herb. Westendorp & Wallays*, BR; *Herb. Verplancke*, BR; *Herb. Saccardo*, PAD). — Host: *Melampyrum sylvaticum*.

The label of the exsiccatum of *P. herbarum* a *melampyri* distributed by Westendorp refers to the original description of *P. herbarum* ('Nouv. not. . . ., no. 51'), which lists *Melampyrum* as second host, but fails to give any differential criterion. The exsiccatum of *P. herbarum* f. *melampyri* Westend., distributed in 1862 by Rabenhorst

(Fungi europ. exs./Klotzschii Herb. mycol. cont., Cent. 5, No. 455a. 1862, BR, M), and collected by Westendorp near Termonde, also lacks a description. All the specimens examined possess numerous pycnidia agreeing morphologically with those of the holotype of *Phoma silvatica* Sacc. (PAD). In some cases they are associated with perithecia of *Didymella winteriana* (Sacc.) Petr. (Munk 1957: 337). Petrak (1922) suggested that *D. winteriana* represents the perfect stage of *P. silvatica*.

mercurialis. — *P. herbarum* f. *mercurialis* Sacc. in *Michelia* 2 (2): 337. 1881; in *Sylloge Fung.* 3: 133. 1884. — Holotype: Dép. de l'Eure, no date, Malbranche (Herb. Saccardo '132', PAD). — Host: *Mercurialis annua*.

The holotype (four stem pieces) contains numerous pycnidia which are in agreement with those of *Phoma exigua* on material of *Mercurialis annua* in the Netherlands (tested by isolation).

minor. — *P. herbarum* f. *minor* Unamuno in *An. Jard. bot. Madr.* 2: 56. 1942. — Type: non-existent (information Dr. E. Paunero, MA); type locality: Hoz de Beteta. — Host: *Digitalis obscura*.

According to the description this should be identical with *Phoma herbarum* s.s., see this paper under 'Synonymy'.

nesliae. — *P. herbarum* f. *nesliae* Thüm. in *Fungi austr.*, Cent. 12, No. 1161. 1874 (nomen nudum). — *P. oleracea* f. *nesliae* (Thüm.) ex Allesch. in *Rab. Kryptog-Flora, Pilze* 6: 274. 1898 ("1901"; "f. *Nesleae*"). — Lectotype: (Fungi austr. No. 1161) Brück, 1872, von Thümen (Herb. Saccardo, PAD). — Host: *Neslia paniculata*.

The exsiccata of *P. herbarum* f. *nesliae* distributed by von Thümen are not provided with a diagnosis, but Allescher, in transferring the form to *P. oleracea*, gave a good description based on a copy of *Fungi austr.* No. 1161 (B?). This description agrees completely with the characteristics of the material in Saccardo's herbarium selected as lectotype; this material is made up of four stem pieces. It proved to be a typical *Asteromella* species (small pycnidia with bacilliform spores, $4.2-5.1 \times 0.8-1.7 \mu$), to be found on stems, capsules, and leaves of all kinds of Cruciferae. Probably it represents the spermagonial stage of *Mycosphaerella cruciferarum* (Fr.) Lindau; compare Winter (1885: 378).

nicotianae. — *P. herbarum* f. *nicotianae* Roum. in *Revue mycol.* 19: 152. 1897. — Isotype: *Fungi sel. exs.*, Cent. 72. No. 7160. 1897, locality not known, May 1896, Fautrey (FH). — Host: *Nicotiana tabacum*.

The isotype material examined consists of two stem fragments and contains numerous pycnidia with 1- and 2-celled spores agreeing with those of *Phoma exigua* on *Nicotiana tabacum* in the Netherlands (tested by isolation). The characteristics of the pycnidia and spores given in the diagnosis of this form are also in accordance with those of *P. exigua*.

parietariae. — *P. herbarum* f. *parietariae* Brunaud in Bull. Soc. bot. Fr. **36** (=II, **11**): 338. 1889. — Type: not known to be in existence; type locality: Pons. — Host: *Parietaria officinalis*.

Judging from the description it is tenable to conclude that this form is identical with *Phoma exigua*, which in the Netherlands is also known to occur on *Parietaria officinalis*.

phlei. — *P. herbarum* f. *phlei* Sacc. in *Michelia* **2** (1): 93. 1880; in *Sylloge Fung.* **3**: 133. 1884 ("Phlaei"). — Type: not known to be in existence; type locality: Saintes. — Host: *Phleum* sp.

The material on which Saccardo based this form was collected by Brunaud, but it is missing in Saccardo's herbarium.

The description, however, is in accordance with the characteristics of a saprophyte known to occur on all kinds of grasses, viz. *Neophoma graminella* (Sacc.) Petrak & Sydow (1927) = *Macrophoma graminella* (Sacc.) Berl. & Vogl., compare Dennis (1964: 124) and Dennis & Gray (1954).

phytolaccae. — *P. herbarum* f. *phytolaccae* Sacc. in *Michelia* **2** (1): 93. 1880; in *Sylloge Fung.* **3**: 133. 1884. — Holotype: Roum., Fungi gall. exs., Cent. 3, No. 230. 1879 ("*Septoria phlyctaenoides* B & C."), near Perpignan, winter 1878, collector not known (Herb. Saccardo, PAD). — Host: *Phytolacca decandra*.

Saccardo based this form on material made up of three stem pieces. It shows many pycnidia with 1- and 2-celled spores. The characteristics of this fungus agree fairly well with those of *Phoma exigua*.

rubi. — *P. herbarum* f. *rubi* Sacc. in *Michelia* **2** (1): 93. 1880; in *Sylloge Fung.* **3**: 133. 1884. — Holotype: Quevilly near Rouen, no date, Letendre (Herb. Saccardo '480', PAD). — Host: *Rubus idaeus*.

The holotype of *P. herbarum* f. *rubi*, consisting of two stem pieces, shows many pycnidia which correspond completely with indigenous material of *Phoma macrostomum* on *Rubus idaeus* (tested by isolation, see Boerema & Dorenbosch, 1970: table I). In association with the raspberry cane midge (*Thomasiniana theobaldi* Barnes) this

fungus may cause severe damage in raspberry (compare Labruyère & Engels, 1963: 250). For a description of *P. macrostomum* in vitro, see also Boerema & Dorenbosch (1965) under the synonym *P. limitata* (Peck) Boerema.

s a l i c a r i a e. — *P. herbarum* f. *salicariae* Sacc. in *Michelia* 2 (1): 93. 1880; in *Sylloge Fung.* 3: 133. 1884. — Holotype: Quevilly near Rouen, no date, Letendre (Herb. Saccardo '889', PAD). — Host: *Lythrum salicaria*.

The holotype shows three stem pieces bearing many pycnidia with irregular fusoid-oblong 1- and more-celled spores similar to those of the ubiquitous saprophyte *Stagonospora samarorum*. See the discussion under *P. herbarum* f. *ansoniae-salicifoliae*.

s a m b u c i. — *P. herbarum* var. *sambuci* Roum. in *Revue mycol.* 3/No. 9: 30. 1881 (nomen nudum). — Isotype: Roum., Fungi gall. exs., Cent. 11, No. 1014. 1881 ("f. *sambuci*"), Toulouse, autumn, no date, Roumeguère (Herb. Roumeguère, PC). — Host: *Sambucus nigra*.

This agrees with *Phoma herbarum* s.s.; see this paper under 'Synonymy'.

s a m b u c i - n i g r a e. — *P. herbarum* f. *sambuci-nigrae* Sacc. in *Michelia* 2 (2): 337. 1881; in *Sylloge Fung.* 3: 133. 1884. — Holotype: type locality and date not known, Roumeguère (Herb. Saccardo '359', PAD). — Host: *Sambucus nigra*.

The holotype material consists of a single split stem piece with numerous pycnidia similar to those of *Phoma exigua*. Boerema & Höweler (1967) regarded this taxon as a specialized pathogenic fungus and raised it to varietal rank, *P. exigua* var. *sambuci-nigrae* (Sacc.) Boerema & Höweler. It causes characteristic leaf spots and shoot dieback.

Vörös (1959), when discussing a *Phoma* found on dead branches of *Sambucus nigra* near Budapest, inadvertently used the combination *Phoma exigua* var. *sambuci-nigrae*. His sentence runs as follows: "Es ist sehr wahrscheinlich, dass dieser Pilz [that is, the fungus found by him], und das sehr nahestehende *Phoma exigua* Desm. "var. *sambuci-nigrae*" (Konidien $6-8 \times 3-3.5 \mu$) mit *Phoma herbarum* West. identisch sind." Judging by the spore size mentioned by Vörös as compared with those of *P. exigua* (Saccardo: "5-7 μ longis") and *P. herbarum* (Saccardo: "6-11 \times 3-4 μ "), it is clear that he must have interchanged the specific epithets 'exigua' and 'herbarum'. Moreover by his use of quotation marks Vörös indicated that he did not definitely accept the variety *sambuci-nigrae*.

s a r o t h a m n i. — *P. herbarum* f. *sarothamni* Gonz.-Frag. in *Trab. Mus. nac. Cienc. nat., Madr. Ser. bot.* 10: 123. 1916. — Holotype: near Alcolea del Rio, Sevilla, Jan. 1914, Gonzáles Fragoso (MA-820). — Host: *Sarothamnus eriocarpus*.

The holotype shows many pycnidia on a single stem piece which are at first mouthless but later open with an irregularly ruptured aperture. The spores are oblong-ellipsoid, $8(-8.5)-10(-10.5) \times 3(-3.5)-4(-4.5) \mu$, provided with a conspicuous hilum, and subhyaline to yellow or olive-brownish. These characteristics accord quite well with those of the form-genus *Cleistophoma* erected by Petrak & Sydow (1927: 294). The infra-specific taxon f. *sarothamni* differs from the type species of *Cleistophoma* only in having smaller spores with a relatively thick wall.

schoberiae e. — *P. herbarum* f. *schoberiae* Sacc. in *Michelia* 2 (1): 93. 1880; in *Sylloge Fung.* 3: 133. 1884. — Type: not known to be in existence; type locality: Straits of Dover. — Host: *Suaeda* sp. (= *Schoberia* sp.).

Saccardo based this form on material collected by Gaudefroy, but apparently he failed to preserve specimens for his herbarium (PAD).

Boerema & Höweler (1967) listed *P. herbarum* f. *schoberiae* as a synonym of *Phoma exigua*. In the original diagnosis the spores are described as being "curvulae," as in fact is often the case in *P. exigua*.

scrophulariae e. — *P. herbarum* f. *scrophulariae* D. Sacc. in *Mycoth. ital.* No. 1527. 1905 (nomen nudum). — Isotype: (*Mycoth. ital.* No. 1527) Tagliacozzo, Aquila, April 1904, collector not known (Herb. Saccardo, PAD). — Host: *Scrophularia* sp.

The exsiccata of this form were distributed with a label giving information on the source of the material but no description. The isotype material examined consists of various stem fragments bearing numerous small, black, and apparently mouthless pycnidia, $50-75 \mu$ diam., situated among subepidermal fibrils of brown hyphae. Spores very few, irregular in shape, continuous, $5-10.2 \times 3.4 \mu$. Except for the relatively large spore-size these characteristics fit the description of *Asteroma scrophulariae* Brunaud very well.

scrophulariae e. — *P. herbarum* f. *scrophulariae* Roum. in *Revue mycol.* 3 / No. 9: 31. 1881 (nomen nudum). — Isotype: Roum., *Fungi sel. exs.*, Cent. 12, No. 1110, Luchon, Haute-Garonne, Febr. 1880. Roumeguère (Herb. Roumeguère, PC). — Host: *Scrophularia nodosa*.

The exsiccata of this form were distributed without a diagnosis; apparently Roumeguère considered this infra-specific taxon to be morphologically identical with *Phoma herbarum* s.s. The material examined, consisting of one stem piece, shows no trace of *Phoma*-pycnidia, so that its identity remains obscure.

sempervivi-tectorum. — *P. herbarum* f. *sempervivi-tectorum* Berl. &

Roum. in *Revue mycol.* 9: 178 ("162"). 1887 (nomen nudum). — Isotype: Roum., *Fungi sel. exs.*, Cent. 43, No. 4216, Coimbra, winter 1876, Moller (FH). — Host: *Sempervivum tectorum*.

Like forma *scrophulariae* Roum. this form was introduced without a diagnosis. Examination of the two stem pieces constituting the isotype revealed a pycnidial fungus with 1-celled and some 2-celled spores similar to those of *Phoma exigua* as found on *Sempervivum tectorum* in the Netherlands (tested by isolation).

sii. — *P. herbarum* var. *sii* Hollós in *Annls hist.-nat. Mus. natn. hung.* 4: 340. 1906. — Type: non-existent (information Museum Natural History in Budapest); type locality: near Nagy-Körös. — Host: *Sium latifolium*.

The description suggests a *Phomopsis* species with α -spores only. Possibly it is the conidial stage of the 'Umbelliferae-hostform' of *Diaporthe arctii* (Wehmeyer, 1933: 41, 42).

solani-nigricantis. — *P. herbarum* f. *solani-nigricantis* Berl. & Roum. in *Revue mycol.* 9: 178 ("162"). 1887 (nomen nudum). — Isotype: Roum., *Fungi sel. exs.*, Cent. 43, No. 4221. 1887, near Coimbra, winter, no date, Moller (FH). — Host: *Solanum nigrum*.

This form was not validly published, as it lacks a diagnosis. The syntype examined comprises various stem pieces bearing numerous pycnidia with 1- and 2-celled spores such as are known to occur in *Phoma exigua* growing on *Solanum nigrum* in the Netherlands (tested by isolation).

solidaginis. — *P. herbarum* f. *solidaginis* Sacc. in *Michelia* 2 (2): 337. 1881; in *Sylloge Fung.* 3: 133. 1884. — Holotype: Aclon, May 1880, Malbranche (Herb. Saccardo '95', PAD). — Host: *Solidago* sp.

The holotype, consisting of two stem pieces, shows fructifications of various fungi, including two different *Phoma* species. The spore dimensions of one of these accord well with Saccardo's description, and its characteristics also agree with those of *Phoma exigua* on indigenous species of *Solidago* (tested by isolation).

stramonii. — *P. herbarum* f. *stramonii* Thüm. in *Mycoth. univ.*, Cent. 7, No. 677. 1877. ("strammonii", nomen nudum). — Isotype: (*Mycoth. univ.* No. 677) Bayreuth, 1876, von Thümen (Herb. Saccardo, PAD). — Host: *Datura stramonium*.

The label with which the exsiccata were distributed gives information on the source of the material but lacks a description. The isotype examined is made up

of three stem pieces containing numerous pycnidia which are identical with those of *Phoma exigua* on material of *Datura stramonium* occurring in the Netherlands (tested by isolation).

stramonii. — *P. herbarum* f. *stramonii* Roum. in *Revue mycol.* 1: 56. 1879 (nomen nudum). — Isotype: Roum., Fungi gall. exs., Cent. 3, No. 212, near Toulouse, autumn 1878, collector not known (Herb. Roumeguère, PC). — Host: *Datura stramonium*.

The name of this form, like that of the preceding forma *stramonii* Thüm., was not validly published, as it lacks a diagnosis; apparently Roumeguère considered the form to be morphologically the same as *Phoma herbarum* s.s. The single stem piece of the material examined is devoid of *Phoma*-pycnidia, so that its identity cannot be ascertained.

tageticola. — *Sphaeria tageticola* Schw. in *Trans. Am. phil. Soc.* II, 4: 222. 1832 ("1834"; = *Synopsis Fung. Am. bor.*). — *P. herbarum* var. *tageticola* (Schw.) Starb. in *Bih. K. Svenska VetenskAkad. Handl.* 19 (Afd. 3, 2): 52. 1894. — Holotype: Bethlehem, no date, Schweinitz (Herb. Schweinitz, Collins collection No. 360, PH); isotype: Herb. Fries (UPS). — Host: *Tagetes* sp.

The holotype material consists of two stem pieces in an envelope while three more stem pieces are separately mounted on a piece of paper (compare Arthur & Bisby, 1918: 178–182). A duplicate of the type is to be found in Fries' herbarium (UPS) and consists of five stem pieces. Starbäck had used this material when he proposed the recombination *P. herbarum* var. *tageticola*. All these specimens agree in that they bear many pycnidia all of whose characters correspond with those of *Phoma exigua* occurring on species of *Tagetes* in the Netherlands (tested by isolation).

tetragoniae. — *P. herbarum* var. *tetragoniae* Sacc. & Berl. in *Revue mycol.* 8: 35. 1886; in *Sylloge Fung.* 10: 180. 1892 ("*Phoma herbarum* **Ph. Tetragoniae*"). — Neotype: Algeria, no date, Trabut (Herb. Saccardo '68', PAD). — Host: *Tetragonia expansa*.

This agrees with *Phoma herbarum* s.s.; see this paper under 'Synonymy'.

thulensis. — *P. herbarum* var. *thulensis* P. Karst. in *Hedwigia* 23: 39. 1884. — Neotype: Green Harbour, 1 Sept. 1869, collector not mentioned (Herb. Karsten, H). — Host: *Pedicularis hirsuta*.

The type material of *P. herbarum* var. *thulensis*, collected in August 1868 by Th.

Fries, has apparently not been preserved. Consequently the only specimen of this variety in Karsten's herbarium is indicated as neotype. It consists of a few small stem pieces bearing some pycnidia with 1- and 2-celled spores similar to those of *Phoma exigua*. The latter is frequently found on various Scrophulariaceae in the Netherlands (tested by isolation).

tulostomatis. — *P. herbarum* var. *tulostomatis* Pat., Cat. rais. Pl. cell. Tun. 116. 1897. — Holotype: Fedjedj, Febr. 1892, Patouillard ("*Phoma Tulostomatis*", FH). — Host: *Tulostoma volvulatum* (Homobasidiomycetidae).

Boerema & al. (1968) pointed out that this variety agrees with *Phoma prunicola*, a dictyochlamydo-spores-producing fungus. This is one of the most common soil-borne *Phoma* species (Dorenbosch, 1970), so that its occurrence on another terrestrial fungus is not surprising. For a description of this species in vitro see Boerema & al. (1965a) and Morgan-Jones (1967b).

urticae. — *P. herbarum* f. *urticae* Sacc. in *Michelia* 1 (5): 523. 1879; in *Sylloge Fung.* 3: 133. 1884. — Holotype: Quevilly near Rouen, no date, Letendre (Herb. Saccardo '139', PAD). — Host: *Urtica* sp.

The holotype consists of part of the stem of a species of *Urtica* with several pycnidia which are identical with those of *Phoma exigua* on indigenous material of *Urtica* (tested by isolation).

urticae. — *P. herbarum* var. *urticae* Roum. in *Revue mycol.* 3 / No. 9: 30. 1881 (nomen nudum). — Isotype: Roum., Fungi gall. exs., Cent. 11, No. 1017. 1881, near Toulouse, winter 1879, Roumeguère (Herb. Roumeguère, PC). — Host: *Urtica dioica*.

Roumeguère distributed this 'variety' of *Phoma herbarum* without a description, so that it may be inferred that he considered it morphologically identical with *P. herbarum*.

The isotype examined, consisting of one stem piece, reveals the characteristic small-spored, beaked pycnidia of *Phoma acuta* (Hoffm. ex Fr.) Fuck. = *Plenodomus acutus* (Hoffm. ex Fr.) Bubák (spore dimensions $4.2-6.8 \times 1.7-2.5 \mu$), the conidial state of *Leptosphaeria acuta* (Fuck.) P. Karst. For a discussion of the characteristics of *P. acuta*, see von Höhnelt (1918: 138) and Petrak (1921: 192).

valerianae. — *P. herbarum* f. *valerianae* Sacc. in *Michelia* 2 (2): 337. 1881; in *Sylloge Fung.* 3: 133. 1884. — Holotype: Rouen, no date, Malbranche (Herb. Saccardo '92', PAD). — Host: *Valeriana* sp.

The holotype material, two stem pieces glued to a sheet of paper, bears numerous pycnidia of a *Phoma* species with 1-celled spores, mostly $4.5\text{--}5.5 \times 1.5\text{--}2.5 \mu$. Careful comparison shows that it fully corresponds with a seed-borne pathogen of Valerianaceae, recently described as *Phoma valerianellae* Gindrat, Semecnik & Bolay (1967) and subsequently under the same name by Boerema & de Jong (1968).⁶

In Saccardo's diagnosis the spore dimensions of *P. herbarum* f. *valerianae* were given as $6 \times 3.5 \mu$, which is larger than the spores actually turn out to be and this explains Boerema & de Jong's failure to recognize f. *valerianae* as a synonym of their species.

verbasci. — *P. herbarum* f. *verbasci* Gonz.-Frag. in Trab. Mus. nac. Cienc. nat., Madr., Ser. bot. 7: 38. 1914. — Type: non-existent (information Dr. E. Paunero, MA); type locality: Estación Alp. de Biol., Mont. Guadarrama. — Host: *Verbascum thapsi*.

The material in the fungus collection of Gonzáles Frago (MA-558), named *P. herbarum* f. *verbasci* and indicated as "cotypo; prope Est. Alp. de Biol. ubi collegit 14-VIII-1914," contains only a species of *Coniothyrium* with brown, relatively large spores ($10.2\text{--}13.6 \times 5.1\text{--}6.8 \mu$). This cannot be the fungus described by Gonzáles Frago, who stated that the spores were hyaline, $7\text{--}9 \times 3\text{--}3.5 \mu$. The description of forma *verbasci* on the other hand, suggests that the ubiquitous species *Phoma exigua* is involved which, in the Netherlands, is found on all kinds of Scrophulariaceae.

verbenae. — *P. herbarum* f. *verbenae* Sacc. in Michelia 1 (5): 523. 1879 (nomen nudum); ex Sacc. in Sylloge Fung. 3: 133. 1884. — Holotype: Alençon, no date, Gillet (Herb. Saccardo '41', PAD). — Host: *Verbena* sp.

The holotype represented by four stem fragments appears to contain many pycnidia of a characteristic *Phomopsis*-stage with α - and β -spores. The dimensions of the α -spores ($6.8\text{--}8.5 \times 2.5\text{--}3.4 \mu$) agree very well with those listed for *P. herbarum*

⁶ Gindrat (Gindrat & al., 1967) misused the information he had received from Dr. R. Schneider (Berlin) and Dr. J. A. von Arx (Baarn) by publishing the manuscript-name *Phoma valerianellae* for a species which Boerema & de Jong had discovered to be undescribed. When Boerema & de Jong subsequently published the name *Phoma valerianellae* Boerema & de Jong (1968) it was a homonymous synonym of *P. valerianellae* Gindrat & al.

Gindrat, in a "Mise au point" (1968) apologized for what had happened. He tried to make rectification by declaring that "la désignation taxonomique correcte de ce champignon est: *Phoma valerianellae* Boerema & de Jong." But as to this statement it may be observed that (i) down to the final letter Gindrat's publication is in accordance with the relevant Articles of the Code, and (ii) the binomial *Phoma valerianellae* is indissolubly connected with the author names Gindrat, Semecnik & Bolay. The statement quoted above is an example of the erroneous application of the word 'taxonomic' where 'nomenclatural' is meant.

f. *verbenae* in 'Sylloge Fung.' (6-7 × 2.5-3 μ). Probably this form is the conidial stage of *Diaporthe verbenae* Tassi which, according to Wehmeyer (1933: 330), may be the same as *D. arctii*.

verbenae-paniculatae. — *P. herbarum* f. *verbenae-paniculatae* Berl. & Roum. in *Revue mycol.* 9: 178 ("162"). 1887 (nomen nudum). — Isotype: Roum., *Fungi sel. exs.*, Cent. 43, No. 4220. 1887, Bot. Garden, Coimbra, autumn 1886, Moller (FH). — Host: *Verbena paniculata*.

This form was introduced without a diagnosis. The isotype examined, consisting of two stem pieces, shows a pycnidial fungus with 1- and 2-celled spores similar to those in *Phoma exigua* on species of *Verbena* in the Netherlands (tested by isolation).

vincae. — *P. herbarum* f. *vincae* Brunaud in *Act. Soc. linn. Bordeaux* 40 (= IV, 10): 75. 1886. — Type: not known to be in existence; type locality: Saintes. — Host: *Vinca major*.

The spore dimensions given for this form, 6-8 × 2.5-3 μ, correspond in all respects with those of *Phoma exigua* on species of *Vinca* in the Netherlands. *P. exigua* is commonly associated with leaf spots and shoot dieback of these hosts, see Jansen (1965).

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