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THE GENUS *CONIOCHAETA* (SACC.) COOKE (CONIOCHAETACEAE, ASCOMYCOTINA) IN SPAIN

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F. FORT** and J. GUARRO**

SUMMARY. — A macro and microscopical study of the genus *Coniochaeta* with the known species in Spain is done, adding microphotographs and iconography. We incorporate an essay of key, based, mainly, on the ascospores morphology and on the presence or absence of setae in the ascomata. *Coniochaeta alkalivirens* Checa & Moreno, *C. areolatirubra* Checa, Barrasa & Moreno and *C. cruciata* Fort & Guarro are proposed as new species. Finally the combination *C. sanguinolenta* (Wallr.) Checa, Barrasa & Moreno, is made after the study of the type-material.

RÉSUMÉ. — Les auteurs réalisent une étude macro et microscopique des espèces du genre *Coniochaeta* connues en Espagne. Ils proposent un essai de clef basée sur la morphologie des ascospores et la présence ou l'absence de poils sur le périthèce. Plusieurs espèces nouvelles sont créées : *Coniochaeta alkalivirens* Checa & Moreno, *C. areolatirubra* Checa, Barrasa & Moreno et *C. cruciata* Fort & Guarro. La nouvelle combinaison *C. sanguinolenta* (Wallr.) Checa, Barrasa & Moreno est réalisée, à la suite de l'étude du matériel type.

KEY WORDS : taxonomy, *Coniochaeta,* ascomycotina, Spain.

INTRODUCTION

The subgenus *Coniochaeta* was created by SACCARDO (1882) for those species of *Rosellinia* with small, gregarious and hairy perithecium. It was raised to genus by COOKE (1887).

MOREAU (1953) indicated that *Coniochaeta* is better related to Sordariaceae than Xylariaceae. However, the taxonomic position of this family is now matter of discussion. MALLOCH & CAIN (1971) established the new family Coniochaetaceae to accommodate *Coniochaeta* and *Coniochaetidium*. MÜLLER & ARX (1973) included *Coniochaeta* in Sordariaceae separating it from other genera of the family by the presence of germ slit in the spore. *Coniochaeta* is closely related to *Rosellinia*, but differences in the amyloidic character of the asci

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between them make difficult to maintain both genera in Xylariaceae (ROGERS, 1979; MAHONEY & LAFAVRE, 1981). Finally, HAWKSWORTH & al. (1983) consider Coniochaetaceae as a synonym of Xylariaceae in Sphaeriales, whereas ERIKSSON & HAWKSWORTH (1985) accept Coniochaetaceae including it in Sordariales.

Coniochaeta species grow in different habitats : lignicolous, humicolous and coprophilous species are known (CAIN, 1934; ARX & MÜLLER, 1954; MUNK, 1957). *C. nodulisporioides, C. ellipsoidea* and *C. ovata* have been isolated from soil cultures only. *C. hansenii, C. polysperma* and others are coprophilous only. Some authors suggest that the coprophilous taxa could be separated at generic level, but it should be tested in the future. *C. malacotricha* and *C. pulveracea* are strictly lignicolous. However other species such as *C. ligniaria* are ubiquitous MAHONEY & LAFAVRE, 1981).

In this work we accept the family Coniochaetaceae Malloch & Cain characterized by non-amyloid asci and ascospores with a longitudinal germ slit. Recently some new genera have been added to this family : *Poroconiochaeta* (UDAGAWA & FURUYA, 1979), *Ephemeroascus* (MALLOCH, 1979) and *Germslitospora* (BENNY & KIMBROUGH, 1980).

At present about 30 species are known (MAHONEY & LAFAVRE 1981; HAWKSWORTH & al., 1983) and some anamorphs have been described : *Lecythophora*-like, *Nodulisporium*-like and *Phialophora*-like (ROGERS & GRAND, 1971; HAWKSWORTH & YIP, 1981; ARX, 1981; GAMS & McGINNIS, 1983). HAWKSWORTH & YIP (1981) have proposed a key to the eleven species known in culture.

In our study we propose a general key of the species known in Spain up to now.

MATERIAL AND METHODS

The material studied is conserved in the Herbaria of Department of Vegetal Biology (Botany), University of Alcalá de Henares, Madrid (HAH) and in Department of Biology and Microbiology, Fac. Medicine, University of Barcelona, Reus, Tarragona (FMR), for revision or consult.

The photographs have been taken with Nikon Optiphot and Leitz Dialux 20 EB microscopes, both with incorporated automatic photographic system.

GENERAL KEY OF THE SPECIES

1. - Asci 4- or 8-spored 2
1'. - Asci multispored (60-125), ascospores 7.7-9.5 x 4.5-7 x 4-6.5 µm, coprophilous . . . . . *C. hansenii*
2. - Asci 4-spored . . . . . *C. tetraspora*
2'. - Asci 8-spored 3

3. - Ascospores flying-saucer shaped and cruciform in polar view . . *C. cruciata*
3'. - Ascospores not so 4
4. - Ascospores subfusiforms or longly ovoids (one end round, other apiculate) . . . . . *C. ovata*
4'. - Ascospores not so 5
5. - Peridium areolate, reddish brown . . . . . *C. areolatirubra*
5'. - Peridium not areolate 6
6. - Ascospores ellipsoidal, 21-23 x 10-12 µm, with both ends apiculate or subapiculate, irregularly biseriate, from soil only . . . . . *C. ellipsoidea*
6'. - Ascospores ellipsoidal or not, with rounded ends 7
7. - Ascospores mainly exceeding 17 µm long 8
7'. - Ascospores mainly less than 17 µm long 9
8. - Ascospores 18-22 x 12-18 x 7-10 µm long, narrowly elliptical in side view . . . . . *C. scatigena*
8'. - Ascospores 16-22 x 8-11 µm, broadly elliptical in side view . . . *C. niessli*
9. - Ascospores mainly less than 10 µm long, broadly elliptical . . . *C. velutina*
9'. - Ascospores mainly exceeding 10 µm long 10
10 - Ascospores mill-stone shaped, 10-14 x 8-11 x 6-8 µm. Perithecia densely setose . . . . . *C. malacotricha*
10'. - Ascospores not so 11
11. - Ascospores narrowly elliptical in face view, with rounded ends, 13-18 x 5-7 x 4.5-6 µm . . . . . *C. saccardoi*
11'. - Ascospores broadly elliptical to subcircular in face view 12
12. - Ascomata setose; ascospores broadly elliptical to subcircular or ovate in face view, 11.5-17 x (7)-10-12 x 7-8 µm . . . . . *C. ligniaria*
12'. - Ascomata glabrous, covered by blunt setae, or with setae present in the neck only 13
13. - Hymenium becoming green in alkaline solutions. Ascospores broadly elliptical in face view, 12-15 x 8-10 x 5-8 µm . . . . . *C. alkalivirens*
13'. - Ascomata with setae or blunt setae. Hymenium not becoming green in alkaline solutions 14
14. - Ascomata covered by blunt setae. Ascospores broadly ellipsoidal, 13-17 x 7-10 x 5-7 µm . . . . . *C. pulveracea*
14'. - Ascomata with setae only in the neck. Ascospores ellipsoidal, 10-12 x 7-8 x 4-5 µm . . . . . *C. subcorticalis*

Coniochaeta alkalivirens Checa & Moreno, sp. nov.
(Fig. 1-2)

= *C. sarothamni* (Schröeter) Arx & Müller, s. Checa & Moreno, *Bull. Soc. Micol. Castellana* 9 :7 (1985) non Schröeter.

Species dispicitur virente hymenio cum alcalinae materies adsunt (KOH ac NH_4OH).

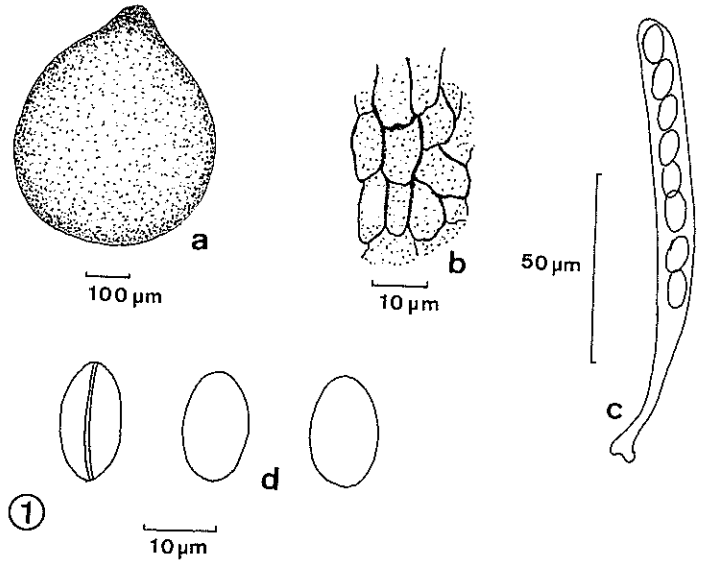

Fig. 1 — *Coniochaeta alkalivirens* Checa & Moreno. a : ascoma - b: peridial cells - c : ascus with ascospores - d : ascospores. Holotypus HAH 3709.

Ascomata gregaria aut aggregata, superficialia, nigra, ostiolata, sive subglobosa sive piriformia, quorum est diameter 200-250 µm, glabra; peridium castaneo colore, pseudoparenchymatichis cellulis constitutum, crassis parietibus, quarum diameter este 7-10 µm. Asci 8 sporis oblique uniseriatis praediti, cylindrici, 110-115 µm longi ac 10-12 µm lati, in apice rotundato, qui in basi producuntur in brevis pedis formam; apex corum haud amyloideus. Paraphyses filiformes, hyalinae, septatae, quarum est diameter 2-3 µm. Ascosporae initio hyalinae postea castaneo colore, longitudinali germinationis linea praeditae, unicellulares, glabrae, later ellipticae a fronte, subfusiformes a latere, conspectae, 12-15 µm longae atque 8-10 µm latae a fronte, 5-8 µm a latere conspectae. .

Holotypus : In dejectis ramis Quercus pyrenaicae, in Fano Dnae. nostrae «de Hontanares», de Riaza (Segovia, Hispania). Leg. P. Yebes & J. Checa, 13-VIII-1984. In herbario Mycologico Universitatis Compluti (Alcalá de Henares, Madrid) nº 3709.

Ascomata superficial, aggregate, black, ostiolate, subglobose to pyriform, 200-500 µm diam., glabrous; peridium dark brown, pseudoparenchymatous, thick walls, 7-10 µm diam., inner peridial cells and subhymenium becoming green in KOH or NH_4OH. Asci octospored non amyloid, cylindrical, 110-115 x 10-12 µm, rounded apex, attenuated at the base in a short stipe. Paraphyses foliform, hyaline, septate, 2-3 µm diam. Ascospores obliquely uniseriate, hyaline at first, becoming brown, with a longitudinal germ slit, one-celled, smooth,

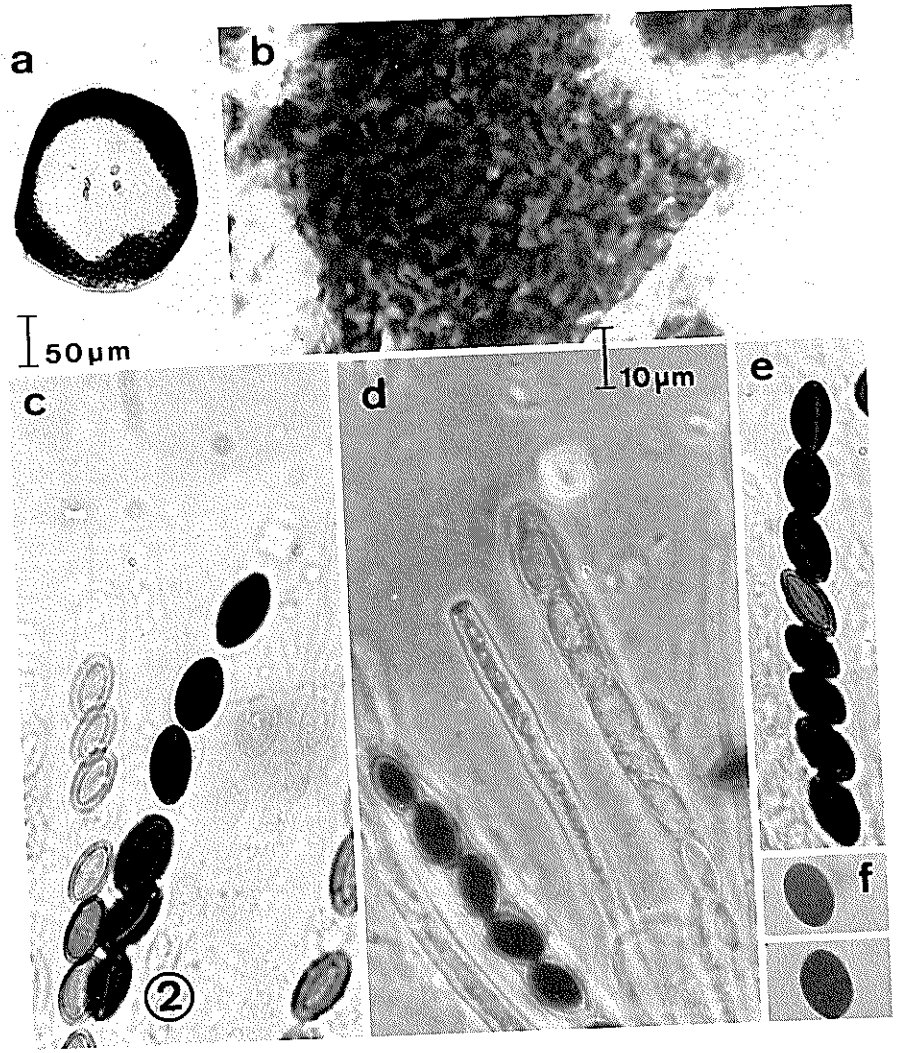

Fig. 2 — *Coniochaeta alkalivirens* Checa & Moreno. a : section of ascoma, HAH 2975 - b : peridial cells, HAH 2975 - c and e : asci with uniseriate ascospores, HAH 2975. d : immature asci, HAH 3709 - f : ascospores, HAH 3709.

broadly ellipsoidal in frontal view, subfusiform in side view, 12-15 x 8-10 x 5-8 µm. Anamorph absent. .

Etymology : from latin, *alkali* = alkaline, *virens* = green.

Specimens examined : on decayed branches of *Quercus pyrenaica*, Ermita de Nuestra Señora de Hontanares, Riaza (Segovia). August 13, 1984. Holotypus

HAH 3709. On decayed branches of *Cytisus scoparius*, Montejo de la Sierra (Madrid). April 15, 1983. HAH 2975.

Observations : this species is close to *C. pulveracea* and *C. subcorticalis*. *C. pulveracea* is characterized by its blunt hairs covering all perithecium. *C. subcorticalis* have few pointed hairs around the ostiole. *C. alkalivirens* is characterized mainly by the typical green reaction on the inner cells of perithecium and subhymenium and hairs lacking.

Coniochaeta areolatirubra **Checa, Barrasa & Moreno, sp. nov.**
(Fig. 3-4)

Species discipitur microscopio intuentibus areolato peridio; meris oculis intuentibus subrubro superindumento.

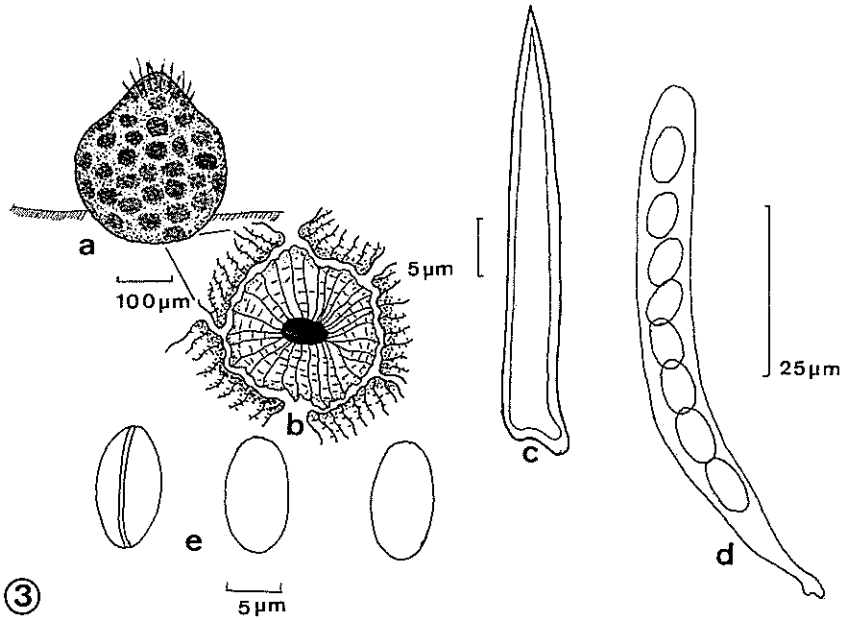

Fig. 3 — *Coniochaeta areolatirubra* Checa, Barrasa & Moreno. a : ascoma - b : peridial cells - c : seta - d : ascus - e : ascospores. Holotypus HAH 3708.

Ascomata dispersa, semiimmersa, nigra, subrubro superindumento praedita, ostiolata, aut piriformia aut subglobosa, 300-320 µm longa, 230-270 µm lata, et ipsa praedita pilis apicalibus rigidis castaneo colore, crassis parietibus, aut rectis aut sinuosis, 50-90 µm longis, quorum basis diameter est 3-5 µm longus;

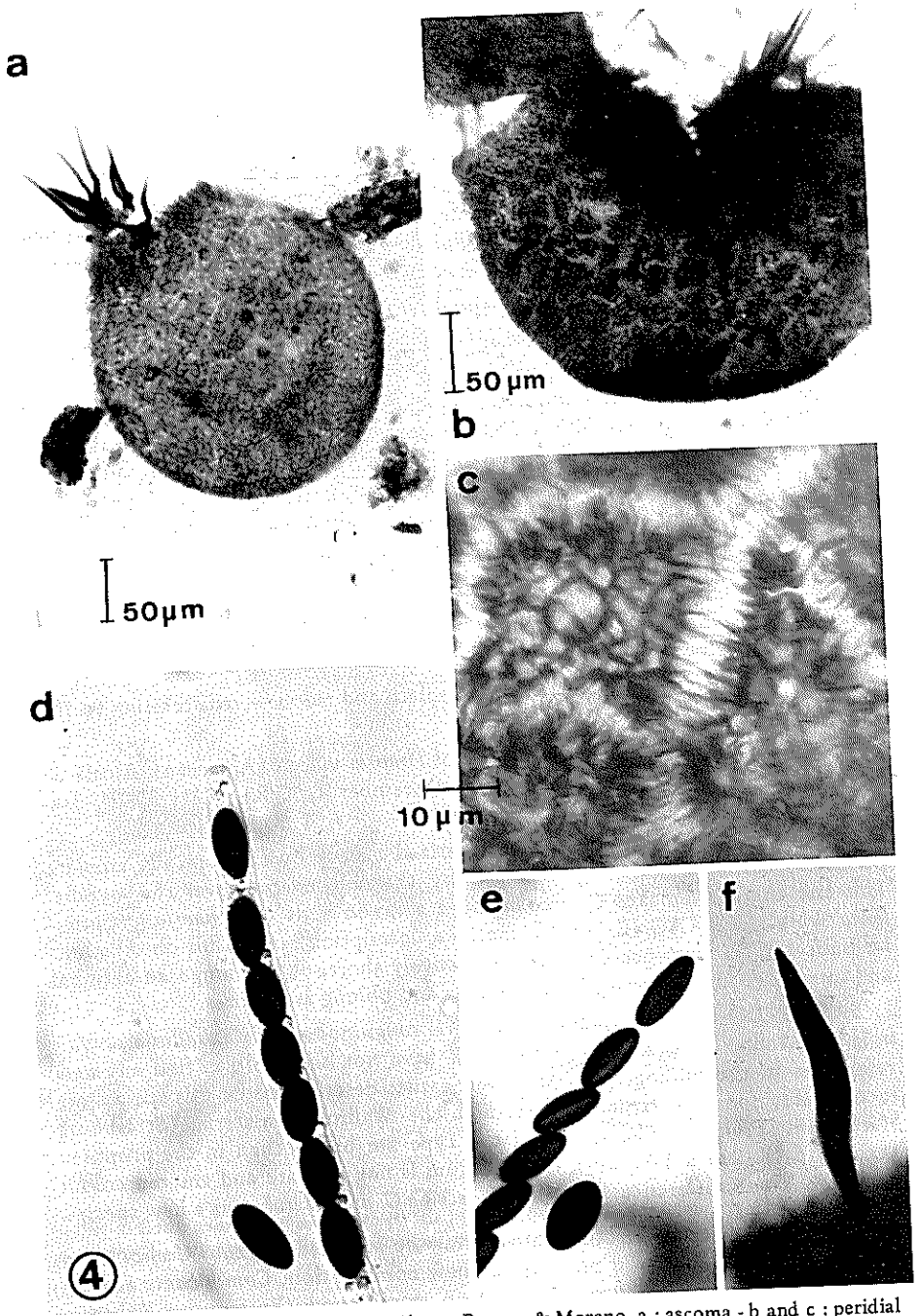

Fig. 4 — *Coniochaeta areolatirubra* Checa, Barrasa & Moreno. a : ascoma - b and c : peridial cells - d : ascus with uniseriate ascospores - e : ascospores - f : seta. Holotypus HAH 3708.

peridium coloro castaneo subrubro, constitutum cellulis pseudoparenchymaticis quarum est diameter 5-7 µm longus, quaeque abnormiter frangutur in splenia. Asci 8 sporis praediti, cylindrici, 100-130 µm longi, 9-12 µm lati, trunci in apice, qui in basi adtenuatur in formam pedis porrecti; apicalis mire visibilis, haud amyloides. Paraphyses filiformes, quarum diameter est 2-3 µm longus. Ascosporae oblique uniseriatae, initio hyalinae, postea castaneo colore, longitudinali germinationis linea praeditae, unicellulares, glabrae, in structura rotundatae 10-13 µm longae, 6-7 µm latae, 5-6 µm altae.

Holotypus : In thallis siccis Thapsiae villosae (Apiaceae), Compluti (Alcalá de Henares), in Academiae campo (Madrid), 1-XII-1983. In Complutensi herbario Micologiae, nº 3708.

Ascomata scattered, semiimmersed, black, with a red covering, ostiolate, pyriform to subglobose, 300-320 x 230-270 µm; apically covered with, straight to undulated setae, measuring 50-90 µm long and 3-5 µm wide at the base; peridium reddish brown, pseudoparenchymatous, areolate, cracking in broad polygones when crushed, 5-7 µm diam. Asci octospored, cylindrical, 100-300 x 9-12 µm, truncated above, with a distinct apical structures, no amyloid, attenuate at the base forming a long stipe; paraphyses filiform, mostly 2-3 µm diam. Ascospores obliquely uniseriate, hyaline at first, then becoming dark brown, one-celled, smooth, ellipsoidal, with rounded ends, 10-13 x 6-7 x 5-6 µm, germ slit longitudinal. Anamorph unknown.

Etymology : from latin *areolata* = areolate and *rubra* = red, refering to the form and colour of the peridial cells.

Specimens examined : on dead twigs of *Thapsia villosa* (Apiaceae), Alcalá de Henares (Universitary Campus, Madrid), December 1, 1983. HAH 3708. Isotypus in herbarium of Dr. von Arx.

Observations : this species is characterized mainly by the typically areolate peridium, absent in other species and by the red covering over the ascoma. This last character makes *C. areolatirubra* a taxon next to *Sphaeria sanguinolenta* Wallr. MONTAGNE (1858), makes a description, and in his observations he indicates the presence of setae «excessively short, 60 µm long» an external and internal reddish covering in the ascoma and oblong ascospores.

SACCARDO (1882), combined *Sphaeria sanguinolenta* to *Rosellinia sanguinolenta* (Wallr.) Sacc. and since then, we have not been able to find any new references in the bibliography. However, earlier descriptions of this species are incomplete, for this reason we studied the Wallroth's material (Strasbourg Herbarium (France)). The spores of the type are bigger than in the proposed taxon (16-19-(21) x 1-12 µm), the peridium is not areolate and the red colour is darker. These differences lead us to describe *C. areolatirubra* as a new species.

This suggests that Wallroth's species must be included in genus *Coniochaeta* instead of in *Rosellinia*. We propose the new combination, ***Coniochaeta sanguinolenta* (Wallr.) Checa, Barrasa & Moreno, comb. nov.** (Basionym : *Sphaeria sanguinolenta* Wallr., *Fl. Crypt. Germ.* 2 : 801 (1833)), Fig. 5.

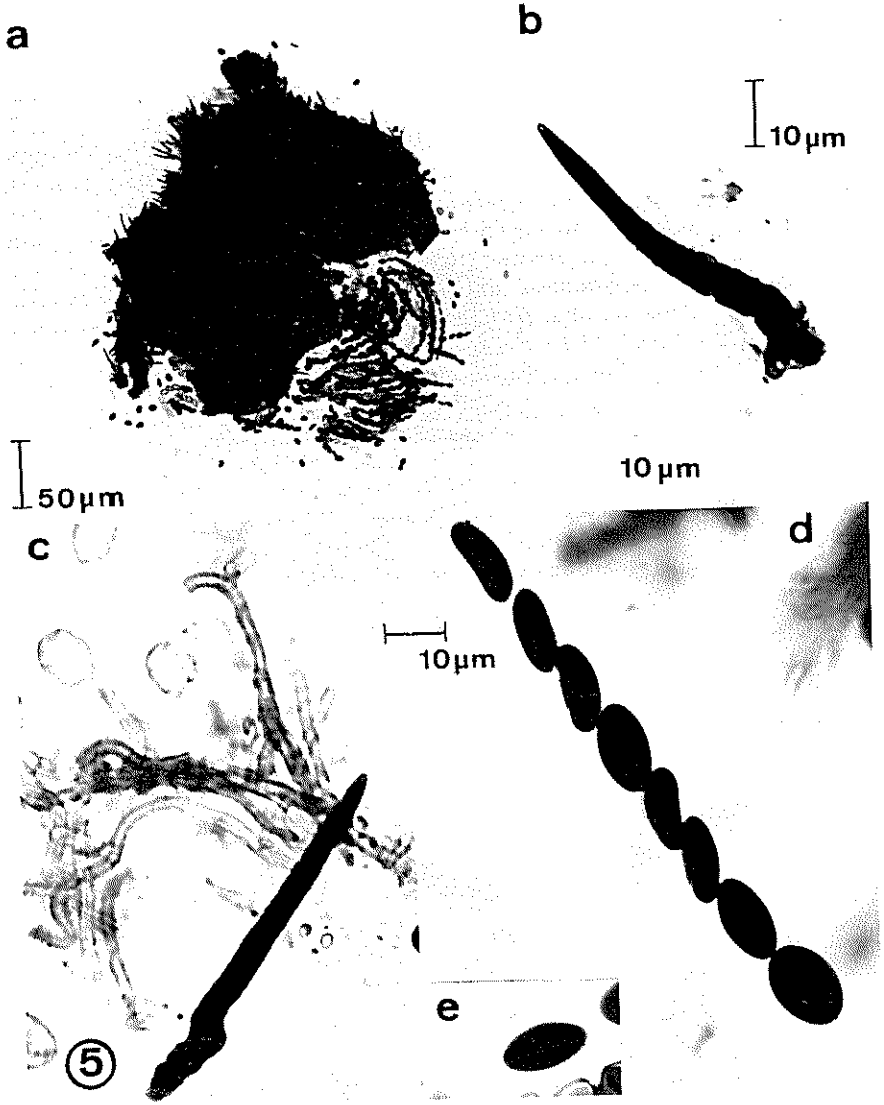

Fig. 5 — *Coniochaeta sanguinolenta* (Wallr.) Checa, Barrasa & Moreno. a : ascoma - b and c : setae - d : ascus with uniseriate ascospores - e : ascospore. Typus Wallroth.

C. sanguinolenta has been found recently in Spain on wood of *Abies pinsapo* (LARIOS, com. pers.).

Coniochaeta cruciata **Fort & Guarro, sp. nov.**
(Fig. 6-7)

Ascomata disseminata, superficialia, fusca et opaca, ostiolata, piriformia, 40-170 µm diam.; pili brunnei, recti, simplices, 10-50 µm longi, basi inflati, 2-4 µm diam., leves, septati, acuminati; collum 8-30 µm longitudine, papilliforme; peridium fuscum et opacum, mediocriter crassum, pseudoparenchymaticum, cellulis minoribus complanatis angularibus compositum, 3-7 µm diam. Asci octospori, late cylindrici vel clavati, 45-44 x 13-19 µm, superne rotundati, figuris apicalibus distinctis nullis, breviter stipitati. Ascosporae oblique biseriatae, primo hyaline deinde atrobrunneae, unicellulares, forma disci inaequaliter complanati late ellipsoidales, partibus peripherilibus en media parte aplanatiores, instar patellae volucris fictae, 11-13 x 7-8,5 x 5,5-6,5 µm, hilo germinale longitudinaliter prolato; episporium mucilaginosum nullum. Conidia incognita.

Holotypus : in folio emortuo Quercus ilicis L.; Garraf, Catalaunia (Hispania), 27-V-1983, FMR 621.

Ascomata scattered, superficial, dark brown and opaque, ostiolate, pyriform, 40-170 µm diam.; covered with setae, swollen at the base, straight, 10-50 x 2-4 µm (at the base); with a short neck 8-30 µm long, papillate; peridium dark brown and opaque, pseudoparenchymatous, moderately thick, consisting of

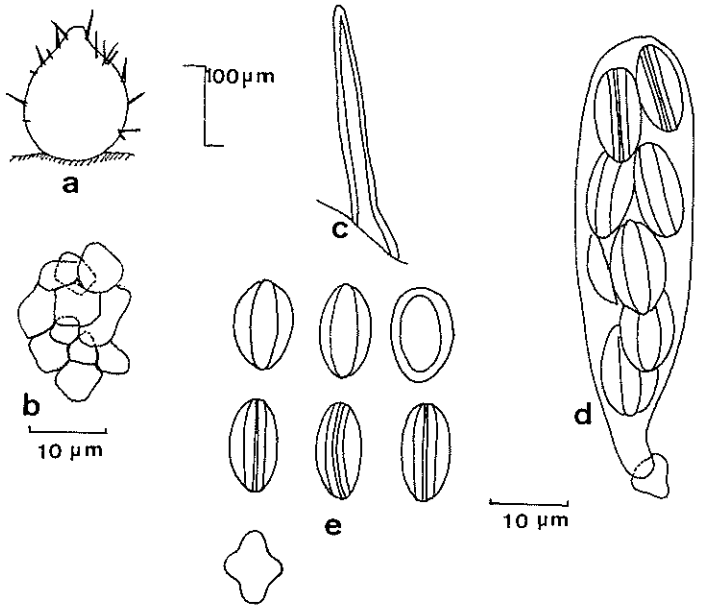

Fig. 6 — *Coniochaeta cruciata* Fort & Guarro. a : ascoma - b : peridial cells - c : seta - d : ascus - e : ascospores. Holotypus FMR 621.

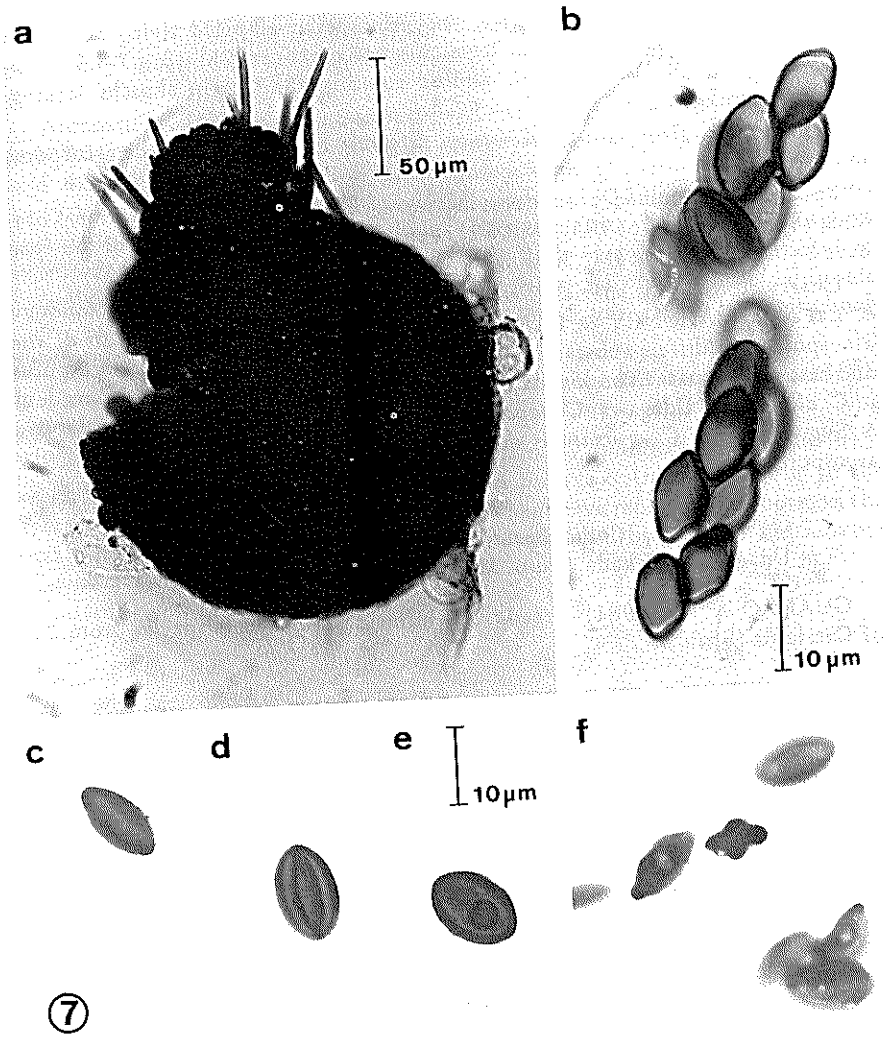

Fig. 7 — *Coniochaeta cruciata* Fort & Guarro. a : ascoma - b : asci with biseriate ascospores - c to f : ascospores. Holotypus FMR 621.

several layers of brown angular cells, 3-7 µm diam. Asci 8-spored, broadly cylindrical to clavate, short stipitate, 45-55 x 13-19 µm, rounded apically without any distinct apical ring or other structures. Ascospores obliquely biseriate, hyaline, turning dark brown to black, one-celled, smooth and thick-walled, in side long view ellipsoid with umbonate ends with the periphery of the spore

more flattened than in the centre, appearing as an ellipsoid flying saucer, in frontal view broadly ellipsoid, in terminal view cruciform, 11-13 x 7-8.5 x 5.5-6.5 µm, germ slit longitudinal, almost running full-length; sheaths lacking. Anamorph unknown.

Etymology : from latin «*cruciatus*», referring to the shape of the ascospores in terminal,view.

Specimens examined : on decaying leaves of *Quercus ilex* L., Garraf, Catalonia (Spain), May 27, 1983. FMR 621. Permanent slide preparations of the type have been deposited at IMI, Kew (U.K.).

Observations : this species is strikingly similar to *C. extramundana* Mahoney & LaFavre (MAHONEY & LAFAVRE, 1981) in the shape and colour of the ascospores but differs substantially by having much smaller biseriate ascospores and setose ascomata. The biseriate arrangement of the ascospores is also evident in *C. ellipsoidea* Udagawa, *C. nepalica* Minoura & al. and *C. perangusta* Udagawa & Sugiyama, but *C. cruciata* is distinct from the latter three by its particular ascospore shape.

Coniochaeta ellipsoidea Udagawa
in Udagawa & Takada, *Trans. Mycol. Soc. Japan* 8 : 50 (1967), Fig. 8.

GUARRO & al. (1981) already cited and described this species from soil of Catalonia (Spain).

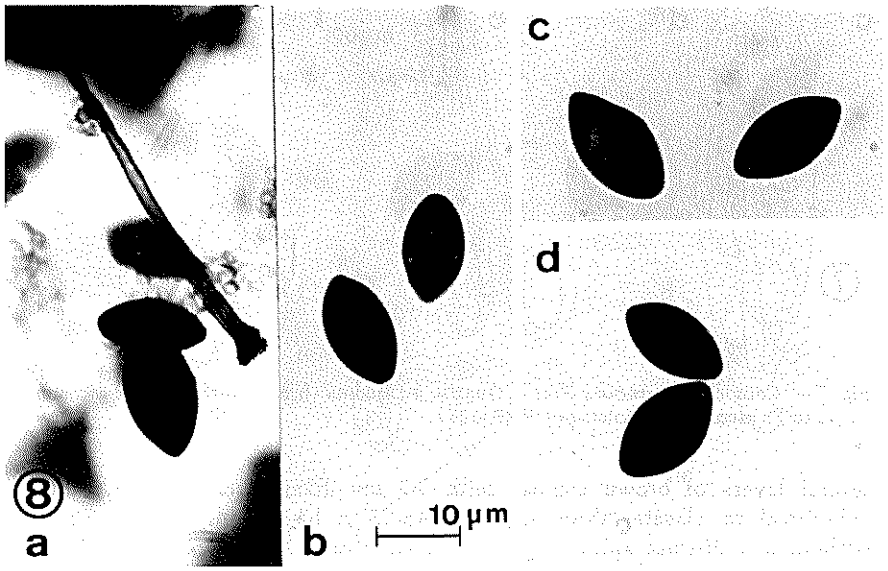

Fig. 8 — *Coniochaeta ellipsoidea* Udagawa. a : seta - b to d : ascospores. FMR 839.

Coniochaeta hansenii (Oudem.) Cain
Univ. Toronto Stud., Biol. Ser. 38 : 63 (1934), Fig. 9-10.

Ascomata scattered, semiimmersed, pyriform, dark brown, ostiolate, 400-600 x 80-90 µm, black, covered with rigid, straight setae, measuring 80-90 µm long and 4.5-5.5 µm wide; peridium pseudoparenchymatous, consisting in angular and isodiametric cells. Asci 64-128 spored, clavate, 140-180 x 20-30 µm, rounded above and short stipitate. Paraphyses filiform-ventricose, septate. Ascospores multiseriate, at first hyaline then becoming dark brown, smooth, discoid or broadly ellipsoidal to circular or ovate in face view, narrowly ellipsoidal in side view, rounded at both ends, 7.5-9 x 4.5-7 x 4-6.5 µm, germ slit longitudinal, surrounded with a narrow gelatinous sheath.

Specimens examined : on rabbit dung in moist chamber, Gandullas (Madrid), November 12, 1981. HAH 2161.

Observations : *C. hansenii* (Oudem.) Cain, *C. philocoproides* (Griffiths) Cain, *C. multispora* Cain and *C. polysperma* Furuya & Udagawa belong to the species group with multispored asci. All of them have more than 9 spores in the asci. The differences between them can be established by the size and number of spores in the asci.

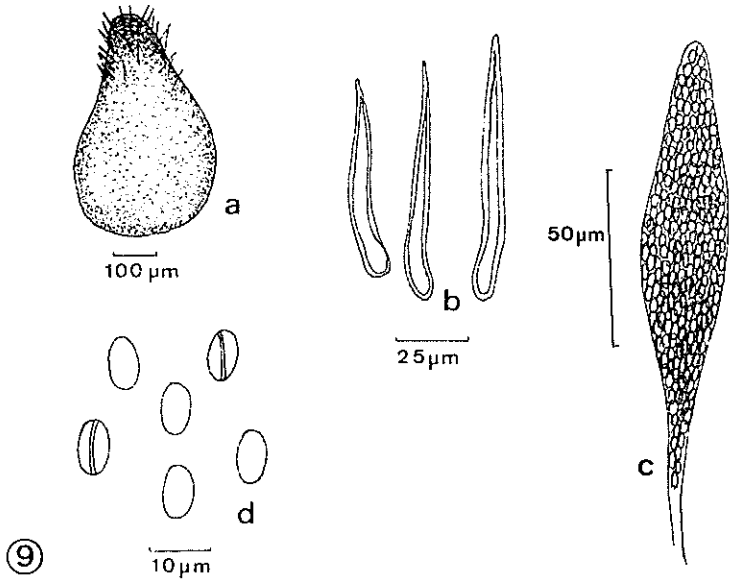

Fig. 9 — *Coniochaeta hansenii* (Oudem.) Cain. a : ascoma - b : setae - c : ascus - d : ascospores. HAH 2161.

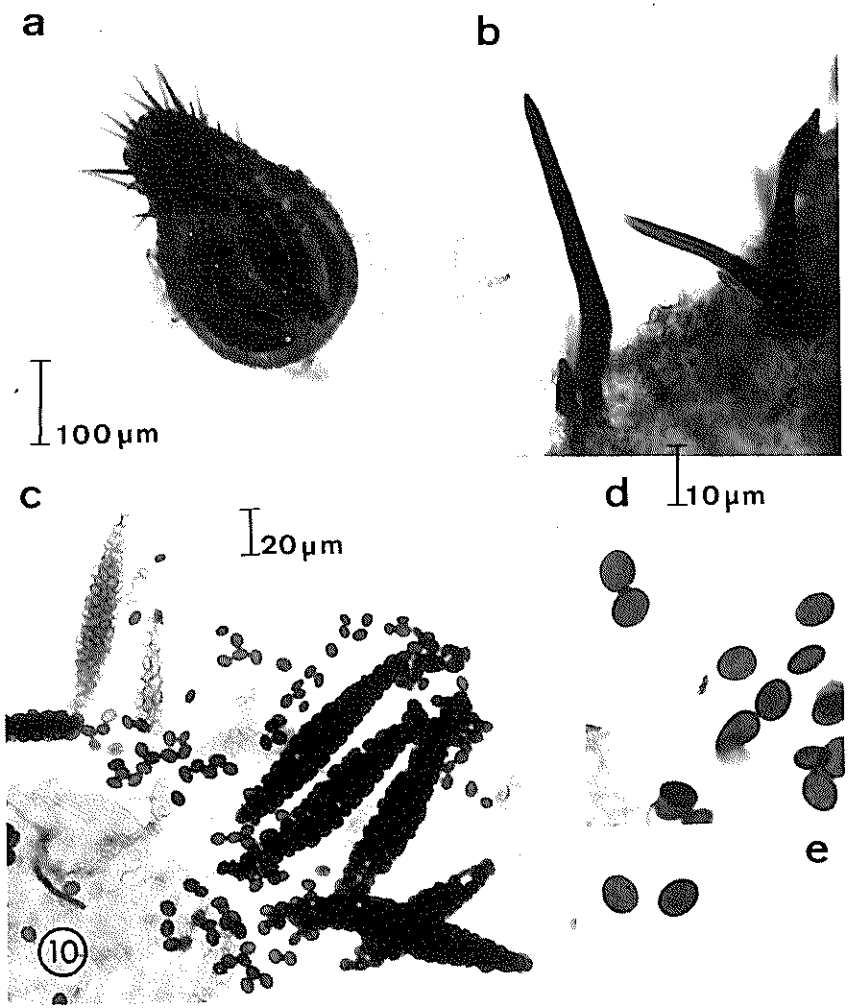

Fig. 10 — *Coniochaeta hansenii* (Oudem.) Cain. a : ascoma - b : setae - c : asci - d and e : ascospores. HAH 2161.

These species have been found growing on dung only (CAIN, 1934; MAHONEY & LAFAVRE, 1981).

Coniochaeta ligniaria (Grev.) Massee
Grevillea 16 : 37 (1887), Fig. 11-12.

= *C. discospora* (Auersw.) Cain, *Univ. Toronto Stud., Biol. Ser.* 38 : 62 (1934).

Specimens examined : on branches of *Fagus sylvatica*, Puerto de la Quesera (Segovia), July 15, 1980. HAH 2883. On branches of *Betula celtiberica*, Puerto de Canencia (Madrid), November 13, 1983. HAH 3484 and 3522. On branches of *Pinus sylvestris*, Puerto de Canencia (Madrid), November 13, 1983. HAH 3427; September 26, 1984. HAH 3750. On branches of *Populus nigra*, Santiuste (Guadalajara), March 22, 1985. HAH 9147. On cow dung, Peña Lecande (Vizcaya), October 2, 1980. HAH 1184. On horse dung, Tamajon (Guadalajara), June 20, 1979. HAH 1891. On rabbit dung, National Park of Teide (Tenerife island), March 30, 1982. HAH 3418.

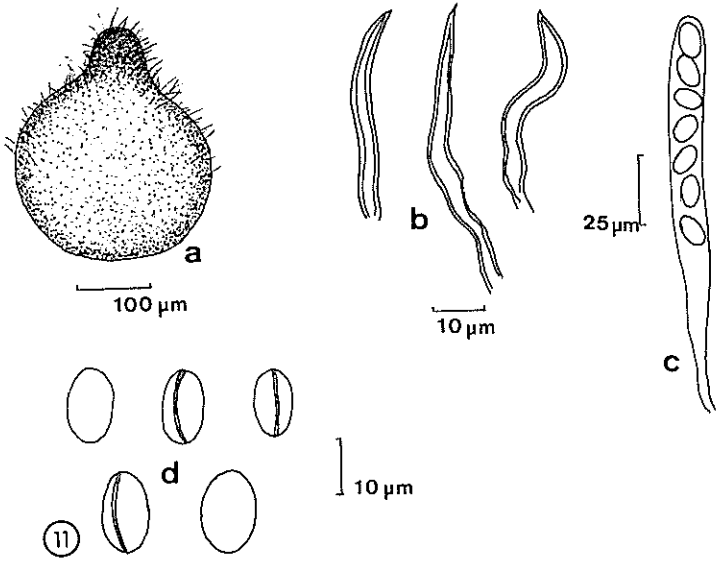

Fig. 11 — *Coniochaeta ligniaria* (Grev.) Massee. a : ascoma - b : setae - c : ascus - d : ascospores. HAH 2883.

Observations : this is a controversed species in the bibliography of the genus because of its variability in habitat and spores size. We found this taxon growing on dung (cow, horse, rabbit, etc.) and wood. We noted little differences in both kinds of specimens. Some authors (ARX & MÜLLER, 1954; MUNK, 1957; HAWKSWORTH & YIP, 1981) consider the coprophilous forms (*C. discospora*) as synonym of *C. ligniaria* which most often grows on lignicolous substrates.

C. ligniaria is characterized by the presence of setae covering their ascomata and ellipsoidal spores. However some coprophilous specimens have more broadly ellipsoidal spores and the pointed hairs are restricted around to the ostiole.

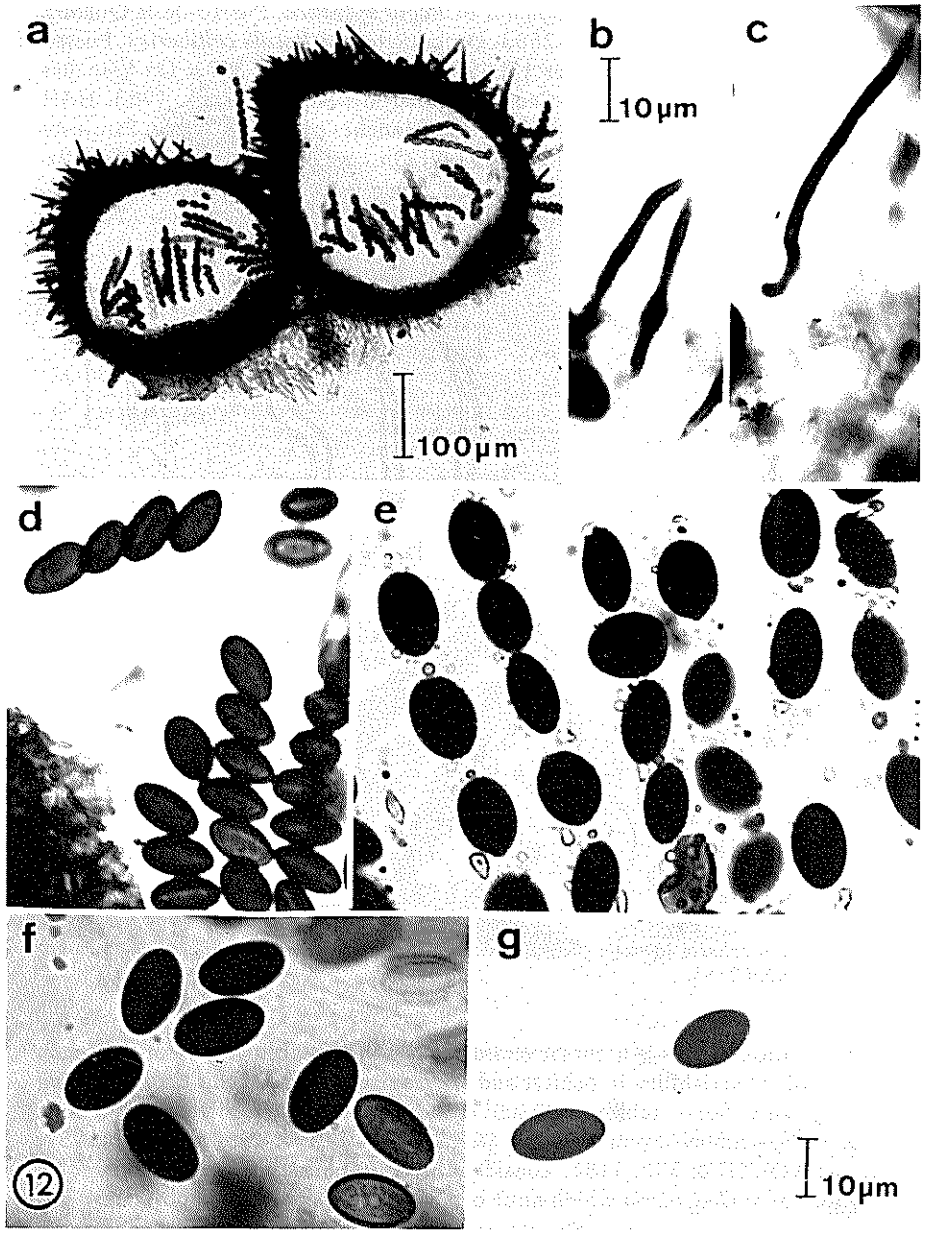

Fig. 12 — *Coniochaeta ligniaria* (Grev.) Massee. a : ascomata section, HAH 3483 - b and c : setae, HAH 9147 - d : uniseriate ascospores, HAH 3484 - e : uniseriate ascospores, HAH 1184 - f and g : ascospores, HAH 3427.

DOGUET (1959) indicated that the presence of hairs on the perithecia is a variable character in culture, becoming glabrous in some cases.

This species is widely distributed in Spain.

Coniochaeta malacotricha (Niessl) Trav.
Fl. Ital. Cryptog. 2 : 473 (1907), Fig. 13-14.

Ascomata scattered, superficial, black, ostiolate, pyriform to subglobose, 270-290 x 200-235 µm, densely covered with setae with a broad base and pointed apex, measuring 35-40 x 4-5 µm; peridium pseudoparenchymatous, brown, consisting in angular cells, 5-7 x 3-4 µm. Asci octospored, cylindrical, 100-115 x 7-9 µm, rounded above, attenuate at the base. Paraphyses filiform. Ascospores uniseriate, brown, one-celled, smooth, typically millstone shaped, broadly ellipsoidal to subcircular in face view, 11-12 x 9-10 µm, germ slit longitudinal, sometimes with little oil drops.

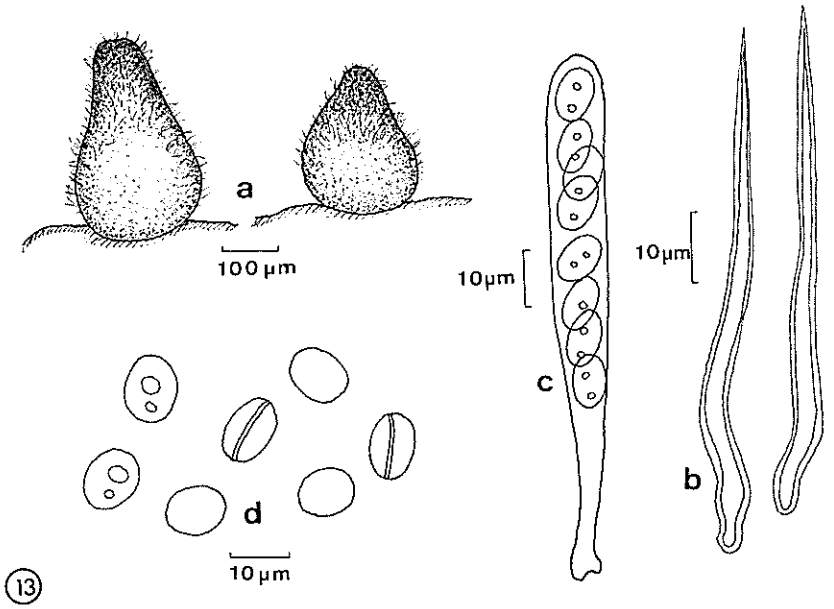

Fig. 13 — *Coniochaeta malacotricha* (Niessl.) Traverso. a : ascomata - b : setae - c : ascus - d : ascospores. HAH 3658.

Specimens examined : on branches of *Pinus sylvestris*, Puerto de los Leones (Segovia), June 10, 1984. HAH 3658, 3659, 3660. On branches of *Pinus sylvestris*, Peralejos de las Truchas (Guadalajara), August 22, 1984. HAH 3702. On

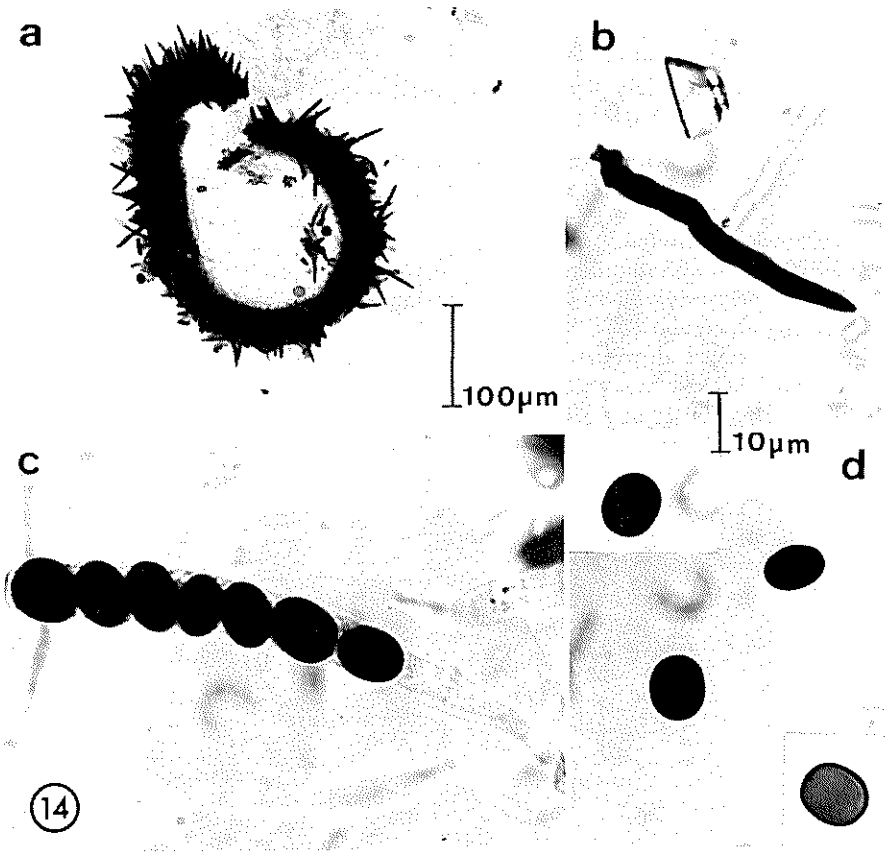

Fig. 14 — *Coniochaeta malacotricha* (Niessl.) Traverso. a : ascoma - b : seta - c : ascus with uniseriate ascospores - d : ascospores. HAH 3658.

branches of *Pinus pinea*, Cerro de los Angeles (Madrid), February 26, 1974. MA-FUNGI 4274 (as *C. ligniaria*).

Observations : *C. malacotricha* is similar to *C. ligniaria* (Grev.) Massee, principally by the spore size. However, the former can be differentiated of the latter by the millstone shaped spores and the more abundant ascomatal setae, reminding a «sea hedgehog». Furthermore *C. malacotricha* is strictly lignicolous (MAHONEY & LAFAVRE, 1981), while *C. ligniaria* grows on different substrates.

This species was cited before on *Pinus halepensis* of Sierra de Quibas (Murcia) by LARIOS (1986).

***Coniochaeta niesslii* (Auersw.) Arx & Müller**
Beitr. Kryptogamenfl. Schweiz 11 : 306 (1954), Fig. 15-16

Ascomata immersed, pyriform, black, 250-300 µm in diam., with pointed or rounded above, brown and sinuous setae in all the ascomata, 30-55 x 3-4 µm; pseudoparenchymatous brown peridial cells. Asci octospored, 130-140 x 15-17 µm, cylindrical, uniseriate, with rounded apex, attenuate at the base. Paraphyses filiform. Ascospores 16-20-(22) x 9-12 x 8-9 µm, brown, broadly ellipsoidal, slightly fusiform, with a longitudinal germ slit.

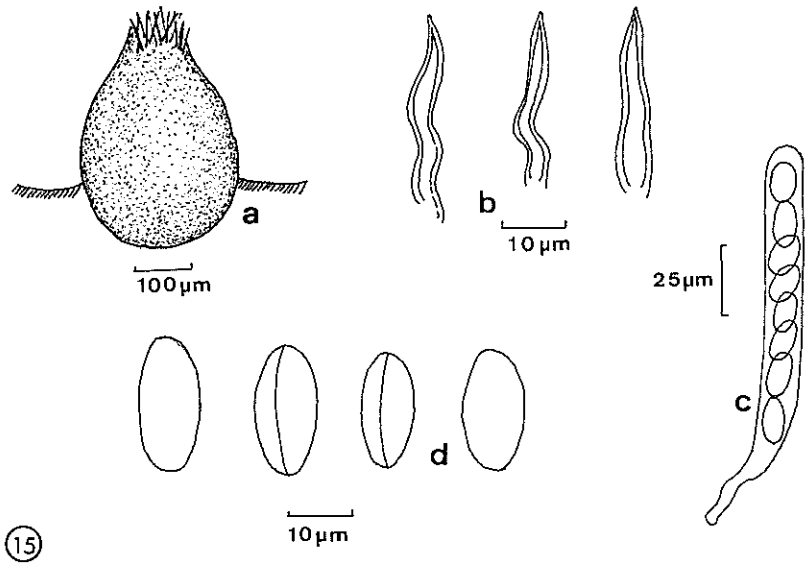

Fig. 15 — *Coniochaeta niesslii* (Auersw.) Arx & Müller. a : ascoma - b : setae - c : ascus - d : ascospores. HAH 3892.

Specimens examined : on branches of *Quercus coccifera*, Aranjuez (Madrid), February 3, 1985. HAH 3892. On branches of *Abies pinsapo*, Sierra de las Nieves, Ronda (Málaga), June 13, 1984. JL 7046 (LARIOS & al., 1986, as *C. malacotricha* (Niessl) Trav.).

This species was cited before as *C. malacotricha* var. *ambigua* (Sacc.) Trav. on *Quercus* in Antoñana (Alava) by URRIES (1952).

***Coniochaeta ovata* Matsushima**
Microfungi of the Solomon Islands and Papua-New Guinea : 72 (1971), Fig. 17-18

Ascomata scattered, semiimmersed to immersed, dark brown to nearly black

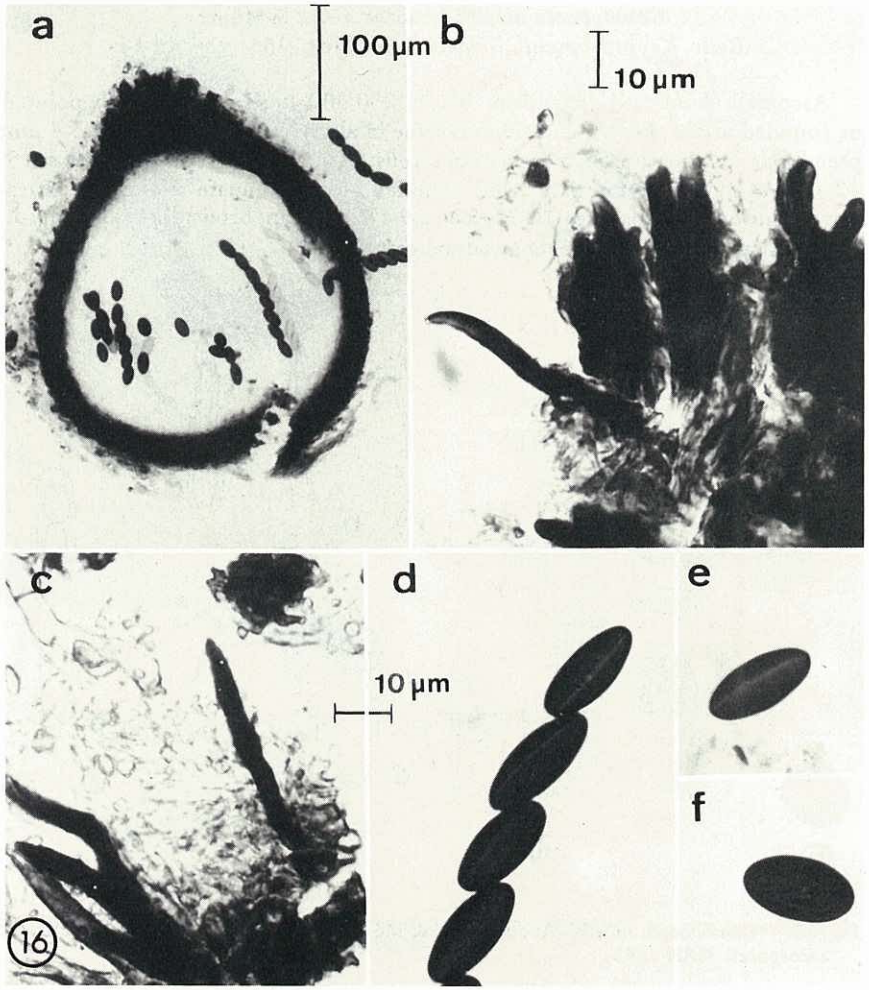

Fig. 16 — *Coniochaeta niesslii* (Auersw.) Arx & Müller. a : ascoma - b and c : setae - d and e : ascospores. HAH 3892.

and opaque, ostiolate, globose to pyriform, 390-600 x 280-400 µm; with setae straight, up to 60 x 3-5 µm (at the base), with a short papilliform neck, up to 50 µm long; peridium brown to black and opaque, pseudoparenchymatous, consisting of several layers of brown polyhedral cells. Asci 8-spored, cylindrical, with, when young, a basal stipe, 100-130 x 7-10 µm. Paraphyses filiform. Ascospores uniseriate, hyaline, dark brown to black with age, one-celled, ovoid

with the narrow end apiculate and sometimes curved, 17-21 x 7-8 x 6-7 µm germ slit longitudinal, almost running full-length; sheaths lacking.

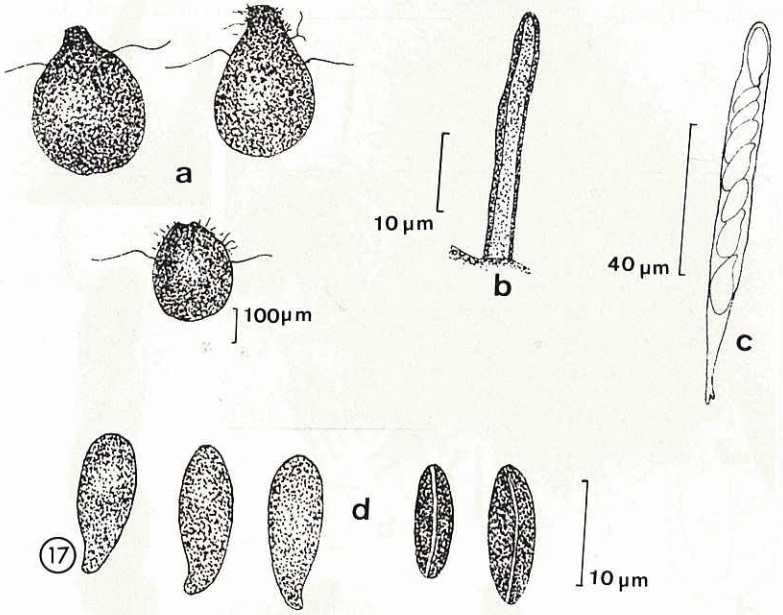

Fig. 17 — *Coniochaeta ovata* Matsushima. a : ascomata - b : seta - c : ascus - d : ascospores. FMR 843.

Colonies on OGMA at 25°C restricted, flat, fleshy, brown to black.

Specimens examined : isolated from a cork oak wood soil, Montenegre, Catalonia (Spain), May 17, 1985. FMR 843.

Observations : this species is similar to *C. saccardoi* (Marchal) Cain but differs mainly in the shape and especially in the size of the ascospores, as well as in the kind of ascomatal setae.

Coniochaeta pulveracea (Ehrh.) Munk

Dansk Bot. Ark. 12 : 11 (1948), Fig. 19-20.

≡ *Sphaeria pulveracea* Ehrh. in Pers., *Syn. Meth. Fung.* : 83 (1801)
= *Coniochaeta sarothamni* (Schröt.) Arx & Müller, *Beitr. Kryptogamenfl. Schweiz* 11 : 308 (1954).
= *Rosellinia sarothamni* Schröt., *Krypt.-Fl. Schlesiens* 3 : 300 (1894)

Ascomata scattered, superficial, black, ostiolate, pyriform to subglobose, 300-400 µm diam., apparently glabrous, but with short, blunt, brown hairs,

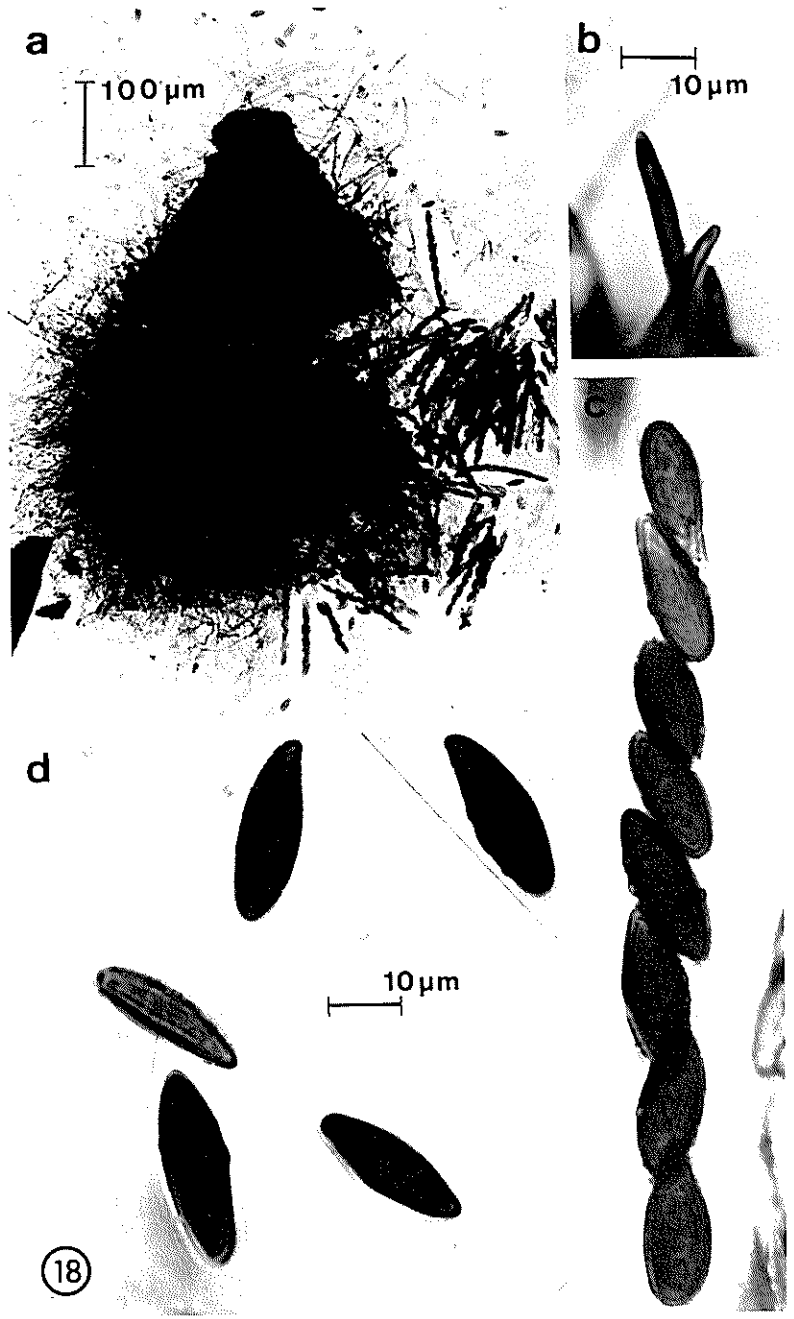

Fig. 18 — *Coniochaeta ovata* Matsushima. a : ascoma - b : setae - c : asci with uniseriate ascospores - d : ascospores. FMR 843.

which are covering the ascoma, 10-14 x 5-7 µm, only observed in cross sections; peridium brown, pseudoparenchymatous, consisting of angular cells, 5-7 x 3-5 µm. Asci octospored, cylindrical, 110-120 x 7-10 µm, truncate above, attenuate at the base; paraphyses filiform around 2 µm diam. Ascospores uniseriate, hyaline at first, then becoming dark brown, one-celled, smooth, ellipsoidal with rounded ends, 13-17 x 7-10 x 5-7 µm, germ slit longitudinal.

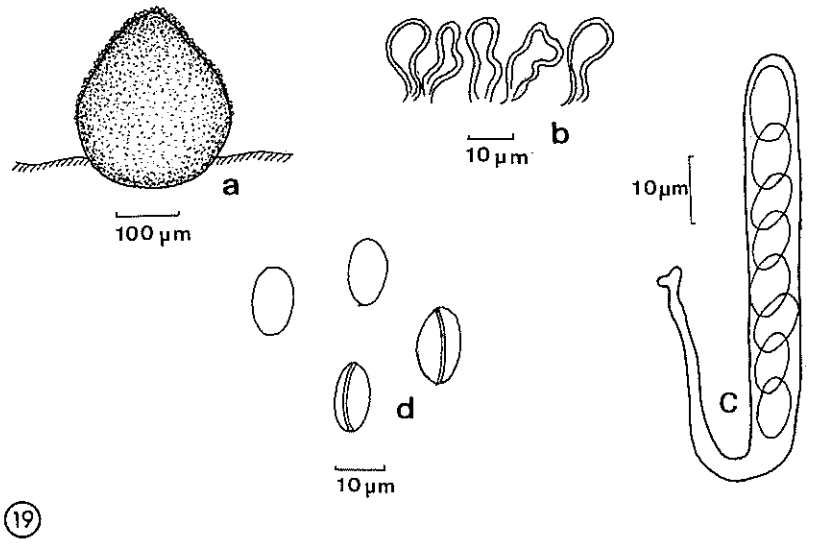

Fig. 19 — *Coniochaeta pulveracea* (Ehrh.) Munk. a : ascoma - b : setae - c : ascus - d : ascospores. HAH 3203.

Specimens examined : on twigs of *Cytisus scoparius*, Embalse de Navalmedio (Madrid), April 28, 1983. HAH 3122. On twigs of *Adenocarpus complicatus*, Montejo de la Sierra (Madrid), June 27, 1983. HAH 3520. On branches of *Retama sphaerocarpa*, El Pardo (Madrid), January 5, 1984. HAH 3420. On branches of *Quercus pyrenaica*, Riofrío de Riaza (Segovia), February 5, 1984. HAH 3203. On branches of *Quercus pyrenaica*, way from Cotos to El Paular (Madrid), April 7, 1984. HAH 3555, 3721. On twigs of *Cytisus scoparius*, way from Navacerrada to La Granja (Segovia), June 10, 1984. HAH 3807. On twigs of *Cytisus scoparius*, Riofrío de Riaza (Segovia), November 15, 1984. HAH 3829. On branches of *Genista scorpius*, La Cabrera (Guadalajara), March 22, 1985. HAH 9152. On branches of *Juniperus nana*, Puerto de los Cotos (Madrid), June 9, 1985. HAH 9140. On branches of *Cytisus purgans*, Cabezas de Hierro (Madrid), June 16, 1985. HAH 9160. On branches of *Cytisus purgans*, Pto. de Cotos (Madrid), September 2, 1933, nº herbarium MA 12819 (as *Rosellinia sarothamni*).

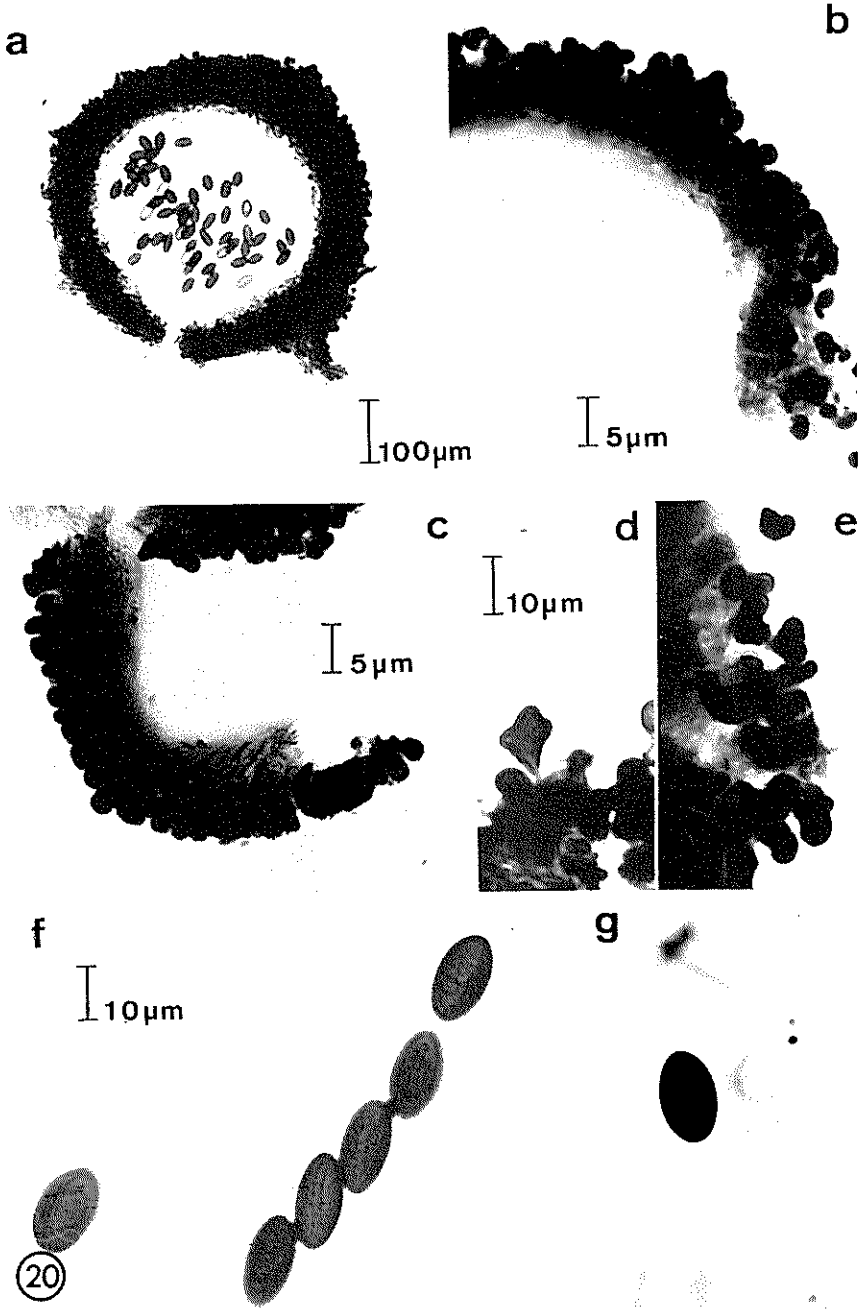

Fig. 20 — *Coniochaeta pulveracea* (Ehrh.) Munk. a : ascoma, HAH 3203 - b and c : ascomata section, HAH 3520 - d and e : setae, HAH 3520 - f : uniseriate ascospores, HAH 3203 - g : ascospores, HAH 3203.

Observations : this species is characterized by its short and blunt setae which are covering the whole ascoma. However, the ascospores shape is different depending of the author; so MUNK (1957) describes them «broadly ellipsoid to almost circular», while for ARX & MÜLLER (1954) these are ellipsoidal. Our specimens have always shown spores clearly ellipsoidal, as indicate the latter.

C. sarothamni is close to *C. pulveracea* and difficult to separate because the earlier descriptions of the former are incomplete.

Examining material from Zurich Herbarium (ZT), we couldn't find important differences between both species, for that, we consider *C. sarothamni* to be synonym of *C. pulveracea*. In the past most of the specimens growing on *Sarothamnus* sp. were identified as *C. sarothamni* without having in account further characteristics.

Coniochaeta saccardoi **(Marchal) Cain**
Univ. Toronto Stud., Biol. Ser. 38 : 65 (1934), Fig. 21-22.

≡ *Hypocopra saccardoi* Marchal, *Bull. Soc. Roy. Bot. Belgique* 24 : 59 (1885).

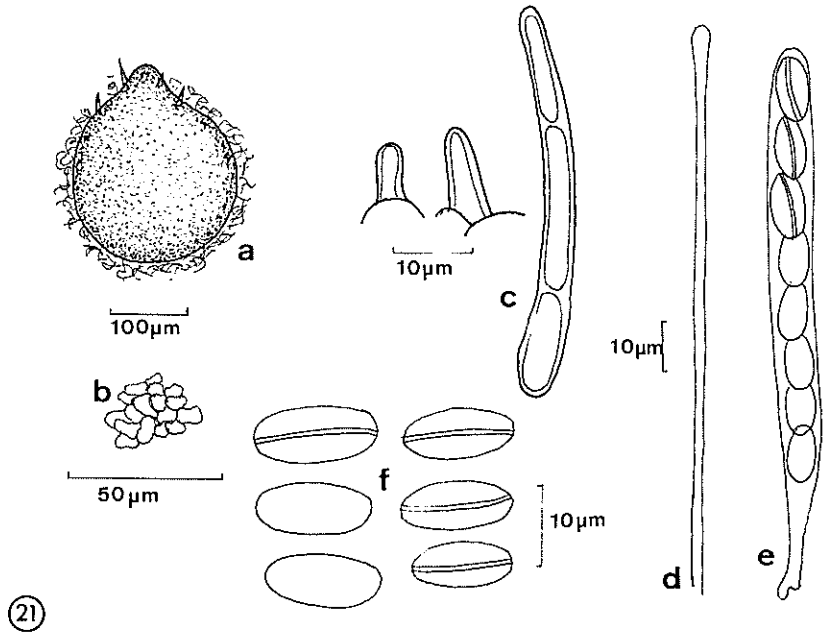

Fig. 21 — *Coniochaeta saccardoi* (Marchal) Cain. a : ascoma - b : peridial cells - c : setae - d : paraphysis - e : ascus - f : ascospores. FMR 620.

Ascomata scattered, superficial, dark brown to nearly black and opaque, ostiolate, globose to pyriform, 230-315 µm diam.; covered with sparse setae, swollen at the base, and rounded apically, straight to slightly undulate 10-80 x 4-6 µm (at the base); with a short papillate neck, up to 20 µm long, papilliform; peridium brown to black and opaque, pseudoparenchymatous, consisting of several layers of brown, angular cells, 4-10 µm diam. Asci 8-spored, cylindrical, rounded apically, without any distinct apical ring or other structures, short stipitate, 95-113 x 5-9 µm. Paraphyses filiform, surpassing the asci, mostly 2-4 µm wide. Ascospores obliquely uniseriate, hyaline at first, then late dark brown to black, one-celled, narrowly ellipsoid, 13-18 x 5-7 x 4.5-6 µm, germ slit longitudinal, running almost full-length.

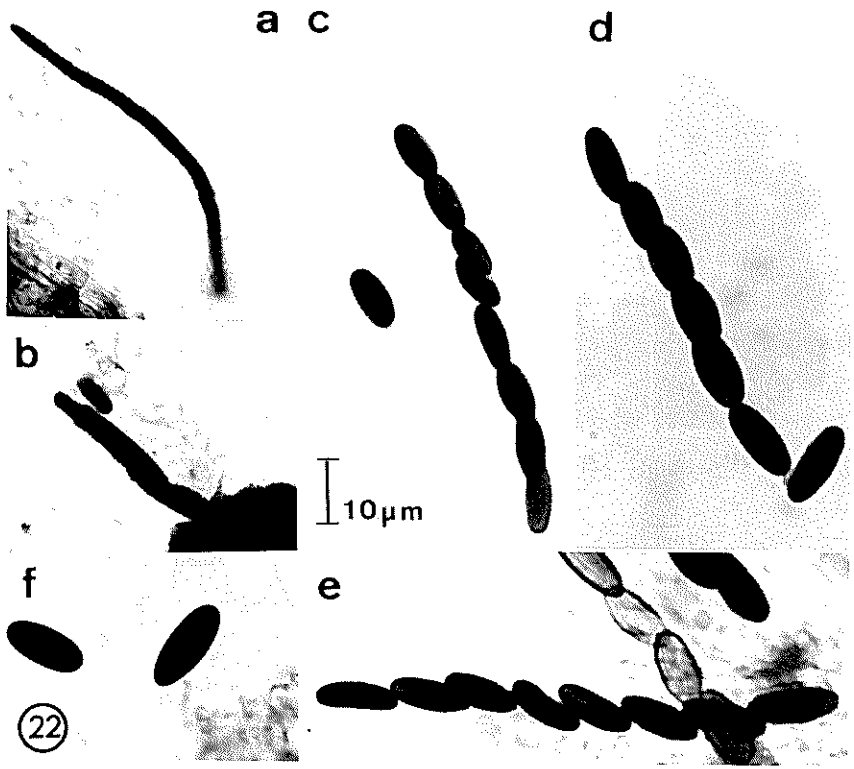

Fig. 22 — *Coniochaeta saccardoi* (Marchal) Cain. a and b : setae - c to e : uniseriate ascospores - f : ascospores. FMR 620.

Specimens examined : on decaying leaves of *Quercus coccifera*, La Torre de Fontaubella, Priorat, Catalonia (Spain). April 4, 1983. FMR 620.

Observations : *C. saccardoi* is characterized, principally, by its spores narrowly ellipsoid.

It has been reported on dung, soil and stems (KOBAYASHI & al., 1969; FURUYA & UDAGAWA, 1973; MAHONEY & LAFAVRE, 1981; SPOONER, 1984).

Coniochaeta scatigena (Berk. & Broome) Cain

Univ. Toronto Stud., Biol. Ser. 38 : 62 (1934), Fig. 23-24.

Ascomata scattered, semiimmersed to superficial, subglobose to pyriform, 350-400 x 200-250 µm, dark brown to black; neck papilliform, short, covered with straight, rigid setae, 63-73 x 4.8-5 µm peridium membranaceous with isodiametric cells. Asci octospored, cylindrical, 100-180 x 15-23 µm, broadly rounded to slightly truncate above, tapering at the base, with a short basal stipe. Paraphyses filiform, septate. Ascospores hyaline at first then becoming dark brown to black, obliquely uniseriate, discoid, one celled, smooth, subcircular to circular in face view, narrowly ellipsoidal in side view, with truncate ends, 18-22 x 12-18 x 8-14 µm, germ slit longitudinal, surrounded with a gelatinous sheath.

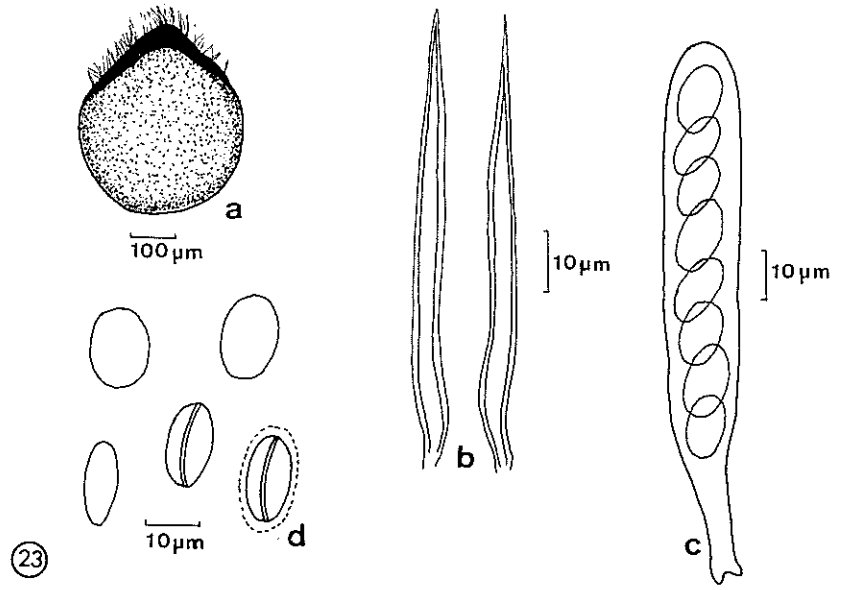

Fig. 23 — *Coniochaeta scatigena* (Berk. & Broome) Cain. a : ascoma - b : setae - c : ascus - d : ascospores. HAH 2678.

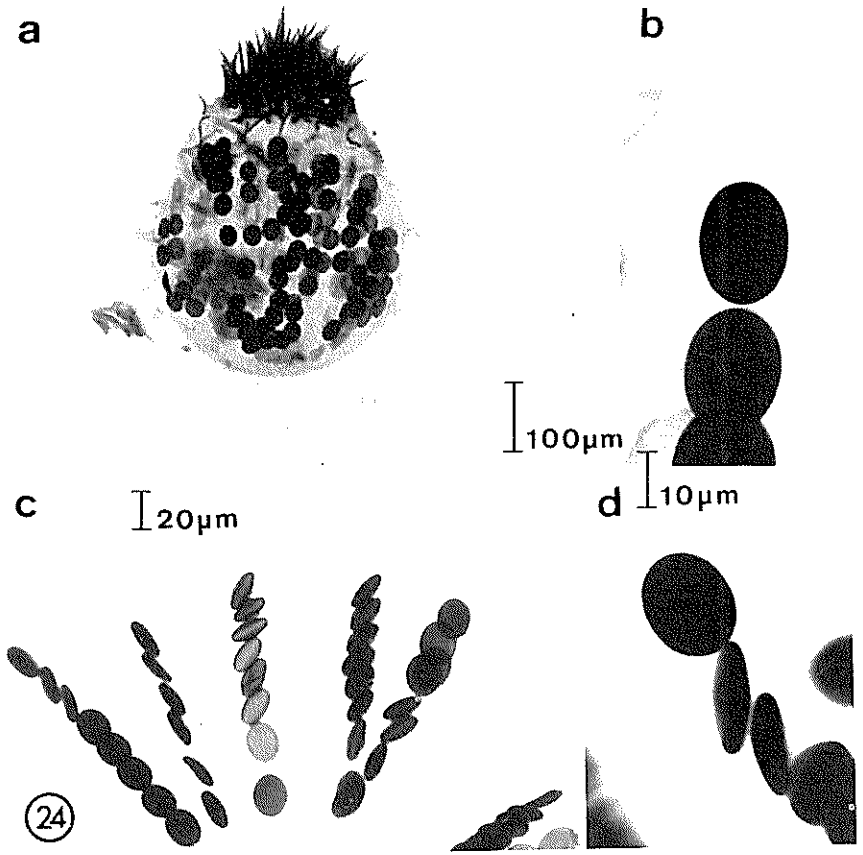

Fig. 24 — *Coniochaeta scatigena* (Berk. & Broome) Cain. a : ascoma - b : uniseriate ascospores - c : asci - d : ascospores. HAH 2678.

Specimen examined : on horse dung in moist chamber, Puerto de Somosierra (Madrid), September 1982. HAH 2678. On cow dung in moist chamber, La Barranca (Madrid), June 21, 1983. HAH 3008.

Observations : *C. scatigena* is a common species on dung but GOCHENAUR (1964) found it once on soil. This species is close to *C. ligniaria* in the shape of ascospores but differs from it in having larger ascospores and pointed hairs around the ostiole.

This species was previously found in Spain between Cabo Prieto and Cabo Mar (Asturias) and Puerto de Pajares (Asturias) growing on horse and cow dung (LUNDQVIST, 1960).

Coniochaeta subcorticalis (Fuck.) Cooke
Grevillea 16 : 16 (1887), Fig. 25-26.

Ascomata scattered, superficial, black, ostiolate, pyriform to subglobose, 200-300 µm diam.; apically covered with scanty, undulated setae 25-35 x 4 µm; peridium brown, pseudoparenchymatous; consisting in angular cells, 5-8 x 3-4 µm. Asci octospored, cylindrical, 80-90 x 8-10 µm, truncate above, attenuate at the base. Ascospores uniseriate, hyaline at first, then becoming brown, one-celled, smooth, broadly ellipsoidal to irregular in face view, ellipsoidal in side view, 10-12 x 7-8 x 4-5 µm, germ slit longitudinal.

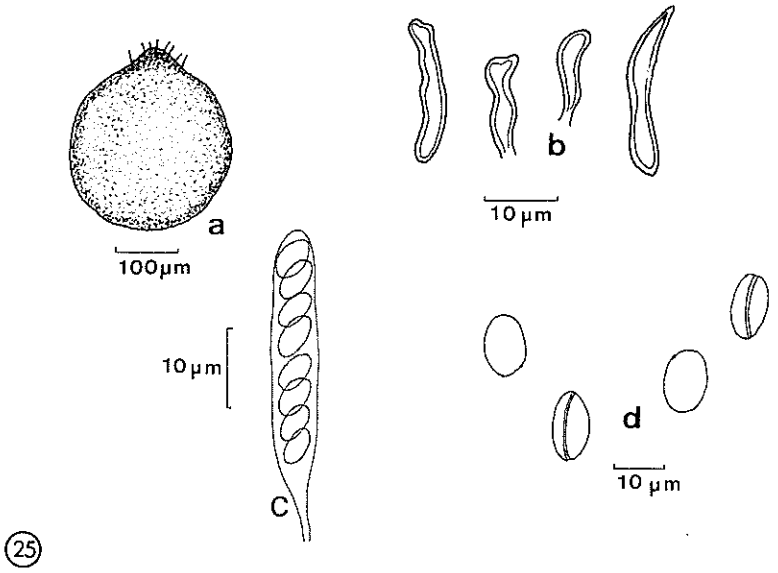

Fig. 25 — *Coniochaeta subcorticalis* (Fuck.) Cooke. a : ascoma - b : setae - c : uniseriate ascospores - d : ascospores. HAH 3121.

Specimens examined : on branches of *Populus nigra*, Alcalá de Henares (Madrid), October 21, 1983. HAH 3121, 3521; May 22, 1985. HAH 9105. On branches of *Salix* sp., El Paular (Madrid), April 7, 1984. HAH 9058. On twigs of *Cistus laurifolius*, Embalse de Navalmedio (Madrid), April 28, 1983. HAH 9057. On dead wood, Monte Aralar (Navarra), November 14, 1973. MA-FUNGI 4937 (as *C. pulveracea*).

Observations : this species is very related to *C. alkalivirens* and *C. pulveracea* but differs by the presence of pointed hairs around the ostiole, and the absence of a greenish reaction with alkaline solution.

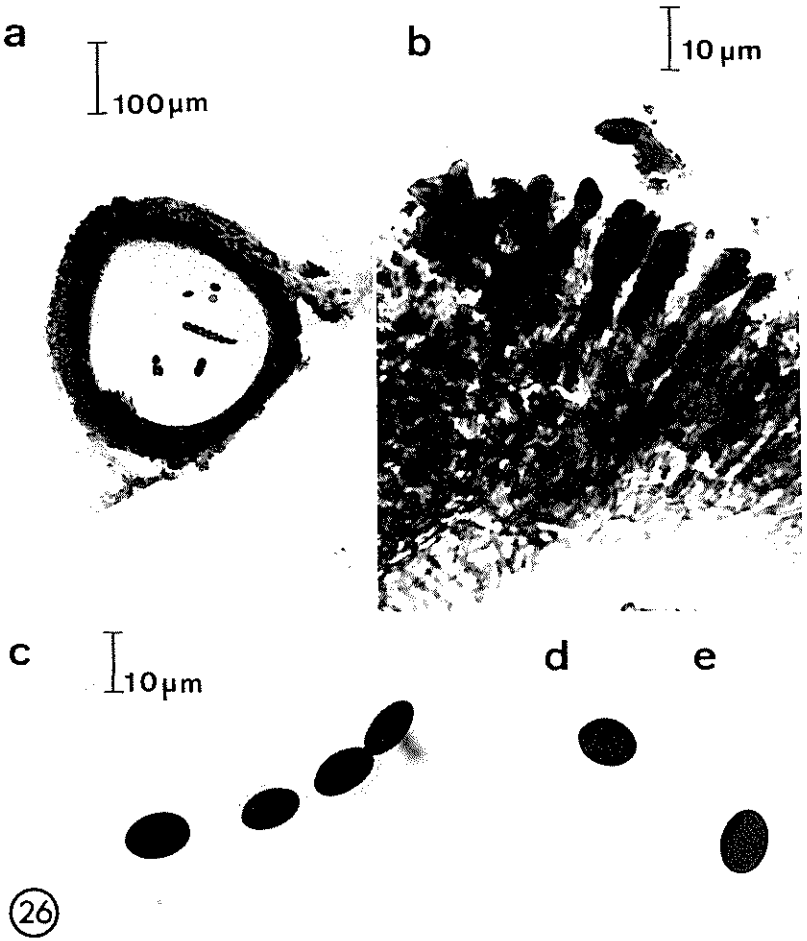

Fig. 26 — *Coniochaeta subcorticalis* (Fuck.) Cooke. a : ascoma - b : setae - c to e : ascospores. HAH 3121.

Coniochaeta tetraspora Cain
Canad. J. Bot. 39 : 1231 (1961), Fig. 27.

Previously cited in Spain by GUARRO (1984). According to MAHONEY & LAFAVRE (1981) this species was only reported from soil but recently we have isolated another strain on sheep dung collected in Granada (FMR 910).

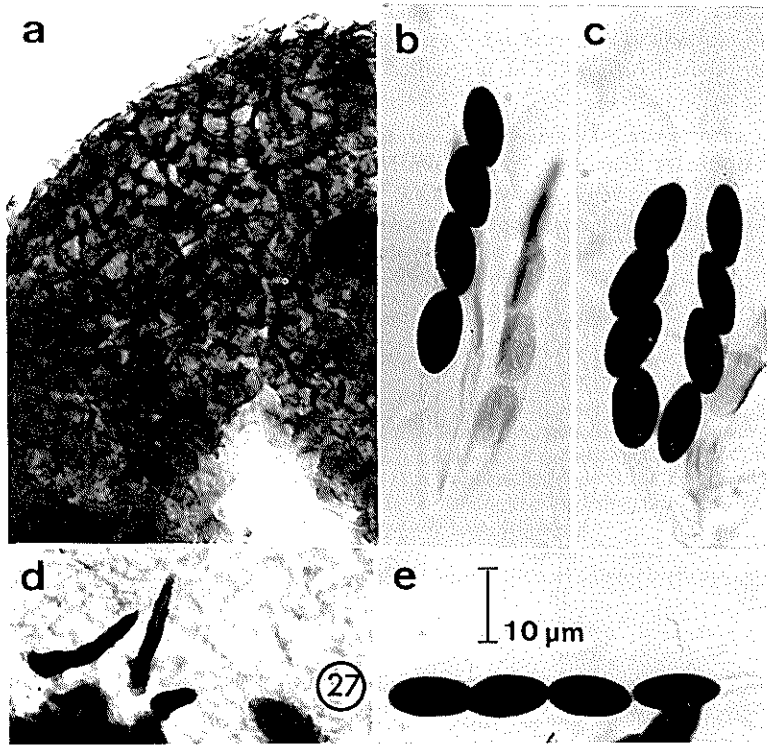

Fig. 27 — *Coniochaeta tetraspora* Cain. a : peridial cells - b and c : asci with uniseriate ascospores - d : setae - e : ascospores. FMR 910.

Coniochaeta velutina (Fuck.) Munk
Dansk Bot. Ark. 17 : 91 (1927), Fig. 28-29.

= *C. leucoplaca* (Berk. & Rav.) Cain, *Univ. Toronto Stud., Biol. Ser.* 38 : 61 (1934).

Specimens examined : on rest of *Juniperus oxycedrus*, between Puebla de Belaña and La Mierla (Guadalajara), March 23, 1979, HAH 2839. On branches of *Fagus sylvatica*, Puerto de la Quesera (Segovia), September 14, 1983, HAH 3123. On twigs of *Lavandula stoechas* var. *pedunculata*, Cerceda (Madrid), Fabruary 11, 1984, HAH 3835. On branches of *Pinus sylvestris*, Poveda de la Sierra (Guadalajara), August 20, 1984, HAH 3755. On branches of *Tamarix gallica*, Titulcia (Madrid), May 17, 1985, HAH 9089. On branches of *Populus nigra*, Majaelrayo (Guadalajara), May 17, 1983, HAH 9103. On rabbit dung, Serra de Prades, Baix Camp (Cataluña), November 25, 1983, FMR 694. On rabbit dung, Castillejos, Baix Camp (Cataluña), November 24, 1985, FMR 914. On branches

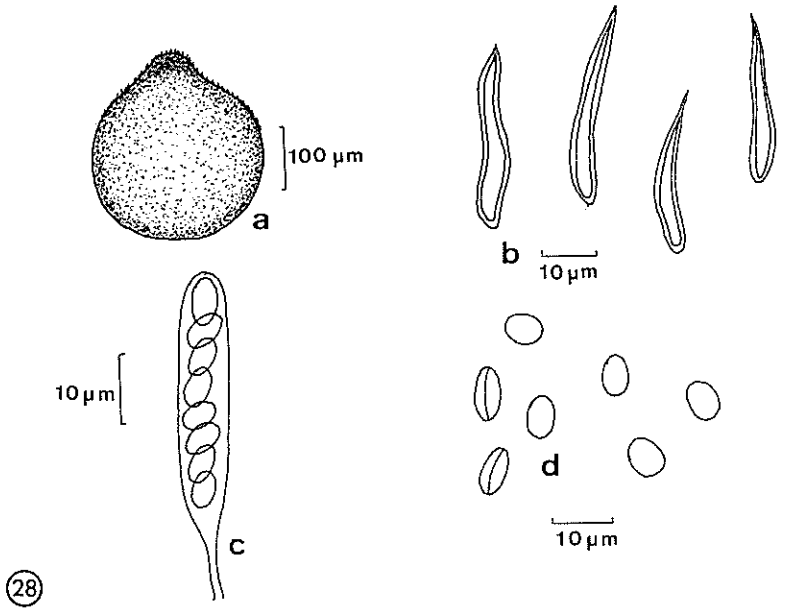

Fig. 28 — *Coniochaeta velutina* (Fuck.) Munk. a : ascoma - b : setae - c : ascus - d : ascospores. HAH 2839.

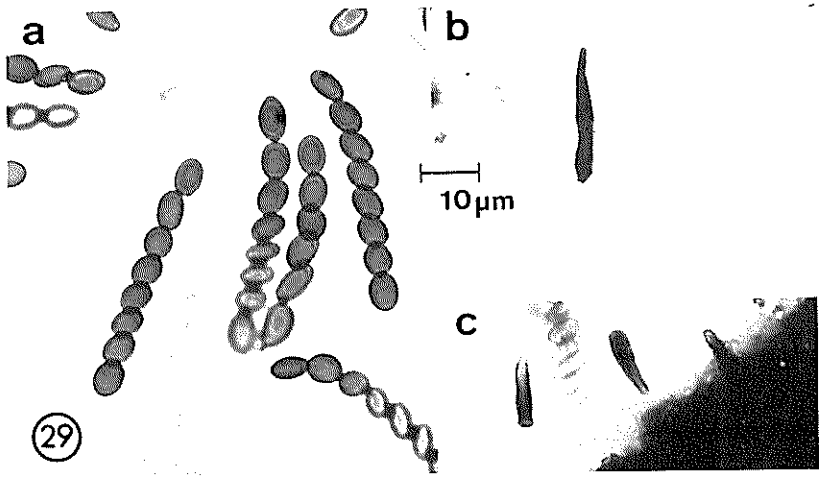

Fig. 29 — *Coniochaeta velutina* (Fuck.) Munk. a : uniseriate ascospores, HAH 2839 - b : seta, HAH 2839 - c : setae, HAH 3835.

of *Populus nigra,* Botanical garden (Madrid), April 20, 1932, n° herbarium 9772 in MA-FUNGI (as *Rosellinia pulveracea*). On branches of *Quercus ilex*, El Pardo (Madrid), January 14, 1940, n° herbarium 11583 in MA-FUNGI (as *Rosellinia pulveracea).*

Observations : *Coniochaeta velutina* is characterized by its ascoma nearly glabrous with small setae or lacking (MUNK, 1957) and small ascospores. The differences indicated by some authors (COOKE & al., 1969; TAYLOR, 1970; MAHONEY & LAFAVRE, 1981) between *C. velutina* and *C. leucoplaca* are mainly in their habitat and spore size. However, in our opinion these differences are not important and we consider them as synonym.

This species was already cited in Spain by LUNDQVIST (1960) and VALLDOSERA & GUARRO (1984).

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