ARBORETUM KÓRNICKIE
ROCZNIK 39, 1994

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Collybia fusipes (Bull. ex Fr.) Quelet and oak decline in Poland: Saprophytic and parasitic forms of the fungus

Abstract

Przybył K. 1994. *Collybia fusipes* (Bull. ex Fr.) Quelet and oak decline in Poland: Saprophytic and parasitic forms of the fungus. Arbor. Kórnickie 39: 155-161.

In some traits, two morphological forms of *C. fusipes* are distinguished: saprophytic, occurring on old stumps of oaks and parasitic, occurring at the base of stems of living *Q. robur* and *Q. petraea* trees. Symptoms of root rot caused by *C. fusipes* are described.

Additional key words: *Quercus*, *Collybia*, root rot.

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Accepted for publication, February 1994.

INTRODUCTION

Collybia fusipes as a parasite of the oak root system

Collybia fusipes (Bull. ex Fr.) Quelet (synonyms: *Agaricus fusipes* Bull. Fr.; *C. lancipes* (Fr.) Gillet is included in section A of genus Collybia, together with the closely related species *C. maculata* Fr. ex A.S., and *C. distorta* Fr. (Kühner and Romagnesi 1953). The morphology of this fungus was described by the authors mentioned above and by Kreisel (1961) and Maublanc (1971). *C. fusipes* belongs to species widely known in Europe (also in Poland), existing most frequently as a saprophyte on deciduous trees, usually on their stumps. Delatour and Guillaumin (1984), and Guillaumin et al. (1985) have demonstrated that *C. fusipes* can behave as a pathogen on trees weakened by ecological factors. In the first stage of Collybia rot, the cortical parenchyma of roots and of collar turned yellowish-orange, whereas the cambium and sapwood become affected in a more advanced stage of the disease. The authors mentioned above

emphasized that in an advanced stage of rot, the fungus can invade the entire root system. *Collybia fusipes* played a big role in oak decline in France, especially in the Tronçais forest in the late 70s (Guillaumin et al. 1983, Guillaumin et al. 1985).

Oak decline in Poland

Oak decline became obvious in Poland after the years 1982 and 1983, when oak died at a more than normal rate. Since that time, several investigations were carried out to get data concerning symptoms and fungal role in the disease (Kowalski 1991, Przybył 1991a). The majority of isolated fungi from overground parts of *Q. robur* were classified as saprophytes and some as weak pathogens. *Ophiostoma querci* Münch (Syd. et P. Sydow) was most frequently isolated from declining trees of *Q. robur* (Przybył 1991a). The penetration of the fungus in the stem was positively correlated with drought (Przybył 1991b, Przybył and Delatour 1993). Growth of *O. querci* in the host was mainly confined to parenchyma cells where there is greater supply of nutrients than in vessels (Przybył 1993). Consequently, *O. querci* belongs to fungi causing sapstain in living oaks weakened by dry summers in previous years. List of fungi, generally considered as more important for oak decline in Poland, includes also *Fusicoccum quercus* Oudem., *Colpoma quercinum* (Pers.) Wallr. (pathogens on twigs) and *Armillaria mellea* (Vahl) Kummer s.l. (probably cause of root rot).

At the collar of trees of *Quercus petraea* and *Q. robur*, the basidiocarps of *C. fusipes* were found in the last two years. Symptoms caused by this fungus in Polish climatic conditions and two morphological forms of the fungus occurring in oak forest are presented in this article.

MATERIAL AND METHODS

A survey of oak forests were carried out with the aim to find *C. fusipes* in the following forest districts: Kórnik (experimental forest), Krotoszyn, Jastrowie and Sulechów. The forests are composed mostly of pedunculate oak (*Q. robur*) and occassionally of sessile oak (*Q. petraea*), 70–120 years old.

Collar and main roots of trees exhibiting *C. fusipes* basidiocarps were examined some 10-30 cm beneath the soil surface according to Delatour and Guillaumin (1984). Samples with white mycelium were taken from the bark and sapwood affected by the orange-yellowish Collybia rot. Isolation was made transferring small chips of fungal material (white mycelium) onto plates of Malt Agar (MA – Merc), containing Penicillium (100 ppm) and Streptomycin (100 ppm) (Delatour and Guillaumin 1984). Thiabendazole (250 ppm) recommended

by the mentioned authors was not used. Fifty basidiocarps separately collected from living oaks and their stumps were examined macroscopically and microscopically. For measurements of basidioconidia the random selected basidiocarps (20 of each morphological form), were chosen and than a spore print was made. Cultures were developed from cap and stem tissue and from basidiospores. Inocula were put onto the medium described above. Successful isolates were transferred to PDA (Potato Dextrose Agar – Merc) and MA.

RESULTS AND DISCUSSION

Symptoms of Collybia root rot

Observations were carried out over 200 trees of *Q robur* and *Q. petraea*. The following two types of symptoms caused by *C. fusipes* were recognized:

1) yellowish-orange necroses of cortical parenchyma in the main roots and collar of healthy *Q. petraea* trees (7 in number) growing in the Kórnik experimental forest and of healthy *Q. robur* trees growing in Sulechów forest district (12 in number);

2) wet, orange rot of bark and sapwood observed on *Q. robur* trees (13 in number) displaying a more or less advanced stage of decline (dry twigs and branches) in the Sulechów oak forest.

In the first case a fungus occurred on the surface of roots in a latent form described earlier by Guillaumin et al. (1985). In the second case, intensive development of rot was associated with abundant growth of the fungus mycelium. Different behaviour of the fungus in trees depended on the degree of their weakness caused by unfavourable situations or climatic stresses. It is a well-known fact that *Q. robur* is less tolerant to low level of water in the soil than *Q. petraea*. In laboratory experiments, the fungus colonies isolated from the white mycelium growing in sapwood and bark resembled colonies obtained from basidiocarps and basidiospores of *C. fusipes* (Figs. 1 and 2). Collybia rot was not found on other sites (Jastrowie and Krotoszyn), where *Hypholoma fasciculare* (Huds.; Fr.) Kumn. and *A. mellea* occurred on declining oaks, particularly on *Q. robur*. In conclusion, *C. fusipes* in Poland is responsible for oak root disease but not for serious damage observed in oak forests after the years 1982 and 1983 and described as decline of oaks. Studies on *C. fusipes* should be continued and in particular the following problems should be elucidated:

– influence of the environmental conditions on infection pathways,
– growth of the fungus in roots of *Q. petraea* and *Q. robur*,
– relationship between *C. fusipes* and *A. mellea*.

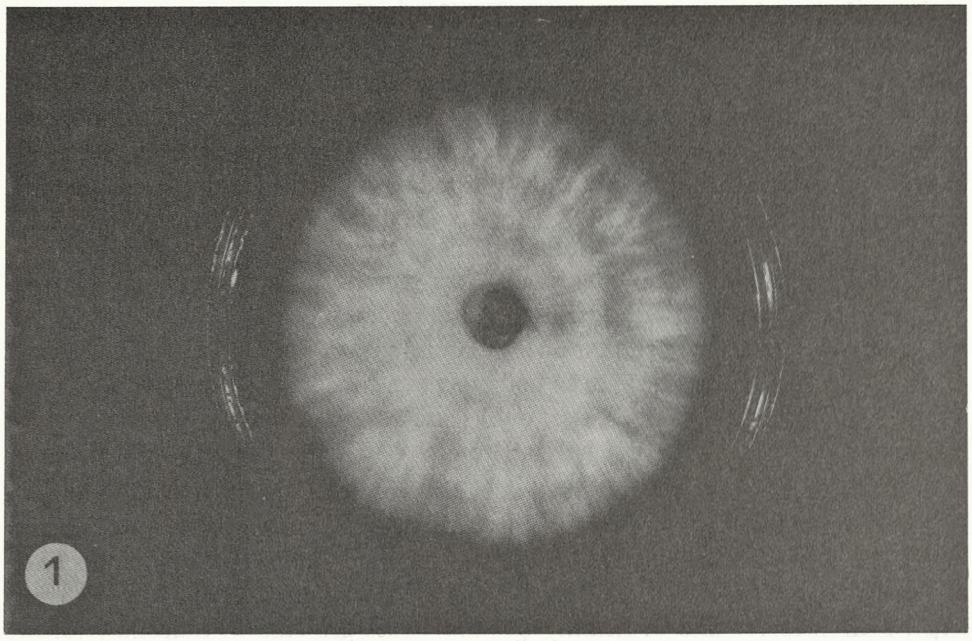

Fig. 1. Collybia fusipes culture from sapwood.

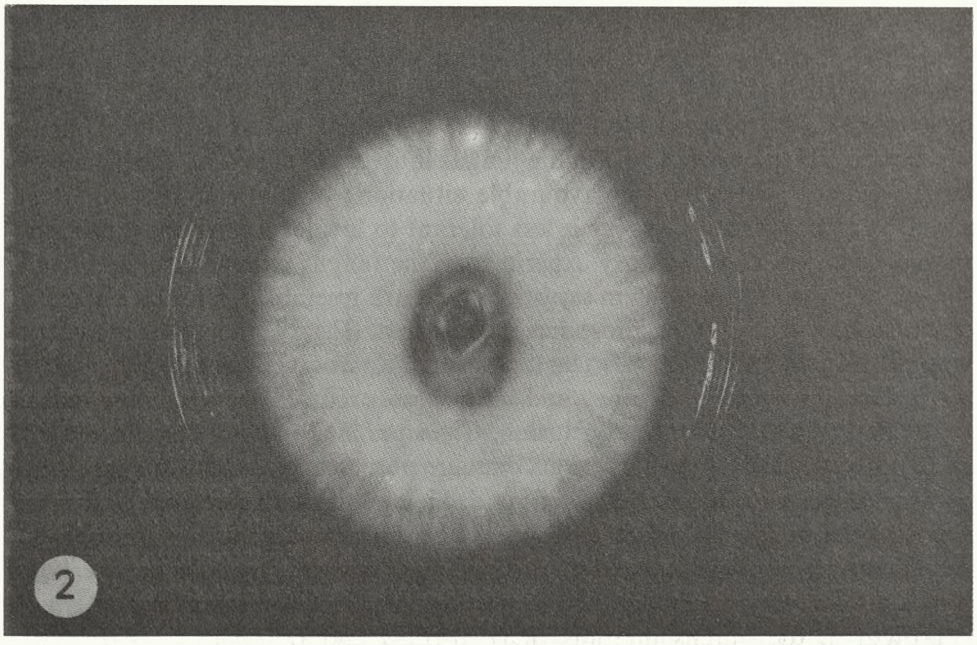

Fig. 2. Collybia fusipes culture from basidiospores tissue. (Photo E. Szubert)

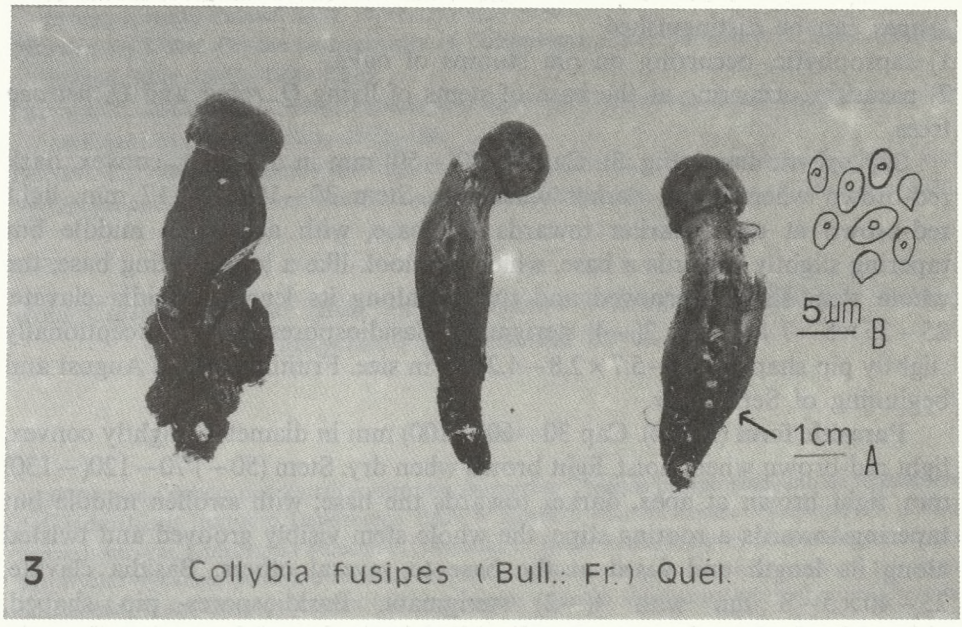

Fig. 3. Saprophytic form: A) basidiocarps, B) basidiospores. (Photo E. Szubert)

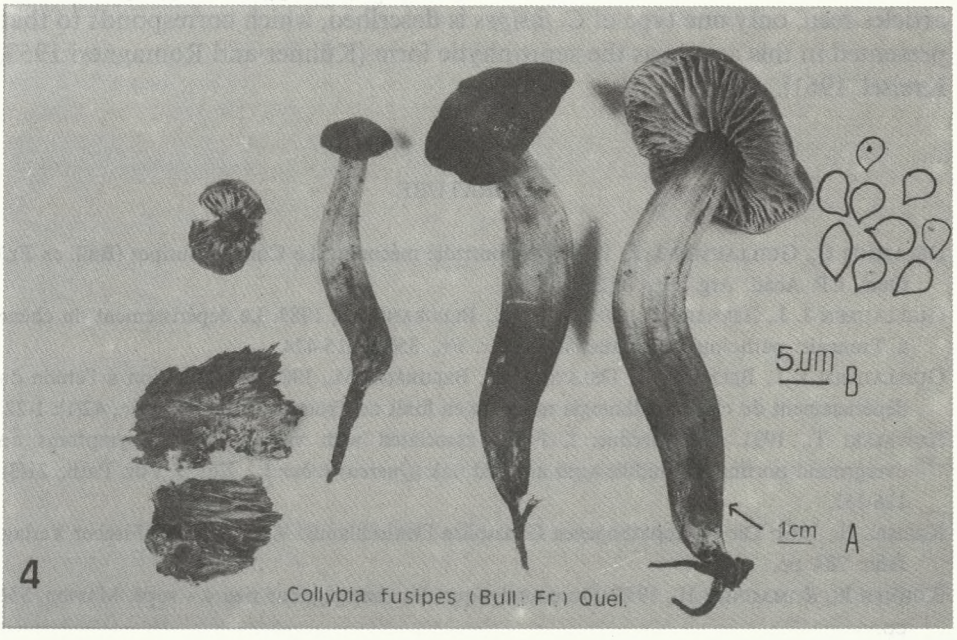

Fig. 4. Parasitic form: A) basidiocarps, B) basidiospores. (Photo E. Szubert)

Morphology of *C. fusipes*. In some traits two morphological forms of *C. fusipes* can be distinguished:
1) saprophytic, occurring on old stumps of oaks,
2) parasitic, occurring at the base of stems of living *Q. robur* and *Q. petraea* trees.

Saprophytic form (Fig. 3). Cap 20–40(−50) mm in diameter, convex, dark red-brown when moist, darker when dry. Stem 30−100×7−17 mm, light red-brown at apex, darker towards the base, with a swollen middle but tapering slightly towards a base, which can look like a long rooting base; the whole stem slightly grooved and twisted along its length. Basidia clavate, 25−35×5−7 μm with 2(−4) sterigmata. Basidiospores elliptic, exceptionally slightly pip shaped, 4.2−5.7×2.8−4.2 μm in size. Fruiting: end of August and beginning of September.

Parasitic form (Fig. 4). Cap 30−60(−100) mm in diameter, slightly convex, light red-brown when moist, light brown when dry. Stem (50−) 70−120(−130) mm, light brown at apex, darker towards the base; with swollen middle but tapering towards a rooting stipe: the whole stem visibly grooved and twisted along its length and fused at the base to several others. Basidia clavate, 25−40×5−8 μm with 4(−2) sterigmata. Basidiospores pip shaped, (4.2−)5.7−7×2.8−5 μm in size. Fruiting: beginning of September (2 weeks later than the saprophyte).

Not many studies were devoted to the morphology of *C. fusipes*. In the articles seen, only one type of *C. fusipes* is described, which corresponds to that presented in this article as the saprophytic form (Kühner and Romagnesi 1953, Kreisel 1961).

LITERATURE

DELATOUR C., GUILLAUMIN J. J., 1984. Un pourridié méconnu: Le Collybia fusipes (Bull. ex Fr.) Quel. CR Acad. Arg. Fr., 70(1): 123-126.

GUILLAUMIN J. J., BERNARD C., DELATOUR C., BELGRAND M., 1983. Le dépérissement du chêne á Tronçais: pathologie racinaire. Rev. For. Fr., 35(6): 415-424.

GUILLAUMIN J. J., BERNARD C., DELATOUR C., BELGRAND M., 1985. Contribution à l'étude du dépérissement du chêne: pathologie racinaire en forêt de Tronçais. Ann. Sci. For., 42(1): 1-22.

KOWALSKI T., 1991. Oak decline: I. Fungi associated with various disease symptoms on overground portions of middle-aged and old oak (*Quercus robur* L.). Eur. J. For. Path., 21(3): 136-151.

KREISEL H., 1961. Die phytopathogenen Grosspilze Deutschlands. V.E.B. Gustav Fischer Verlag, Jena: 284 pp.

KÜHNER R., ROMAGNESI H., 1953. Flore analytique des champignons rieurs – supé. Masson, 556 pp.

MAUBLANC A., 1971. Les champignons comestibles et vénéneux. P. Lechevalier. T. II, 285 pp.

PRZYBYŁ K., 1991a. Mycoflora of the overground portions of dying *Quercus robur* L. Proc. Intern. Symp., Kórnik, Poland, May 15–18, 1990: 141-149.

PRZYBYŁ K., 1991b. On the pathogenicity of Ophiostoma piceae. Proc. Intern. Symp., Kórnik, Poland, May 15–18, 1990: 83-89.

PRZYBYŁ K., DELATOUR C., 1993. Pathological aspects of Ophiostoma querci on Quercus robur seedlings. Eur. J. For. Path. 23(5): 186.

PRZYBYŁ K., 1993. Preliminary histological studies of Quercus robur seedlings inoculated with Ophiostoma querci. Proc. Intern. Congress, Selva di Fasano, Italy, Sept. 13-18, 1992: 67-70.

Rola *Collybia fusipes* (Bull. ex Fr.) Quelet w zamieraniu dębów w Polsce: Saprofityczna i patogeniczna forma grzyba

Streszczenie

Obserwacje dębów pod kątem występowania grzyba *C. fusipes* przeprowadzono na terenie lasu doświadczalnego Instytutu Dendrologii PAN w Kórniku oraz na terenie następujących nadleśnictw: Jastrowie, Krotoszyn i Sulechów. Owocniki *C. fusipes* wzrastały przy podstawie pnia drzew zdrowych i wykazujących symptomy zamierania. *C. fusipes* należy do grzybów zwanych pasożytami słabości, które zakażają drzewa osłabione przez czynniki abiotyczne lub biotyczne. Choroba atakuje miękisz kory pierwotnej pod perydermą korzenia (początkowe stadium choroby – patogen w stanie utajonym) oraz drewno bielu (zaawansowane stadium choroby). W obrębie gatunku *C. fusipes* wyróżniono dwie formy morfologiczne: saprofityczną – występującą na pniach dębów oraz patogeniczną – występującą na drzewach żyjących.