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***Aspergillus*, *Penicillium*, and Related Species Reported from Turkey**

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This internet site was last updated on August 29, 2006 and contains the following:

1. Background information including an abstract
2. A summary table of substrates/habitats from which the genera have been isolated
3. A list of reported species, substrates/habitats from which they were isolated and citations
4. Literature Cited

Abstract: This database, available online, reviews 392 published accounts and presents a list of species representing the genera *Aspergillus*, *Penicillium* and related species in Turkey. *Aspergillus niger*, *A. flavus*, *A. fumigatus*, *A. versicolor* and *Penicillium chrysogenum* are the most common species in Turkey respectively. According to the published records, 376 species have been recorded from various substrates/habitats in Turkey.

Key Words: *Aspergillus*, *Penicillium*, *Eupenicillium*, *Gliocladium*, *Paecilomyces*, *Talaromyces*, *fungal habitats*, *microfungi*, *Turkey*.

Introduction

The purpose of this database is to document the *Aspergillus*, *Penicillium*, and the related species isolated from Turkey. The database will make the Turkish literature on the

subject available to an international audience. It will also give future researchers information on whether a species is a new record for Turkey.

Aspergillus and *Penicillium* are economically, ecologically, and medically important and large genera. Species of these genera can cause the decay of stored products. They are important in view of health hazards. In addition, they are used in industrial and food fermentation processes, and they exist commonly in different types of soils, indoor and outdoor air, food and water [6, 15, 21]. Since *Aspergillus* and *Penicillium* are found almost everywhere, they are frequently cited in species lists in ecological studies. *Aspergillus* and *Penicillium* species are commonly found as contaminants in foods while drying and subsequent storage [7, 22]. Thus, accurate identification of *Aspergillus* and *Penicillium* at the species level is essential. *Aspergillus* and *Penicillium* are not easy to identify to the species level. To further complicate things, the taxonomy of both genera still needs work, but there appear to be fewer problems in *Aspergillus* than in *Penicillium*. Although molecular, biochemical and physiological methods are important for systematics of *Aspergillus* and *Penicillium* species, morphological properties are used common for identification.

Citation of the author names presented in this paper have been standardized according to Kirk & Ansell [23]. The nomenclature follows updates presented in Samson & Gams [24] and Pitt et al. [1]. Throughout my database, I assume that authors properly identified the species reported. Accepted species names are shown in bold italics. Synonyms are cross-referenced and are not in bold print. More information on the taxonomy of these two genera can be found in many books, e.g. Pitt et al. [1], Samson & Pitt [2], Raper & Thom [3], Raper & Fennell [4], Pitt [5], Domsch et al. [6], Samson et al. [7], Ramirez [8], Pitt & Hocking [9], Singh et al. [10], Samson and Pitt [11], Klich [12], Pitt [292] and in many articles such as Christensen and Backus [13], Pitt [14], Klich [15], Banke et al. [16], Muntanola-Cvetkovic et al. [17], Peterson et al. [18], Tuthill et al. [19], and Tuthill et al. [20], and Klich [12].

The online database reviews 392 published materials and presents a list of species isolated from Turkey. The species list for the *Aspergillus* and *Penicillium* species and related genera are arranged in alphabetical order. The first part of this work was published by Asan [25] in 2000. Synonyms and authors of fungal names can be found in literature, e.g. Samson & Pitt [2], Pitt et al., [1], Klich [12] and www.indexfungorum.org

As of August 29, 2006, there were 376 species had been isolated and identified from the different regions of Turkey. Asan [25] gave 251 species in 2000, and this database adds 125 species to the earlier list, bringing the total number of *Penicillium* species isolated in Turkey so far to 203 and of *Aspergillus* species to 117. Some microfungus taxa which were determined only to the genus level are presented in the Colakoglu [26-28], Demirci & Caglar [29], Arslan & Baykal [30], Coskuntuna & Ozer [31], Yazicioglu et al. [32], Kalmis et al. [33], Ayata et al. [34], Atik & Tamer [35], Yazicioglu et al. [36], Eltem et al. [37], Yenigun [38], Azaz [39], Gozdasoglu et al. [94], Turkutanit [95], Aslan et al. [96], Birbir et al. [97], Gokcay and Taseli [98], Topal and Pembeci [229], Ergin et al. [230], Ozyaral et al. [239], Oksuz et al. [242], Erkilic et al. [231], Gur and Akin [248], Unlu et al., [257], Saba et al., [259], Gulec et al., [262], Azaz et al. [286], Okten et al. [288, 289], Iplikcioglu et al. [300], Okten et al. [303], Erdogan [314], Harmanci et al. [317], Ulutan et al. [320], Dincer et al. [329], Yulug and Kustimur [331], Var et al. [332 and 333], Bastas et al. [336], Karabulut et al. [338], Sennazli et al. [340], Ilhan et al. [341], Demirci and Kordali [342], Gunduz and Ok [343], Cakir et al. [344], Eken et al. [345], Alptekin et al. [348], Orman et al. [361], Tamer et al. [362], Hapcioglu et al. [364], Topbas et al. [367] and references between the 192-224. Also, Sulun [40] totally published soil microfungus flora of North-East Anatolia as a review in 2001.

Fungi have some functions in ecosystems such as decomposition of organic matter, accumulation of toxic materials and production of environmental biochemicals, etc. [250]. In addition, Klich [251] reviewed the biogeography of *Aspergillus* species in soil and litter in 2002. She reviewed over 250 studies related with microfungi from soils and litter. Also Christensen et al. [252] reviewed *Penicillium* species in soil in relation to the latitude and vegetation. New fungal species have commonly been isolated from soil and plant debris [13, 253-255]. In Turkey, *Aspergillus niger* is the most commonly reported species. It has been reported in 176 different studies, with *A. flavus* reported in 140, *A. fumigatus* in 134, *A. versicolor* in 84, *P. chrysogenum* in 79, *A. terreus* in 65, *A. ochraceus* in 60, *P. glabrum* (= *P. frequentans*) in 51, *A. wentii* in 48 and *P. funiculosum* in 48 studies respectively. These species may adapt to ecological conditions better than the other, more rarely reported, species. Species were isolated from different substrates and/or habitats such as, soil, water, air, food, etc. Ilhan et al. [414] illustrated 4 *Aspergillus*, 1 *Penicillium* and 1 *Paecilomyces* species as morphological in SEM, first time in Turkey. According to the Tumbay [423], first isolated *Aspergillus* species in Turkey is *Aspergillus fumigatus* that

isolated from human external ear canals by Koukouli in 1923 (Koukouli M. 1923. Enduit des conduit auditif externe provoque par *Aspergillus fumigatus*. Gazete Medicale d'Orient. 68: 257). But I could not find any other records between the years of 1923 and 1947. The total number of *Aspergillus*, *Penicillium* and the related species isolated from some substrate and/or habitats being presented in the Table 1.

Table 1. Genera and the substrates and/or habitats from which they were isolated in Turkey.

Substrate	Genus Name
Air	
Outdoor	A, P
Outdoor+Indoor	P, E
Indoor	A, P, G, Em
Food/Fodder	
Biscuit	A, P, G
Black pepper, powdered	P, E
Cake	A, P, G
Cheese	A, P
Chicken feed	A, P
Foodstuff/Feed stuff	A, P, N, Pc, Er
Fodder	A, P
Meat products	A, P
Mushroom	P
Olive	A, P
Packaged powder soup	P, E
Poultry feed	A
Poultry meat	A
Red pepper, powdered	P, E, Pc, Er
Spices	A
Tomato/tomato paste	AP
Turkish delight	P
White pepper, powdered	P, T
Wheat/fodder	A, P
Fruits/vegetables	
Apple	A, P
Apple+lemon+fig+grapefruit +apricot+tangerine+orange	P
Citrus fruits	P
Lemon	A, P
Fig	A, P
Grape	A, P
Lemon+grapefruit+quince+ tangerine+orange+apple+ pomegranate+strawberry	E

Pear	P
Satsuma mandarin	P
Seedling of vegetables	P
Seedling root of vegetables	P, E
Tomato, cucumber, aubergine	A, P, G
Cherry	P

Seeds/grains/nuts

Barley	A
Corn seed	A, P
Cereal	A, P
Haricot bean	A, P, G
Hazelnut	A, P, Er, Pc
Onion seed	A
Peanut	A
Pistachio nut	A
Pomegranate	A
Potato/onion	A, P, G
Rape seed	A, P
Rice	A
<i>Seed of hungarian vetch</i>	A
Soybean seed	A, P
Soybean plant	A
Walnut+hazelnut+fig+peanut	A
Wheat seed	A, P, T
Wheat/barley	A, P
Raisin	A

Soil

Agricultural soil	A, P, E, G, T, Pc
Cotton field soil	A
Forest soil	A, P, G, Pc
Greenhose soil	A, P, E, G, T, Pc, Er
Orchard soil	A, P
Pistachio soil+outdoor air	A
Pistachio soil	A
Soil, detailed is unknown	A, P, E, G, T, Pc, Er
Soil+outdoor air+peanut	A
Soil polluted by cement	A, P, Er
Soil polluted by meat waste	A, P
Vineyard soil	A, P
Tea field soil	A, P, G, Pc
Wheat/Barley field soil	A

Water

Lake water	A, P, E, T, Er
Waste water	A, P
water of dental unit	A, P

General

Apricot pulp	A
Baby talc powder	A, P, Pc, Er

Cat	A
Cattle	A
Chicken	A
Corn kernel	A, P
Cornflakes	A, P, Pc
Cotton material	A
Dog	A, P
Drug tablets	A, P, N, T, Pc, Er
Dung	A, Pc
Dust	A, P, E, T, Pc
Eye cosmetics	A, P, E, Pc, Er
Geese	A
Hatchery	A
Human Skin cream	A
Human	A, P, Pc
Juice of <i>Citrus</i> fruits	A, P
Lake water+outdoor air	E
Leather goods	A, P, E, N, Pc, Er
Leather	P, E, T
Lemon trees	A
Lucerne root cuttings	A
Milk	A, P
Milk, milk products, fruit juices	T
Moss	A, P
Ostrich	A
Pharmaceutical products	P, E
Pistachio trees	A
Potato storage	P
Raw cotton	A, P
Shampoo	A
Sheep, cat, monkey, horse, hen, pigeon, partridge	A
Surgical strings	A, P, E, G, T, Pc, Er
Syrup	A
Tea (packaged)	A
Turkey	A
Turkish cigarettes	A, P, Er
Turkish Van Cat	A, P
Waste of milk factory	P

Letters indicate: A: *Aspergillus* spp., P: *Penicillium* spp., E: *Eupenicillium* spp., G: *Gliocladium* spp., N: *Neosartorya* spp., T: *Talaromyces* spp., Pc: *Paecilomyces* spp., Er: *Eurotium* spp., Em: *Emericella* spp.

During the 19th century, the systematics of *Aspergillus* was strictly botanical. With the developments of pure culture methods in the turn of the century, some properties began to be observed [305]. Four monumental books on *Aspergillus* have been published since Link's definition of the genus in 1809. Klich [12] indicated that the PA Micheli first described the genus *Aspergillus* in 1729. Thom and Church organized 69 species into 13 groups. Thom and Raper introduced Czapek Agar as a standart culture medium and organized 77 species into 14 groups in 1945 [306]. Raper and Fennell's book is published in 1965. There are places 18 groups and 132 species; also there are descriptions of 28 new species. Domsch et al. [6] have characterized 26 common species in 8 groups. Many of new species were published after 1965. Approximately 80 species in *Aspergillus* described as new between 1965-1985 and 670 publications per year have added to our knowledge of *Aspergillus* [306]. 58 new *Aspergillus* species are published between 1985-1992. In addition, 36 species of *Aspergillus* described as new between the 1992-1999 [307]. So, 174 new species between the year of 1965-2000. But, Pitt et al [1] accepted only 184 *Aspergillus* species and 24 synonyms. In addition, Pitt et al. [1] accepted 8 holomorphic genera associated with *Aspergillus* anamorphs: *Chaetosartorya*, *Emericella*, *Eurotium*, *Fennellia*, *Hemicarpenales*, *Neosartorya*, *Petromyces* and *Sclerocleista*. Number of species generally vary in literature. Klich's work [12] was published in 2002. Although there are nearly 200 accepted *Aspergillus* species, Klich's book considers only the morphology the 45 most common species, so is not intended to be a monograph of the genus. The new species isolated from primarily, India, Europe, Egypt, Syria, tropical Africa, Japan and North America. However, as the number of species described in *Aspergillus* increased, systematics problems multiplied [305].

Some species of *Aspergillus* are osmophilic. *Aspergillus* genus can be characterized by the presence of conidiophores, vesicle (*in terminal of the conidiophore*), conidium-bearing cells (termed phialides; they may be uniseriate or biseriate), and foot cells. Foot cells of genus are generally difference as a morphologically [304]. Sclerotia can be found in some species (*Aspergillus alliaceus* Thom & Church, for example), but there is no sclerotia in most species. Using some media for identification of *Aspergillus* species [12]: CYA25 (*Czapek Yeast Extract Agar used at 25 C*), CYA37 (*Czapek Yeast Extract Agar used at 37 C*), CY20S (*Czapek Yeast Extract Agar with 20 % sucrose*), MEA (*Malt Extract Agar*), CZ (*Czapek Dox Agar*).

Raper and Fennell [4] used group concept for subdivision of *Aspergillus* species. But group concept has no appropriate for ICBN [*International Code of Botanical Nomenclature*], so, Samson and Gams [24] proposed new scheme [7, 12] (below):

Subgenus	Section	Teleomorph
<i>Aspergillus</i>	<i>Aspergillus</i> <i>Restricti</i>	<i>Eurotium</i> Link: Fr., <i>Dichlaena</i> Mont. & Durieu.
<i>Fumigati</i>	<i>Fumigati</i> <i>Cevrini</i>	<i>Neosartorya</i> Malloch & Cain.
<i>Ornati</i>	<i>Ornati</i>	<i>Warcupiella</i> Subram., <i>Sclerocleista</i> Subram., <i>Hemicarpenetes</i> Sarbhoy & Elphick
<i>Clavati</i>	<i>Clavati</i>	
<i>Nidulantes</i>	<i>Nidulantes</i> <i>Versicolores</i> <i>Usti</i> <i>Terrei</i> <i>Flavipedes</i>	<i>Emericella</i> Berk. & Br. <i>Fennellia</i> Wiley & Simmons
<i>Circumdati</i>	<i>Wentii</i> <i>Flavi</i> <i>Nigri</i> <i>Circumdati</i> <i>Candidi</i> <i>Cremeri</i> <i>Sparsi</i> <i>Ochraceorosei</i> (New Sect., Source: Ref. 420)	<i>Petromyces</i> Malloch & Cain. <i>Neopetromyces</i> Frisvad & Samson <i>Chaetosartorya</i> Subram.
<i>Stilbothamnium</i>	[Species forming synnemata (12)]	
<i>Aspergillus parvisclerotigenus</i>	Comb. Nov. (Source: Ref. 420)	

Species identification in *Penicillium* genus is not easy. Raper & Thom's book [3] is important work on *Penicillium* taxonomy. Publications increased after published above book. And new taxonomical approaches was evolved. Work of Pitt [5] that has new idea was published in 1979 and followed other book of Pitt in the year of 2000 [292] about common *Penicillium* species. Pitt [1979] re-organised taxonomic groupings and indicated that the colony texture is not primary criteria for *Penicillium* identification. Ramirez [8] published his work in 1982. This work followed especially Raper & Thom [3]'s system and has new described species. According to the Pitt [292], above works were based primarily morphological characters and physiological properties (*temperature and water relations, pigmentation, colony development on certain standart media*). There were 137 species of

Penicillium proposed by Raper & Thom [3] in 1949, 150 species proposed by Pitt [5] in 1979 and 227 species proposed by Ramirez [8] in 1982. But, according to the Pitt [292], only 30 to 40 are common in nature. Using some media for identification of *Penicillium* species [292] are: CYA (*Czapek Yeast Extract Agar*), MEA (*Malt Extract Agar*), G25N (*25 % Glycerol Nitrate Agar*), CREA (*Creatine Sucrose Agar*), CSN (*Neutral Creatine Sucrose Agar*).

Key to Subgenera of *Penicillium* according to Pitt [292]:

Subgenus	Section
<i>Aspergilloides</i> Dierckx	<i>Aspergilloides</i>
	<i>Exilicaulis</i>
<i>Furcatum</i> Pitt	<i>Divaricatum</i>
	<i>Furcatum</i>
<i>Penicillium</i>	<i>Cylindrosporium</i>
	<i>Penicillium</i>
<i>Biverticillium</i> Dierckx	<i>Biverticillata-Symmetrica</i> Thom

List of species, substrates and/or habitats, and citation numbers

Note: Accepted names are in *bold italics*.

Aspergillus Fr.: Fr.

[Teleomorphs (7): *Eurotium*, *Emericella*, *Neosartorya*].

Aspergillus aculeatus Izuka. See *A. japonicus*

A. aeneus Sappa [Greenhouse soil (42)].

A. allahabadii B. S. Mehrotra & Agnihotri [**Soil** (46, 99), polluted by cement (45, 283); grape (41)].

A. alliaceus Thom & Church [**Soil** (47, 48, 99, 112, 119, 141, 151, 153, 156, 158, 162, 249), corn fields (163), agricultural (150), forest (49), polluted by cement (45, 283, 308); foodstuff (123, 125), outdoor air (425)]. Teleomorph: *Petromyces alliaceus* Malloch & Cain. Major mycotoxins (12): Ochratoxin A.

A. alutaceus Berk & M. A. Curtis See *A. ochraceus*

A. ambiguus Sappa. [Leather goods (264)].

A. amstelodami L. Mangin. See *A. vitis*.

A. asperescens Stolk [**Soil**-greenhouse (42), forest (55), agricultural (150); indoor air (152)].

A. aureolus Fennell & Raper. See *A. aureoluteus*

A. aureoluteus Munt. Reported as *A. aureolus* [Seedling root of vegetables (113)]. Teleomorph: *Neosartorya aureola* (Fennell & Raper) Malloch & Cain.

A. auricomus (Gueg.) Saito [**Soil** (141), greenhouse (42), orchard (136); indoor air (360)].

A. awamori Nakaz. [**Soil** (56, 141), corn fields (167), orchard (136); **Dust** (134), bed (53); grape (41), drug tablet (265), corn kernel (353)].

A. biplanus Raper & Fennell [**Soil**-greenhouse (42), corn fields (163)].

A. brunneouniseriatus Suj. Singh & B.K. Bakshi [Waste water (57), soil (158), raw cotton (294, 295)].

A. brunneus Delacr. Reported as *A. echinulatus* (Delacr.) Thom & Church. [Bed dust (53, 278), wheat/barley (128), drug tablet (265, 278), shampoo (278), spices (278), turkish delight (278), poultry meat (278)]. Teleomorph: *Eurotium echinulatum* Delacr.

A. caesiellus Saito [Hazelnut (166)].

A. caespitosus Raper & Thom. [Outdoor air (425)].

A. candidus Link [**Soil** (47, 48, 99, 116, 151, 153, 164, 171), greenhouse (42), polluted by cement (45, 283, 308), burnt and normal forest (49), agricultural (44), black pine and oak forest (62); **Air** (293, 368), outdoor (60, 275, 301); indoor (58, 61, 152); **Dust** (134), bed (53); **Seed**-wheat (54), rape (131), wheat/barley (128); foodstuff (51, 52, 123, 125, 154), substrate and/or habitat are unknown (59, 185), human skin wound (63), barley (64), feed stuff (65, 267), poultry feed (66), soybean (127), pharmaceutical products (129, 142, 183), cereal (130), lemon trees (133), hazelnut (140), olive (148), rice (188), drug tablet (265), baby talc powder (271), surgical strings (273), wheat/fodder (347), *Eurygaster integriceps* = Sunn pest (395)]. Important metabolites (Source: 7, 12): Terphenyllin, xanthoascin.

A. carbonarius (Bainier) Thom [Soil (141), greenhouse (42); Air-indoor (152), outdoor (155); foodstuff (51, 52, 125, 154), grape (41), bed dust (53), eye cosmetics (272)].

A. carneus Blochwitz [Soil (67, 99, 141, 144), agricultural (153, 156), polluted by cement (45, 161, 283), burnt and normal forest (49), forest (55); grape (41), olive (148), dung (170), haricot bean (355)]. Major mycotoxins (12): Citrinin.

A. cervinus Masee [Soil (56), greenhouse (42), agricultural (44); outdoor air (60)].

A. chevalieri (L. Mangin) [Soil (115, 141, 171), agricultural (153, 156); foodstuff (51, 52, 123, 125, 154), bed dust (53, 278), pharmaceutical products (142), juice of *Citrus* fruits (266, 278), eye cosmetics (272), powdered black pepper (274), syrup (278), surgical strings (278), spices (278), turkish delight (278), poultry meat (278)]. Teleomorph: *Eurotium chevalieri* L. Mangin [Feed stuff (65), red pepper (77), soil (249), leather goods (264, 278), drug tablet (265, 278), apricot pulp (270)]. Reported as *A. equitis* Samson & W. Gams [Soil (99)]. Reported as *A. chevalieri* var. *multiascosporus* Nakaz [Soil (112, 114)]. Reported as *A. chevalieri* var. *chevalieri* [Eye cosmetics (272)].

A. chevalieri var. *intermedius* (Thom & Raper) Malloch & Cain. See *A. intermedius*

A. chevalieri var. *multiascosporus* Nakaz. See *A. chevalieri*

A. citrisporus Hohn. [Indoor air (152), substrate and/or habitats are unknown (415)]. Teleomorph: *Sclerocleista thaxteri* Subram.

A. clavatonanicus Bat. H. Maia & Alecrim [Outdoor air (159)].

A. clavatus Desm. [Foodstuff (51, 52, 123, 125, 154), human skin wound (63), feed stuff (65, 267), soil (6, 46, 112, 114, 164), meat products (100), cereal (130), Air (293), indoor (152), substrate and/or habitat are unknown (189), leather (263), leather goods (264)]. Important metabolites (7, 12): Patulin, ascladiol, cytochalasin E, tryptoquivalins.

A. cremeus Kwong-Chung & Fennell See *A. cremeoflavus*

A. cremeoflavus Samson & W. Gams. Reported as *A. cremeus* [Foodstuff (125)]. Teleomorph *Chaetosartorya cremea* (Kwon-Chung & Fennell) Subram.

A. cristatus Raper & Fennell. See *A. cristatellus*

A. cristatellus Kozak. Reported as *A. cristatus*. [Substrate and/or habitat are unknown (68), bed dust (53, 278), spices (278), turkish delight (278), poultry meat (278), leather goods (278)]. Teleomorph: *Eurotium cristatum* (Raper & Fennell) Malloch & Cain. [Greenhouse soil (42)]

A. deflectus Fennell & Raper [Soil-greenhouse (42), agricultural (44), polluted by meat waste (165)].

A. diversus Raper & Fennell [Olive (148)].

A. echinulatus (Delacr.) Thom & Church. See *A. brunneus*

A. elegans Gasperini [Soil (116)].

A. ellipticus Raper & Fennell [Burnt and normal forest soil (49)].

A. equitis Samson & W. Gams. See *A. chevalieri*

A. ficuum (Reichardt) Henn. See *A. niger*

A. fischeri Wehmer. See *A. fischerianus*

A. fischerianus Samson & W. Gams [Feed stuff (65)]. Reported as *A. fischeri* [= *Neosartorya fischeri* (Wehmer) Malloch & Cain.]. [Soil (112, 114, 144), bed dust (53), foodstuff (123, 125), Feed stuff (65), fig (145), substrate and/or habitat are unknown (121, 415), leather (263), leather goods (264), drug tablet (265), surgical strings (273)]. Major mycotoxins (12): Verrucologen, fumitremorgin A & B. Teleomorph: *Neosartorya fischeri* (Wehmer) Malloch & Cain. Reported as *A. fischeri* Wehmer [Soil (112, 114, 144),

bed dust (53), foodstuff (123, 125), fig (145), substrate and/or habitat are unknown (121), leather (263), leather goods (264), drug tablet (265), surgical strings (273)].

A. flaschentraegeri Stolk [Grape (41), agricultural soil (150)].

A. flavipes (Bainier & Sartory) Thom & Church [**Soil** (47, 48, 112, 114, 119, 120, 143, 158), agricultural (44, 150, 153, 156), greenhouse (42), wheat fields (69); indoor air (61, 152), waste water (57), human skin wound (63)]. Teleomorph: *Fennellia flavipes* B. J. Wiley & E. G. Simmons.

A. flavofurcatus Bat. & H. Maia [Grape (41), vineyard soil (70, 282), corn kernel (353)].

A. flavus Link [**Soil** (46-48, 56, 71, 73, 76, 78, 99, 115, 116, 119, 138, 139, 143, 144, 151, 182, 191, 228, 249), burnt and normal forest (49), oak forest (75), polluted by cement (45, 283, 308), black pine and oak forest (62), greenhouse (42), orchard (136), agricultural (150, 164, 246), tea field (302); **human** (298, 321), skin wound (63), pericardial fluid (102), phlegm (79), ear (234, 268, 276, 372, 389), external ear canals with otomycosis (316, 388), paranasal sinuses (238), maxillary sinus (375), nail (240, 358), balalayka (277), bronchoalveolar lavage (280), sputum (371), bronchial mucosa (377); **Air** (293, 368), outdoor (60, 275, 365, 425), indoor (152, 359, 360, 363), indoor/outdoor (135); **Seed-wheat** (54, 350), soybean (124, 126, 127), corn (258, 351, 353, 391); **Olive** (148), natural black olives in brine (327); foodstuff (51, 52, 125), cheese (72, 132), grape (41), bed dust (53), substrate and/or habitat are unknown (74, 185, 187, 309, 393, 415, 427), waste water (57), tomato/tomato paste (43), feed stuff (65, 267), red pepper (77), peanut (80, 179, 346), walnut, hazelnut, fig and peanut (81), poultry feed (66, 374, 412), hazelnut (101, 140, 166, 178, 232, 247, 269, 390), pistachio nut (103), seedling root of vegetables (113), pharmaceutical products (129, 142, 183), cereal (130, 184), lemon trees (133), fig (145, 287, 379), fodder (146), packaged powder soup (147), seedling of vegetables (181), leather goods (264), drug tablet (265), juice of *Citrus* fruits (266), baby talc powder (271), eye cosmetics (272), surgical strings (273), powdered black pepper (274), powdered red pepper (274, 335), powdered white pepper (274), wheat/fodder (347), fig (385)]. Important metabolites (7, 12): Kojic acid, 3-nitropropionic acid, cyclopiazonic acid, aflatoxin B, aspergillitic acid. *A. flavus* var. *columnaris* Raper & Fennell [Outdoor air (155), powdered red pepper (274), water of dental unit (291), corn kernel (353)].

A. floriformis Samson & Mouch. [Greenhouse soil (42)].

A. foetidus Thom & Raper [**Dust** (134), bed (53); **Soil**-agricultural (156), vineyard soil (282); grape (41), tomato/tomato paste (43), cereal (184), corn kernel (353), outdoor air (425)]. *A. foetidus* var. *acidus* (Nakaz., Simo & A. Watanabe) Raper & Fennell [Vineyard soil (70), corn kernel (353, 428)]. *A. foetidus* var. *pallidus* (Nakaz., Simo & A. Watanabe.) Raper & Fennell [**Soil**-vineyard (70, 282), burnt and normal forest (49), polluted by cement (45, 283); grape (41), tomato/tomato paste (43), substrate and/or habitat are unknown (285), moss (*Musci*) (290), corn kernel (353)].

A. fructiculosus Raper & Fennell]. See *A. fruticans*

A. fruticans Samson & W. Gams. Reported as *A. fructiculosus* Raper & Fennell [Agricultural soil (44)]. Teleomorph: *Emericella fruticulosa* (Raper & Fennell) Malloch & Cain.

A. fumigatus Fresen. [**Soil** (46, 67, 76, 78, 99, 112, 114-117, 119, 120, 141, 143, 144, 158, 164, 182, 191, 228, 249), wheat fields (69), forest (55), polluted by cement (45, 283), burnt forest (49), black pine and oak forest (62), greenhouse (42), agricultural (138, 150, 153, 156, 246), corn field (163), polluted by meat waste (165), tea field (302); **Air** (368), outdoor (60, 275, 301, 365, 425), indoor (82, 318, 359, 360), outdoor/indoor (135, 284), solid waste collection centres (104); **Human** (106, 243, 298, 325, 376, 378, 387),

skin wound (63, 237), lung and central nervous system (105), ear (79, 137, 234, 268, 276, 372, 389), outer ear (384, 423), external ear canals with otomycosis (388), bronchoalveolar lavage (236, 260, 280, 381), paranasal sinuses (238), eye (244), articulation liquid (245), gall bladder (261), balalayka (277), blood and bronchoalveolar lavage fluid (315), bronchial mucus (322), brain abscess (326), percutaneous aspiration (382), lung (413); **Seed**-wheat (54), rape (131); **Animal**-dog-urine, nasal swabs, lungs, kidney, liver, heart, spleen, nasal concha and lymphoid nodules (323), nasal discharge (336), ear (369), ostrich-nasal swabs, lung and trachea (279, 354), lung and air sacs (356), geese (334), turkey-granuloma (370), chicken-granuloma (392), chicken (399), sheep, cat, monkey, horse, hen, pigeon, partridge (397), male cat (426); grape (41), bed dust (53), tomato (43), lake water (83), feed stuff (65, 267), foodstuff (51, 52, 123, 125, 154), poultry feed (66, 374), meat products (100), substrate and/or habitat are unknown (121, 185, 233, 393, 415), cereal (130, 184), dust (134), hazelnut (140, 166), pharmaceutical products (142, 183), biscuit (168), apple (169), dung (170), seedling of vegetables (181), drug tablet (265)], juice of *Citrus* fruits (266), baby talc powder (271), eye cosmetics (272), powdered black, red and white pepper (274), cornflakes (296), packaged tea (349), hatchery (380). Important metabolites (7, 12): Gliotoxin, verrucologen, fumitremorgin A & B, fumitoxins, tryptoquivalins. *A. fumigatus* var. *ellipticus* Raper & Fennell [Indoor air (61), soil (164)].

A. giganteus Wehmer. [Human skin wound (63), substrate and/or habitat are unknown (121)].

A. glaucoaffinis Samson & W. Gams. Reported as *A. pseudoglaucus* Blochwitz [Indoor air (82), forest soil (55), powdered black pepper (274), turkish delight (278), poultry meat (278), dust (278)]. Teleomorph: *Eurotium pseudoglaucum* (Blochwitz) Malloch & Cain.

A. glaucus Link [Air-indoor (58), outdoor (60); foodstuff (51, 52, 123, 125, 154), human skin wound (63), wheat seed (54), poultry feed (66, 374), pharmaceutical products (129, 183), rice (188), leather (263), leather goods (264), powdered red pepper (274), lake water (366), dog (369)]. Teleomorph: *Eurotium herbariorum* (F. H. Wigg.) Link [Air (368), outdoor (425); feed stuff (65, 154), dust (134), drug tablet (265), surgical strings (273), powdered black pepper (274), lake water (366)].

A. halophilus Sartory, R. Sartory & J. Mey. See *A. proliferans*

A. heteromorphus Bat. & H. Maia [Soil (99), greenhouse (42), vineyard (70, 282), burnt and normal forest (49)].

A. hollandicus Samson & W. Gams. See *A. vitis*

A. insulicola Montem. & A. R. Santiago [Greenhouse soil (42)].

A. intermedius Blaser. Reported as *A. chevalieri* var. *intermedius* (Thom & Raper) Malloch & Cain. [Bed dust (53, 278), drug tablet (265, 278), juice of *Citrus* fruits (266, 278), eye cosmetics (272), powdered black pepper (274), syrup (278), shampoo (278), spices (278), turkish delight (278), poultry meat (278), leather goods (278)]. Teleomorph: *Eurotium intermedium* Blaser.

A. janus Raper & Thom [Agricultural soil (150), substrate and/or habitats are unknown (415)]. *A. janus* var. *brevis* Raper & Thom [Burnt and normal forest soil (49)].

A. japonicus Saito [Grape (41), soil (6, 112), outdoor air (425)]. (Some authors identified this species as *Aspergillus aculeatus* Iizuka [Soil-greenhouse (42), corn fields (163), agricultural (44); grape (41), outdoor air (425)].

A. kanagawaensis Nehira [Outdoor air (60), soil polluted by cement (45, 283)].

A. lanosus Kamal & Bhargava. [Greenhouse soil (42)].

A. malodoratus Kwon-Chung & Fennell [Agricultural soil (44)].

A. melleus Yukawa [**Soil** (158), agricultural (44, 153, 156), outdoor and pistachio soil (118), surgical strings (273)]. Major mycotoxins (12): Ochratoxin A, penicillic acid, xanthomegnin, viomellein, vioxanthin.

A. microcysticus Sappa [Outdoor air (155)].

A. montevidense Talice & J. A. Mackinnon. See *A. vitis*

A. nidulans (Eidam) G. Winter, . [**Soil** (46-48, 112, 115, 119, 120, 139, 141, 144, 151, 158, 164, 182, 191), agricultural (150), polluted by cement (45, 283), orchard (136), vineyard (282); **Air**-indoor (58, 360), outdoor/indoor (135); foodstuff (51, 52, 123, 125, 154), substrate and/or habitat are unknown (74), **Human**-skin wound (63), bronchoalveolar lavage (280); red pepper (77), wheat seed (54), kashar cheese (107), cereal (130), dust (134), pharmaceutical products (183), corn (258), leather (263), leather goods (264), baby talc powder (271), internal organs and stomach contents of cattle (400)]. New name proposed by Samson & Gams [24]: *A. nidulellus* Samson & W. Gams. Teleomorph: *Emericella nidulans* (Eidam) Vuill. [Drug tablet (265), juice of *Citrus* fruits (266), eye cosmetics (272), surgical strings (273), powdered black pepper (274), wheat seed (350), substrate and/or habitats are unknown (415)]. Major mycotoxins (12): Sterigmatocystin. *A. nidulans* var. *acristatus* Fennell & Raper [Vineyard soil (70)]. *A. nidulans* var. *echinulatus* Fennell & Raper [Bed dust (53)].

A. niger Tiegh. [**Soil** (46-48, 56, 71, 76, 78, 87, 89, 99, 112, 114-117, 119, 120, 139, 141, 143, 144, 151, 182, 191, 227, 228, 249, 405), polluted by cement (45, 283, 308), oak forest (75), agricultural (44, 138, 150, 153, 156, 246), greenhouse (42), black pine and oak forest (62), forest (49, 84), orchard (136), tea field (302), wheat and barley field (64), cotton field (394); **Air** (293, 368), indoor (58, 61, 82, 85, 152, 318, 359, 360, 363), outdoor (60, 83, 155, 159, 226, 275, 301, 365, 425), solid waste collection centres (104), outdoor/indoor (135, 284); **Human** (106, 243, 281, 298, 319, 324, 378), skin wound (63), phlegm (79, 122), ear (137, 234, 235, 268, 276, 372, 389), outer ear (384), external ear canals with otomycosis (316, 388), nail (240, 241, 358), bronchoalveolar lavage (280), eye (383), surgical specimens of sinuses (386), isolated from human with aortitis following cardiac surgery (419); **Cheese** (132), kashar (107); **Dust** (134), bed (53); **Seed**-onion (50, 86), wheat (54), soybean (124, 126, 127), corn (157, 258, 351, 353, 391, 428), rape (131), wheat/barley (128), hungarian vetch (417); **Olive** (148), Turkish-style black table olives (330); **Tree**-lemon (133), pistachio (373); foodstuff (51, 52, 123, 125, 154), grape (41, 416), waste water (57), substrate and/or habitat are unknown (74, 108, 121, 149, 185, 186, 187, 190, 310, 415, 418), feed stuff (65, 267), red pepper (77), soil, outdoor air, peanut (118), apple, lemon, fig, grapefruit, apricot, tangerine and orange (81), poultry feed (66), meat products (100), seedling root of vegetables (113, 181), pharmaceutical products (129, 142, 183), cereal (130, 184), hazelnut (140, 232), fig (145, 225), fodder (146), packaged powder soup (147), pomegranate (176), rice (188), drug tablet (265), baby talc powder (271), surgical strings (273), powdered black pepper (274), powdered red pepper (274), powdered white pepper (274), cornflakes (296), cotton material (328), human skin cream (339), peanut (346), wheat/fodder (347), packaged tea (349), lake water (366), fig (385), lucerne root cuttings (396), internal organs and stomach contents of cattle (400), raisin (422)]. Important metabolites (7, 12): Naphtho-Y-pyrone, malformins, ochratoxin A. Reported as *A. ficuum* (Reichardt) Henn. [**Soil** (46, 99), wheat fields (69), polluted by cement (45, 283), orchard (136), agricultural (153, 156); grape (41), wheat/barley (128), fodder (146), potato/onion (160), apple (169)].

A. niveus Blochwitz [**Soil** (119, 120, 158, 162), corn fields (163), wheat fields (69), greenhouse (42), agricultural (44, 150, 153, 156); seedling root of vegetables (113),

foodstuff (125), cereal (130), outdoor air (301)]. Teleomorph: *Fennellia nivea* (B. J. Wiley & E. G. Simmons) Samson.

A. nutans McLennan & Ducker [Soils of wheat field (69)].

A. ochraceus K. Wilh. [Soil (46-48, 115, 120, 141, 143, 144, 151, 158, 191, 249), black pine and oak forest (62), orchard (136), polluted by cement (161, 308), agricultural (138, 150, 153, 246), oak forest (75); Dust (134), bed (53); Air (293), outdoor/indoor (135), indoor (152), outdoor (301, 425); Seedling-root of vegetables (113), vegetables (181); Seed-wheat (54, 350), soybean (124, 127), wheat/barley (128); grape (41), foodstuff (52, 123, 125), feed stuff (65, 267), poultry feed (66, 374), pharmaceutical products (129, 183), cereal (130) (Authors did not indicate which one cereal, such as wheat? barley?, etc.), fodder (146), potato/onion (160), substrate and/or habitat are unknown (187), fig (225), leather (263), leather goods (264), drug tablet (265), juice of *Citrus* fruits (266), eye cosmetics (272), surgical strings (273), powdered black pepper (274), powdered red pepper (274), powdered white pepper (274), Turkish-style black table olives (330), substrate and/or habitat are unknown (393, 415)]. Important metabolites (7, 12): Penicillic acid, ochratoxin A, xanthomeginin, viomellein, vioxanthin. Reported as *A. alutaceus* Berk. & M.A. Curtis. [Seed-onion (50), hungarian vetch (417); soil (6)].

A. ornatulus Samson & W. Gams [Soil (99)]. Reported as *A. ornatus* Raper, Fennell & Tresner [Soil (228), agricultural (153, 156); Indoor air (61), foodstuff (125), eye cosmetics (272)]. Teleomorph: *Sclerocleista ornata* (Raper, Fennell & Tresner) Subram.

A. ornatus Raper, Fennell & Tresner. See *A. ornatulus*.

A. oryzae (Ahlb.) Cohn [Soil (88, 99, 115, 120, 141, 144, 228), agricultural (44, 138, 153, 156); Seed-wheat (54), soybean; foodstuff (51, 52, 123, 125, 154), red pepper (77), packaged powder soup (147), human nail (241), leather goods (264), drug tablet (265), baby talc powder (271), eye cosmetics (272), surgical strings (273)], air (368), outdoor air (425). Important metabolites (7, 12): Kojic acid, cyclopiazonic acid, 3-nitropropionic acid. *A. oryzae* var. *effusus* (Tiraboschi) Ohara [Soil polluted by cement (45, 283)].

A. ostianus Wehmer [Outdoor air (155), soils of corn field (163)]. Major mycotoxins (12): Ochratoxin A, penicillic acid.

A. paleaceus Samson & W. Gams. Reported as *A. stramenius* [Outdoor air (155)]. Teleomorph: *Neosartorya stramenia* (R. Novak & Raper) Malloch & Cain.

A. parasiticus Speare [Air-outdoor (301, 425), outdoor/indoor (135); Olive (148), natural black olives in brine (327); foodstuff (51, 52, 123, 125, 154), substrate and/or habitats are unknown (59, 415), grape (41), bed dust (53), tomato (43), human skin wound (63), wheat seed (54, 350), poultry feed (66, 374), pharmaceutical products (129), leather goods (264), drug tablet (265), hazelnut (269), baby talc powder (271), eye cosmetics (272), surgical strings (273), powdered black pepper (274), powdered red pepper (274), powdered white pepper (274), fig (287, 379), soil of wheat and barley field (64), wheat/fodder (347), corn kernel (353)]. Important metabolites (7, 12): Kojic acid, aspergillilic acid, aflatoxin B₁, B₂, G₁, G₂.

A. parvulus G. Sm. [Soil (115, 120, 139, 143, 144), agricultural (150), wheat fields (69); outdoor air (159), substrate and/or habitat are unknown (190)].

A. penicillioides Speg. [Dust (134), bed (53); soil (116), foodstuff (52, 123, 125), outdoor/indoor air (135), leather goods (264), drug tablet (265), baby talc powder (271), eye cosmetics (272), surgical strings (273), powdered red pepper (274)].

A. petrakii Voros [Soil (76, 78, 120), greenhouse (42); grape (41)].

A. phoenicis (Corda) Thom [**Soil** (99, 141), agricultural (153, 156); foodstuff (51, 52, 123, 125, 154), bed dust (53), pistachio soil (118), pharmaceutical products (142), apple (169), leather goods (264), eye cosmetics (272), powdered black pepper (274), powdered red pepper (274)].

A. proliferans G. Sm. [Turkish delight (278), poultry meat (278)]. Reported as *A. halophilus* Sartory, R. Sartory & J. Mey. [Poultry meat (278)].

A. pseudoglaucus Blochwitz. See *A. glaucoaffinis*

A. pulverulentus (McAlpine) Wehmer [Grape (41), vineyard soil (70, 282)].

A. pulvinus Kwon-Chung & Fennell [Grape (41), greenhouse soil (42), olive 148].

A. puniceus Kwon-Chung & Fennell [Grape (41), outdoor/indoor air (135), soil (191, 249)].

A. raperi Stolk [**Air**-indoor (152), outdoor (155); foodstuff (125)]

A. recurvatus Raper & Fennell [Orchard soil (136)].

A. repens de Bary. See *A. reptans*

A. reptans Samson & W. Gams Reported as *A. repens* de Bary [**Soil** (46, 112, 114, 120, 158, 162, 164, 171), black pine and oak forest (62), oak forest (75), agricultural (150, 153, 156), polluted by cement (45, 283); **Air** (293), indoor (152), outdoor (155, 275); foodstuff (51, 52, 125, 154), bed dust (53, 278), wheat/barley (128), pharmaceutical products (142), potato/onion (160), leather goods (264, 278), drug tablet (265, 278), juice of *Citrus* fruits (266, 278), eye cosmetics (272), syrup (278), shampoo (278), spices (278), turkish delight (278), poultry meat (278)]. Teleomorph: *Eurotium repens* de Bary [Red pepper (77)].

A. restrictus G. Sm. [**Air**-outdoor (425), outdoor/indoor (135); foodstuff (123, 125), soil polluted by meat waste (165)].

A. ruber (J. Konig, Spieck. & Bremer) Thom & Church. See *A. rubrobrunneus*

A. rubrobrunneus Samson & W. Gams Reported as *A. ruber* (J. Konig, Spieck. & Bremer) Thom & Church [**Soil** (120), agricultural(150); **Air** (293), indoor (82); wheat/barley (128), turkish delight (278), poultry meat (278)].

A. rugulosus (Thom & Raper) See *A. rugulovalvus*

A. rugulovalvus Samson & W. Gams. Reported as *A. rugulosus* [Soil (115, 117)]. Teleomorph: *Emericella rugulosa* (Thom & Raper) C. R. Benj. Major mycotoxins (12): Sterigmatocystin.

A. sclerotiorum G.A. Huber [**Soil** (6, 46, 76, 99, 112, 114-116, 228), greenhouse (42), burnt and normal forest (49), agricultural (44); red pepper (77), wheat seed (54), raw cotton (294, 295), air (368)]. Major mycotoxins (12): Ochratoxin A, penicillic acid.

A. sparsus Raper & Thom [Foodstuff (125)].

A. speluneus Raper & Fennell [Soil (67), dung (170)].

A. spinulosus Warcup. See *Raperia spinulosa*

Raperia spinulosa Subram. & Rajendran. Reported as *A. spinulosus* [Substrate and/or habitat are unknown (68), grape (41), greenhouse soil (42), indoor air (82, 152)]. Teleomorph: *Warcupiella spinulosa* (Warcup) Subram. [This anamorph has been removed from the genus *Aspergillus*. Source: Pitt et al. (1)].

A. stramenius R. O. Novak & Raper. See *A. paleaceus*

A. stellifer Samson & W. Gams Reported as *A. varicolor* (Berk. & Broome) Thom & Raper [Grape (41), soil (112, 114), outdoor air (425), substrate and/or habitat are unknown (427)]. Teleomorph: *Emericella varicolor* Berk. & Broome

A. stromatoides Raper & Fennell [Greenhouse soil (42)]. Teleomorph: *Chaetosartorya stromatoides* B. J. Wiley & E. G. Simmons.

A. subsessilis Raper & Fennell. [**Soil** (249), agricultural (246)].

A. sulphureus (Fresen.) Wehmer [**Soil** (46, 182, 191, 228), polluted by cement (45, 283); **Seedling**-root of vegetables (113), vegetables (181); foodstuff (51, 52, 123, 125, 154), indoor air (58), soybean seed (124), cereal (130), substrate and/or habitat are unknown (393)].

A. sydowii (Bainier & Sartory) Thom & Church [**Soil** (115, 119, 120, 141, 249), greenhouse (42), agricultural (138, 153, 156, 246), burnt and normal forest (49); foodstuff (51, 52, 123, 125, 154), grape (41), bed dust (53), wheat seed (54), seedling root of vegetables (113), cereal (130), outdoor/indoor air (135), drug tablet (265), eye cosmetics (272), cornflakes (296)].

A. tamaritii Kita [**Air**-outdoor (425), outdoor/indoor (284); **Dust** (134), bed (53); soil (119, 164), foodstuff (51, 123, 125, 154), wheat seed (54), soybean seed (127), cereal (130), fig (145), leather goods (264), juice of *Citrus* fruits (266), eye cosmetics (272), powdered black pepper (274), powdered red pepper (274)]. Important metabolites (7, 12): Cyclopiazonic acid, fumigaclavines.

A. terreus Thom [**Soil** (6, 47, 48, 56, 99, 112, 114, 117, 119, 120, 139, 141, 143, 144, 158, 162, 191, 228, 249), polluted by cement (45, 283), orchard (136), agricultural (150, 153, 156, 246), greenhouse (42), pistachio soil (118); foodstuff (51, 52, 123, 125, 154), Grape (41), bed dust (53), substrate and/or habitat are unknown (74, 180, 185, 393), tomato (43), **Human** (243), skin wound (63), external ear canals with otomycosis (316), ear (372), nail (358); feed stuff (65, 267), red pepper (77), wheat seed (54), poultry feed (66), seedling root of vegetables (113), cereal (130), **Air** (368), outdoor (425), outdoor/indoor (135); hazelnut (140), apple (169), corn (258), powdered black pepper (274), raw cotton (294, 295), lake water (366)]. Important metabolites (7, 12): Terrein, patulin, citrinin, citreoviridin, gliotoxin. *A. terreus* var. *africanus* Fennell & Raper. [**Soil** (249), agricultural (246)]. *A. terreus* var. *aureus* Thom & Raper [**Soil** (158, 162)].

A. terricola E. J. Marchal [**Soil** (76, 141, 227), wheat fields (69), greenhouse (42), agricultural (44, 153), corn field (167), polluted by cement (45, 283); cake (109), biscuit (168), haricot bean (355)]. *A. terricola* var. *americana* Marchal [**Soil** (99, 141, 228, 249), agricultural (138, 153, 156, 246), burnt and normal forest (49), soil polluted by cement (161); grape (41), corn kernel (353)]. *A. terricola* var. *indicus* (B. S. Mehrotra & Agnihotri) Raper & Fennell [**Soil** (162)].

A. thomii G. Sm. [**Soil** (47, 48), orchard (136), polluted by cement (308); indoor air (82), foodstuff (125)]. Considered by many taxonomists to be a mutant of *A. flavus*

A. tonophilus Ohtsuki [Turkish delight (278)]. Teleomorph: *Eurotium tonophilum* Ohtsuki.

A. tubingensis (Schober) Mosseray [**Soil** (46, 99, 141), agricultural (153, 156), burnt and normal forest (49); grape (41), corn kernel (353, 428), raisin (422)]. Considered by many taxonomists to be a variety of *A. niger*.

A. unguis (Emile-Weil & L. Gaudin) Thom & Raper [Grape (41), vineyard soil (70, 282)].

Teleomorph: *Emericella unguis* Malloch & Cain.

A. unilateralis Thrower [Lemon trees (133)].

A. ustus (Bainier) Thom & Church [**Soil** (6, 46, 99, 112, 114, 119, 120, 141, 158, 164, 182, 191, 228, 249), burnt and normal forest (49), orchard (136), agricultural (153, 156), polluted by cement (45, 283), greenhouse (42); **Air** (368), outdoor (425), outdoor/indoor (135); foodstuff (51, 52, 123, 125, 154), grape (41), human skin wound (63), wheat seed (54, 350), kashar cheese (107), seedling root of vegetables (113), substrate and/or habitat are unknown (121), cereal (130), lemon trees (133), fig (145)]. Important metabolites (7, 12): Austamide, austidiol, austins, austocystins.

A. varicolor (Berk. & Broome) Thom & Raper. See *A. stellifer*

A. versicolor (Vuill.) Tirab. [**Soil** (47, 48, 56, 76, 78, 88, 99, 112, 115, 141, 144, 151, 162, 164, 228, 249), corn field (163), forest (49), agricultural (44, 138, 150, 153, 156, 246), orchard (136), polluted by cement (45, 283), greenhouse (42), tea field (302); **Cheese** (72, 398), kashar (107); **Human-skin wound** (63), bronchoalveolar lavage (79, 280), nail (241); **Seed-wheat** (54, 350), rape (131); **Dust** (134), bed (53); **Air** (368), outdoor/indoor (135, 284), indoor (58, 61, 359, 360), outdoor (159, 226, 365, 425); foodstuff (51, 52, 123, 125, 154), grape (41), feed stuff (65, 267), red pepper (77), poultry feed (66, 374), meat products (100), seedling root of vegetables (113), wheat/barley (128), cereal (130), lemon trees (133), pharmaceutical products (142, 183), packaged powder soup (147), olive (148), hazelnut (166), leather goods (264), drug tablet (265), juice of *Citrus* fruits (266), baby talc powder (271), eye cosmetics (272), powdered red pepper (274), raw cotton (294, 295), cornflakes (296), substrate and/or habitat are unknown (415)]. Important metabolites (7, 12): Sterigmatocystin, nidulotixin.

A. viridinutans Ducker & Thrower [Grape (41), vineyard soil (70, 282)].

A. vitis Novobr. Reported as *A. amstelodami* (L. Mangin) Thom & Churc. [**Dust** (134), bed (53, 278); **Air-outdoor/indoor** (135), outdoor (155); foodstuff (51, 52, 123, 125, 154), soil (112, 114, 249), wheat seed (54), leather goods (264, 278), drug tablet (265, 278), surgical strings (273, 278), powdered black pepper (274), powdered red pepper (274), spices (278), turkish delight (278), poultry meat (278)]. Reported as *A. montevidense* Talice & J. A. Mackinnon [Soil (171), **Air** (293), indoor (152), turkish delight (278)]. Teleomorph: *Eurotium amstelodami* L. Mangin [Feed stuff (65), red pepper (77), substrate and/or habitats are unknown (415)].

A. wentii Wehmer. [**Soil** (6, 46, 56, 99, 112, 114, 119, 141, 144, 162, 164), greenhouse (42), wheat fields (69), corn fields (163, 167), agricultural (150, 153, 156), polluted by meat waste (165), pistachio soil (118); **Air-indoor** (58, 82, 152), outdoor (60, 155, 159, 226, 365, 425); foodstuff (51, 52, 123, 125, 154), substrate and/or habitats are unknown (74, 415), feed stuff (65, 267), seedling root of vegetables (113), cereal (130), olive (148), hazelnut (166), biscuit (168), wheat/fodder (347), corn kernel (353), lemon (421)]. Important metabolites (7, 12): Emodin, wentilacton.

A. zonatus Kwon-Chung & Fennell [Foodstuff (125), eye cosmetics (272)].

***Penicillium* Link: Fr.**

[Teleomorphs (292): *Eupenicillium* F. Ludw., *Talaromyces* C. R. Benj.]

P. abeanum G. Sm. See *P. spinulosum*

P. aculeatum Raper & Fennell [Outdoor air (60), soils of corn field (163)].

P. adametzii K.M. Zalesky [**Soil** (112, 144, 162, 249), wheat fields (69), agricultural (150, 246), orchard (136); seedling root of vegetables (113), foodstuff (125), outdoor/indoor air (284)].

P. adametzioides S. Abe ex G. Sm. [Foodstuff (52), indoor air (82)].

P. aeneum G. Sm. See *P. citreonigrum*

P. albicans Bainier [Vineyard soil (70)]. (According to Pitt (5) probably

Scopulariopsis

P. alicantinum C. Ramirez & A. T. Martinez. See *P. citreonigrum*

P. allahabadense B.S. Mehrotra & D. Kumar [**Soil** (158), wheat fields (69)].

P. alutaceum D. B. Scott [Foodstuff (123, 125)]. Teleomorph: *Eupenicillium alutaceum* D. B. Scott.

P. anaticum Stolk [Foodstuff (51, 52, 154), soil (119)]. Teleomorph: *Eupenicillium anaticum* Stolk [**Soil** (93), greenhouse (42), leather goods (264)].

P. asperosporum G. Sm. [Outdoor air (60)].

P. atramentosum Thom [**Soil** (46), polluted by cement (45, 283), **Air** (368), indoor (152)]. Important metabolites (7, 12): Roquefortine C. Secondary metabolites with unknown toxicity (Source: 7): Meleagrins, oxaline, rugulovasins A & B.

P. atrosanguineum B.X. Dong. See *P. miczynskii*

P. atrovenetum G. Sm. [Outdoor air (60)].

P. aurantiogriseum Dierckx. [**Soil** (249), agricultural (246), greenhouse (42); **Air** (368), indoor (61, 82); foodstuff (51, 52, 154), wheat seed (54), fig (145), olive (148), biscuit (168), kashar cheese (409), chicken feed (412)]. Important metabolites (7, 12): Nephrotoxic glycopeptides, verrucosidin, Penicillic acid, terrsetric acid. Secondary metabolites with unknown toxicity (7): Aurantiamin, auranthine, anacine. Reported as *P. carneolutescens* G. Sm. [Soil (56)]. Reported as *P. cordubense* C. Ramirez & A. T. Martinez [**Soil** (141, 249), agricultural (156, 246)]. Reported as *P. cyclopium* Westling [**Soil** (88, 164), black pine and oak forest (62), agricultural (150), oak forest (75); **Seed-wheat** (54), rape (131); grape (41), seedling root of vegetables (113), foodstuff (125), cheese (132), **Air** (293), outdoor/indoor (135); olive (148), apple (169), cornflakes (296)]. Important metabolites (7, 12): Xanthomegnin, viomellein, vioxanthin, penicillic acid. Secondary metabolites with unknown toxicity (7): Cyclopenin, cyclophenol, dehydrocyclopeptin, cyclopeptin, viridicatol, 3-methoxyviridicatin, verrucofortine (=verrucosine), puberuline, rugulosuvine, leucyltryptophanyldiketopiperazine. Reported as *P. martensii* Biourge [Grape (41), soil (112, 114), foodstuff (125)]. Reported as *P. polonicum* Westling [Wheat seed (54)]. Important metabolites (7, 12): Nephrotoxic glycopeptides, penicillic acid. Secondary metabolites with unknown toxicity (7): Cyclophenol, cyclophenol, dehydrocyclopeptin, cyclopeptin, viridicatol, 3-methoxyviridicatin, verrucofortine (=verrucosine), puberuline, rugulosuvine, leucyltryptophanyldiketopiperazine, aspterric acid, anacine, methyl-4-[-(2-(2R)-hydroxyl-3-butynyl-oxy)]benzoate, pseurotins, Y-elementene. Reported as *P. puberulum* Bainier [**Soil** (112, 114, 249), greenhouse (42), agricultural (246); **Air**-outdoor (226), indoor (82), outdoor/indoor air (284); foodstuff (51, 52, 123, 154), lake water and outdoor air (83), cereal (130)]. Reported as *P. verrucosum* var. *cyclopium* (Westling) Samson, Stolk & Hadlok [**Soil** (56, 76, 99, 141, 164), burnt and normal forest (49), agricultural (44, 138, 153, 156), polluted by cement (45, 161, 283); **Cheese** (72), kashar (107, 409); **Seed-wheat** (54), soybean (127); **Air**-outdoor (155), indoor (152); bed dust (53), meat products (100), foodstuff (125, 154), pharmaceutical products (142, 183), potato/onion (160), apple (169), leather goods (264), drug tablet (265), baby talc powder (271), surgical strings (273)]. Reported as *P. verrucosum* var. *ochraceum* (Bainier) Samson, Stolk & Hadlok [**Soil** (46), polluted by cement (45, 283)].

P. aureum Corda. See *P. viridicatum*

P. bifforme Thom. See *P. camembertii*

P. bilaiae Chalab. Reported as *P. bilaii* Chalab. [Foodstuff (51, 52, 154)].

P. bilaii Chalab. See *P. bilaiae*

P. botryosum Bat. & H. Maia. See *P. citrinum*

P. brasilianum Bat. [Agricultural soil (156)].

P. brevicompactum Dierckx. [**Soil** (6, 46, 56, 99, 112, 114, 141, 164, 227, 228, 249), forest (55), polluted by cement (45, 283), agricultural (153, 156), black pine and oak forest (62), burnt and normal forest (49), oak forest (75); **Air** (293, 368), outdoor (60, 155, 159, 275, 365, 425), outdoor/indoor (85, 135, 284), indoor (82, 152, 360); **Water**-lake (83, 366), waste (57); foodstuff (51, 52, 123, 125, 154), cheese (72, 132), grape (41), bed dust (53), red pepper (77), cereal (130), rape seed (131), fig (145),

potato/onion (160), pharmaceutical products (183), substrate and/or habitat are unknown (187), leather goods (264), drug tablet (265), baby talc powder (271), cornflakes (296), corn kernel (353)]. Important metabolites (7, 12): Botryodiploidin, mycophenolic acid, brevianamide A, met O. Reported as *P. stoloniferum* Thom [**Soil** (46, 164), polluted by cement (45, 161, 283), agricultural (138); **Air** (293), outdoor/indoor (135), indoor (152), hazelnut (166)].

P. brevissimum J. N. Rai & Wadhvani. See *P. capsulatum*

P. brunneum Udagawa [**Soil** (158)].

P. camembertii Thom [**Air**-outdoor (60, 155, 159, 425), indoor (284), outdoor/indoor (135); **Waste-water** (57), milk factory (173); soil (117, 162), foodstuff (51, 123, 125, 154), cheese (72), fig (145), mushroom (172), baby talc powder (271), substrate and/or habitat are unknown (311, 313, haricot bean (355)]. Important metabolites (7, 12): Cyclopiazonic acid. Reported as *P. biforme* Thom [Agricultural soil (150)].

P. canescens Sopp. [**Soil** (6, 76, 89, 99, 112, 114, 117, 119, 139, 141, 144, 162, 227), polluted by cement (45, 283), burnt and normal forest (49), agricultural (138, 150, 153, 156); foodstuff (52), cereal (130), fodder (146), apple (169), drug tablet (265), outdoor air (284, 301)]. Reported as *P. yarmokense* Baghd. [**Soil**: agricultural (156), tea field (302); indoor air (152)].

P. capsulatum Raper & Fennell. [**Soil** (171)]. Reported as *P. brevissimum* J. N. Rai & Wadhvani [**Soil** (158)].

P. carneolutescens G. Sm. See *P. aurantiogriseum*

P. casei W. Staub. See *P. verrucosum*

P. caseicola Bainier [**Soil** (162), vineyard (70); **Air**-outdoor/indoor (135), outdoor (155); cake (109), pharmaceutical products (183)].

P. caseicolum Bain. [**Air** (293)].

P. castillonense C. Ramirez & A.T. Martinez. See *P. madriti*

P. charlesii G. Sm. See *P. fellutanum*

P. chermesinum Biourge. [**Soil** (99, 227, 228), burnt and normal forest (49), polluted by cement (45, 283), agricultural (138), tea field (302)]. Reported as *P. indicum* D. K. Sandhu & R. S. Sandhu [Indoor air (152)].

P. chrysogenum Thom [**Soil** (6, 46, 76, 78, 99, 114-117, 119, 120, 141, 158, 161, 164, 227, 228, 249), burnt and normal forest (49), agricultural (44, 153, 246), polluted by cement (45, 283), polluted by meat waste (165), black pine and oak forest (62), greenhouse (42), tea field (302); **Cheese** (72, 132, 398), kashar (107); **Dust** (134), bed (53); **Air** (293, 368), indoor (58, 61, 82), outdoor/indoor (135, 284), outdoor (226, 275, 365, 425); **Seed**-wheat (54), rape (131), corn (258); foodstuff (51, 52, 123, 125, 154), grape (41), lake water (83), **Human**-skin wound (63), cerebrospinal fluid (297); meat products (100), cereal (130), pharmaceutical products (142), fig (145), potato/onion (160), hazelnut (166), substrate and/or habitat are unknown (185, 309), leather (263), leather goods (264), drug tablet (265), juice of *Citrus* fruits (266), baby talc powder (271), eye cosmetics (272), surgical strings (273), powdered black pepper (274), powdered red pepper (274), raw cotton (294, 295), cornflakes (296), lake water (366)]. Important metabolites (7, 12): Roquefortune C, meleagrins, penicilin. Reported as *P. griseoroseum* Dierckx. [**Soil** (112), forest (55); **Air**-outdoor (226), Indoor (61, 82); foodstuff (51, 52, 154), lake water (83), cereal (130), apple (169)]. Reported as *P. notatum* Westling [**Soil** (46, 112, 114, 139, 191), agricultural (138), polluted by cement (161); **Cheese** (132, 398), kashar (107); **Air**-outdoor/indoor (135), indoor (359); foodstuff (51, 52, 154), grape (41), meat products (100), wheat/barley (128), potato/onion (160), raw cotton (294, 295)]. Reported as *P. citreoroseum* Dierckx [**Soil** (112, 114)].

P. citreonigrum Dierckx [**Soil** (249), forest (55), agricultural (246); cereal (130), **Air** (368), outdoor (425), outdoor/indoor (284)]. Reported as *P. aeneum* G. Sm. [**Soil** (228), burnt and normal forest (49), polluted by cement (45, 283)]. [= *Penicillium citreoviride* var. *aeneum* S. Abe]. Reported as *P. alicantinum* C. Ramirez & A. T. Martinez [**Soil** (171), polluted by cement (45, 283)]. Reported as *P. citreoviride* Biourge [**Air**-outdoor/indoor (135), indoor (152); soil (112, 114), cheese (411)]. Reported as *P. galliacum* C. Ramirez & A. T. Martinez et Berenguer [Foodstuff (52)].

P. citreoroseum Dierckx. See *P. chrysogenum*

P. citreoviride Biourge. See *P. citreonigrum*

P. citrinum Thom [**Soil** (6, 47, 48, 99, 115, 116, 119, 120, 141, 151, 158, 227, 228), forest (49, 55), greenhouse (42), wheat fields (69), agricultural (138, 156), tea field (302); grape (41), foodstuff (52, 123, 125, 154), **Air** (368), indoor (82), outdoor (226, 425), outdoor/indoor air (284); human skin wound (63), meat products (100), cereal (130), packaged powder soup (147)]. Important metabolites (7, 12): Citrinin. Reported as *P. botryosum* Bat. & H. Maia [**Air** (293), indoor (152); agricultural soil (156)]. Reported as *P. sartoryi* Thom [**Soil** (46), polluted by cement (45, 283), corn fields (167)].

P. claviforme Bain. See *P. vulpinum*

P. clavigerum Demelius. [**Soil** (99, 227), forest (49), agricultural (44, 138, 153, 156), Turkish-style black table olives (330)].

P. commune Thom. [**Soil**-agricultural (138, 153, 156), wheat fields (69); foodstuff (51, 52), grape (41), outdoor air (60, 425), cheese (411)]. Important metabolites (7, 12): Cyclopiazonic acid, rugulovasine A & B. Secondary metabolites with unknown toxicity (7): Cyclophenin, cyclophenol, dehydrocyclopeptin, cyclopeptin, viridicatol, viridicatin, cyclopaldic and cyclopolic acid. Reported as *P. lanoso-coeruleum* Thom [Grape (41), soil (88)]. Reported as *P. lanosogriseum* Thom [Grape (41)]. Reported as *P. lanosoviride* Thom [Grape (41), soil (88), foodstuff (52)].

P. concentricum Samson, Stolk & Hadlok [Foodstuff (51, 52, 154), wheat/barley (128), potato/onion (160)].

P. coralligerum Nicot & Pionnat [Bed dust (53), indoor air (152), drug tablet (265), juice of *Citrus* fruits (266)].

P. cordubense C. Ramirez & A. T. Martinez. See *P. aurantiogriseum*

P. corylophilum Dierckx. [**Soil** (46, 227, 249), burnt and normal forest (49), polluted by cement (45, 283), forest (55), agricultural (246), tea field (302); foodstuff (51, 52), bed dust (53), wheat seed (54), leather goods (264), drug tablet (265), baby talc powder (271), powdered red pepper (274), outdoor air (284), raw cotton (294, 295), corn kernel (353)]. Reported as *P. humuli* J. F. H. Beyma [**Soil**-greenhouse (42), agricultural (44), polluted by cement (45, 283); **Air**-indoor (360), outdoor (365, 425)].

P. corymbiferum Westling. See *P. hirsutum*

P. crateriforme J.C. Gilman & L.V. Abbott [Soils of wheat field (69)].

P. crustosum Thom [**Air**-outdoor (226, 301, 425), indoor (61, 82), outdoor/indoor (284); **Soil** (249), forest (49), agricultural (246); foodstuff (51, 52), grape (41), wheat seed (54), wheat/fodder (347), corn kernel (353), cheese (398)]. Important metabolites (7, 12): Penitrem A-F, terrestric acid, roquefortune C. Secondary metabolites of unknown toxicity (7): Cyclophenin, cyclophenol, dehydrocyclopeptin, cyclopeptin, viridicatol, viridicatin, styrene, 2-methylisoborneol, geosmin, dimethyl-disulphide. Reported as *P. farinosum* Novobranova [**Soil** (56), agricultural (153); **Air**-indoor (85, 360), outdoor (365)]. Reported as *P. terrestre* Jensen [Grape (41), foodstuff (125)].

P. cyaneum (Bainier & Sartory) Biourge. [**Soil** (191), polluted by meat waste (165), tea field (302); foodstuff (51, 52, 154), hazelnut (166)].

P. cyclopium Westling. See *P. aurantiogriseum*

P. cyclopium var. *echinulatum* Raper & Thom. See *P. echinulatum*

P. decumbens Thom [**Soil** (6, 47, 48, 56, 76, 78, 99, 112, 114, 117, 119, 141, 151, 158, 228, 249), wheat fields (69), greenhouse (42), burnt and normal forest (49), agricultural (138, 153, 156, 246), forest (55), tea field (302), polluted by cement (308); **Air-outdoor** (226, 425), indoor (284); foodstuff (51, 52, 123, 125, 154), potato/onion (160), moss (*Musci*) (290)].

P. dierckxii Biourge. Reported as *P. gerundense* C. Ramirez & A. T. Martinez [Soils of corn field (163)].

P. digitatum (Pers. : Fr.) Sacc. [**Air** (368), indoor (82), outdoor/indoor (135); **Citrus fruits** (90-92, 175, 177), satsuma mandarins (404), lemon, grapefruit, tangerine, orange, quince, pomegranate, apple and strawberry (81), lemon (406, 410); foodstuff (51, 52, 125, 154), substrate and/or habitat are unknown (59, 108), grape (41), bed dust (53), olive (148), soil (171, 405)]. Important metabolites (7, 12): Tryptoquivalins.

P. diversum Raper & Fennell [**Soil** (99, 112, 114, 227, 228), burnt and normal forest (49), agricultural (156); foodstuff (52), hazelnut (166)].

P. diversum var. *aereum* Raper & Fennell. See *P. primulinum*

P. donkii Stolk [Soil (74, 151, 158), outdoor/indoor air (284)].

P. duclauxii Delacr. [**Soil** (48), orchard (136); outdoor air (60, 425), tomato (43), cake (109), biscuit (168)].

P. echinulatum Raper & Thom ex Fassat. [**Soil** (46), polluted by cement (45, 283), agricultural (156); **Dust** (134), bed (53); foodstuff (51, 52, 123, 125, 154), **Air** (368), outdoor (425), indoor (58); cheese (72), grape (41), cereal (130), packaged powder soup (147), olive (148), apple (169), leather goods (264), drug tablet (265), baby talc powder (271), surgical strings (273)]. Important metabolites (7, 12): Territrems. Reported as *P. cyclopium* var. *echinulatum* Raper & Thom. [Indoor air (61)]. [*Penicillium echinulatum* E. Dale in Biourge = *Penicillium janczewkii* K. M. Zalesky].

P. ehrlichii Kleb. See *P. klebahnii*

P. estinogenum A. Komatsu & S. Abe ex G. Sm. [Soils of wheat fields (69), outdoor air (60, 159)].

P. expansum Link. [**Soil** (46, 76, 78, 99, 141, 164, 227, 228, 249), greenhouse (42), black pine and oak forest (62), burnt and normal forest (49), agricultural (138, 153, 156, 246), polluted by cement (45, 161, 283); foodstuff (51, 52, 123, 125, 154), bed dust (53), **Air** (293, 368), indoor (82, 85), outdoor (275, 425); **Cheese** (411), kashar (107); **Seed-soybean** (127), wheat/barley (128), corn kernel (353), wheat/fodder (347); **Fruit & Vegetable**-potato/onion (160), pear (174, 408), cherry (312), Turkish-style black table olives (330), apple (407); lake water (83), meat products (100), pharmaceutical products (183), substrate and/or habitat are unknown (189), leather goods (264), drug tablet (265), surgical strings (273)]. Important metabolites (7, 12): Roquefortune C, patulin, citrinin, communesins, chaetoglobosin C. Reported as *P. resticulosum* Birkinshaw, Raistrick & G. Sm. [Grape (41), olive (148), water of dental unit (291)].

P. fagi C. Ramirez & A. T. Martinez. See *P. raciborskii*

P. farinosum Novobranova. See *P. crustosum*

P. fellutanum Biourge. [**Soil** (47, 48, 112, 114, 151), agricultural (138); **Air** (368), outdoor/indoor (135); cereal (130), cheese (411)]. Reported as *P. charlesii* G. Sm. [**Soil** (99), agricultural (138, 153); **Air-indoor** (360), outdoor (365)]; hazelnut (166).

P. fennelliae Stolk [Forest soil (49)].

P. frequentans Westling. See *P. glabrum*

P. funiculosum Thom [**Soil** (6, 47, 48, 56, 112, 114-116, 119, 120, 139, 151, 158, 162, 171, 191, 249), corn fields (163, 167), greenhouse (42), agricultural (44, 150, 246), orchard (136), polluted by cement (308); **Air-indoor** (58, 61), outdoor (60, 159,

425), outdoor/indoor (135); **Dust** (134), bed (53); foodstuff (51, 123, 154), grape (41), potato/onion (160), leather (263), leather goods (264), drug tablet (265), juice of *Citrus* fruits (266), baby talc powder (271), eye cosmetics (272), surgical strings (273), powdered red pepper (274)].

P. fuscum (Sopp) Raper & Thom [Soil (56, 88, 144), outdoor air (155)].

P. galliacum C. Ramirez & A. T. Martinez et Berenguer. See *P. citreonigrum*

P. gerundense C. Ramirez & A. T. Martinez. See *P. dierckxii*

P. giganteum R. Y. Roy & G. N. Singh. See *P. megasporum*

P. glabrum (Wehmer) Westling. [**Soil**: forest (49), polluted by cement (308); foodstuff (51, 52, 154), lake water (83), olive (148), **Air** (368), outdoor/indoor (284)]. Important metabolites (7, 12): Citromycetin. Reported as *P. frequentans* Westling [**Soil** (46, 116, 117, 119, 141, 144, 158, 162, 164, 227, 228), black pine and oak forest (62), oak forest (75), polluted by cement (45, 161, 283), orchard (136), agricultural (138, 150, 153, 156), tea field (302); **Dust** (134), bed (53); foodstuff (51, 52, 123, 125, 154), cheese (72), grape (41), substrate and/or habitat are unknown (74), tomato/tomato paste (43), wheat/barley (128), rape seed (131), outdoor/indoor (135), pharmaceutical products (142, 183), potato/onion (160), leather (263), leather goods (264), juice of *Citrus* fruits (266), baby talc powder (271), eye cosmetics (272), surgical strings (273), powdered black pepper (274), powdered red pepper (274); **Air** (293), outdoor (275); haricot bean (355)].

P. gladioli Machacek. See *P. gladioli*

P. gladioli L. McCulloch & Thom. Reported as *P. gladioli* Machacek [**Dust** (134), bed (53); **Soil** (47, 48), polluted by cement (308); outdoor/indoor air (135), drug tablet (265)]. Reported as *P. rolfsii* var. *sclerotiale* Novobr. [**Soil** (48, 151)]. Teleomorph: *Eupenicillium crustaceum* F. Ludw. [Lake water (366)].

P. glandicola (Oudem.) Seifert & Samson. Reported as *P. granulatum* Bain. [**Soil** (249), agricultural (150, 246); **Air**-outdoor (425), outdoor/indoor air (135, 284); foodstuff (51, 52, 125, 154), grape (41), olive (148), apple (169)].

P. godlewskii K. M. Zalesky. See *P. jensenii*

P. gracilentum Udagawa & Y. Horie [Foodstuff (123, 125)]. Teleomorph: *Eupenicillium gracilentum* Udagawa & Y. Horie.

P. granulatum Bain. See *P. glandicola*

P. griseo-azureum C. Moreau & V. Moreau. See *Penicillium waksmanii*

P. griseofulvum Dierckx. [**Soil** (164, 171, 249), agricultural (138, 246); **Dust** (134), bed (53); **Air** (368), indoor (82), outdoor/indoor (135, 284), outdoor (226, 425); foodstuff (51, 52, 123, 125, 154), red pepper (77), wheat seed (54), meat products (100), cereal (130), pharmaceutical products (142), hazelnut (166), leather goods (264), drug tablet (265), baby talc powder (271), powdered red pepper (274)]. Important metabolites (7, 12): Roquefortune C, cyclopiazonic acid, patulin, griseofulvin. Reported as *P. patulum* Bainier [Seedling root of vegetables (113), rape seed (131), soil (182), substrate and/or habitat are unknown (393)]. Reported as *P. urticae* Bainier [Foodstuff (125), outdoor air (155), apple (169)].

P. griseoroseum Dierckx. See *P. chrysogenum*

P. griseum (Sopp) Biourge. See *P. restrictum*

P. herquei Bainier & Sartory [**Soil** (56, 99, 141), forest (55), agricultural (138, 153), corn fields (163); tomato/tomato paste (43), foodstuff (125), outdoor/indoor air (135, 284), mushroom (172), substrate and/or habitat are unknown (285), cornflakes (296)].

P. hirsutum Dierckx. [Foodstuff (51, 52, 154), wheat seed (54), apple (169), **Air** (368), outdoor/indoor (284)]. Important metabolites (7, 12): Roquefortune C, terrestrial

acid. Reported as *P. corymbiferum* Westling [Grape (41), foodstuff (125), soil (56, 144)]. Reported as *P. verrucosum* var. *corymbiferum* (Westling) Samson, Stolk & Hadlok [Soil (6), polluted by cement (45, 283); bed dust (53), foodstuff (123, 154), wheat/barley (128), potato/onion (160), leather goods (264), drug tablet (265), baby talc powder (271)].

P. hispanicum C. Ramirez, A. T. Martinez & Ferrer. See *P. implicatum*

P. humuli J. F. H. Beyma. See *P. corylophilum*

P. ilerdanum C. Ramirez, A. T. Martinez & Berer. See *P. piceum*

P. implicatum Biourge. [Soil (6, 115-117, 164, 249), polluted by cement (45, 283), agricultural (246); foodstuff (51, 52, 123, 125, 154), Air-indoor (82), outdoor (284), olive (148)]. Reported as *P. hispanicum* C. Ramirez, A. T. Martinez & Ferrer [Outdoor air (155)].

P. indicum D. K. Sandhu & R. S. Sandhu. See *P. chermesinum*

P. indonesiae Pitt. Reported as *P. javanicum* J. F. H. Beyma [Soil (112), foodstuff (125)]. Nom. Holomorph: *Eupenicillium javanicum* (J. F. H. Beyma) Stolk & D. B. Scoot. [Surgical strings (273)].

P. intermedium Stolk & Samson. See *Talaromyces intermedium*

P. isariforme Stolk & J. A. Mey [Greenhouse soil (42)].

P. islandicum Sopp. [Soil (249), agricultural (44), polluted by cement (45, 283), agricultural (246); grape (41), foodstuff (52), cake (109), cereal (130), Air-indoor (152), outdoor/indoor (284); biscuit (168)].

P. italicum Wehmer. [Soil (120), greenhouse (42); Air (368), outdoor/indoor (135), outdoor (155, 425); Citrus fruits (90-92, 175, 177), strawberry, quince, pomegranate, lemon, orange, grapefruit, tangerine (81), lemon (352, 406, 410); foodstuff (51, 52, 123, 125, 154), substrate and/or habitat are unknown (59), bed dust (53), cereal (130), corn kernel (353)]. Reported as *P. italicum* var. *avellaneum* Samson & Y. Gutter [Outdoor air (155)]. Reported as *P. italicum* var. *italicum* Wehmer [Soil (46-48, 99, 228), burnt and normal forest (49), polluted by cement (45, 283), agricultural (153, 156); indoor air (152)].

P. italicum var. *avellaneum* Samson & Y. Gutter. See *P. italicum*

P. janczewskii K. M. Zalesky. [Soil-greenhouse (42), forest (55); Air (368), indoor (61); cereal (130)]. Reported as *P. nigricans* Bainier in Thom [Soil (76, 78, 139, 141, 162, 164, 228), oak forest (75), black pine and oak forest (62), orchard (136), agricultural (138, 150), tea field (302); foodstuff (52), human skin wound (63), meat products (100), potato/onion (160), hazelnut (166), apple (169)].

P. janthinellum Biourge [Soil (46, 99, 112, 114-117, 119, 141, 158, 164, 228, 249), burnt and normal forest (49), agricultural (44, 138, 150, 153, 156), polluted by cement (45, 283), greenhouse (42), forest (55), orchard (136), polluted by meat waste (165); Air (368), outdoor (365, 425); foodstuff (51, 52, 125, 154), human skin wound (63), baby talc powder (271), moss (*Musci*) (290)].

P. javanicum J. F. H. Beyma See *P. indonesiae*

P. jensenii K. M. Zalesky. [Soil (99, 141, 144, 227, 228), agricultural (138, 150, 153, 156), burnt and normal forest (49), polluted by cement (45, 283), forest (55); Air-outdoor (60, 365), indoor (61, 360); foodstuff (51, 52, 154)]. Reported as *P. godlewskii* K. M. Zalesky [Soil (162), agricultural (44); hazelnut (166)].

P. klebahnii Pitt. Reported as *P. ehrlichii* Kleb. [Outdoor air (155)]. Teleomorph: *Eupenicillium ehrlichii* (Kleb.) Stolk & D. B. Scoot.

P. kloeckeri Pitt. Reported as *P. wortmannii* Klocker [Soil (162)]. Nom. Holomorph: *Talaromyces wortmanni* (Klocker) C. R. Benj.].

P. kojigenum G. Sm. See *P. lanosum*

P. kurssanovii Chalab. See *P. restrictum*

P. lanosum Westling [Soil (76, 99, 144, 158, 162, 227, 228), burnt and normal forest (49), wheat fields (69), agricultural (138, 153, 156), corn field (163); Air-outdoor (60, 155, 159), outdoor/indoor (135), indoor (152); grape (41), cake (109), foodstuff (154), hazelnut (166), biscuit (168), apple (169)]. Reported as *P. kojigenum* G. Sm. [Soil (46), polluted by cement (45, 283)].

P. lanoso-coeruleum Thom. See *P. commune*

P. lanosogriseum Thom. See *P. commune*

P. lanosoviride Thom. See *P. commune*

P. lapidosum Raper & Fennell [Soil (115), outdoor air (425)]. Teleomorph: *Eupenicillium lapidosum* D. B. Scott & Stolk.

P. lilacinum Thom. See *Paecilomces lilacinus*

P. lividum Westling [Foodstuff (51, 52, 125, 154), cereal (130), Air (368), outdoor/indoor (135); surgical strings (273)]. Reported as *P. trzebinkianum* S. Abe [Foodstuff (52), tea field (302)].

P. loliense Pitt [Indoor air (61)].

P. luteo-aurantium G. Sm. See *P. resedanum*

P. luteum Zukal See *Talaromyces luteus*

P. madriti G. Sm. [Soil (99, 249), forest (49), agricultural (153, 246)]. Reported as *P. castellanense* C. Ramirez & A.T. Martinez [Soil (228)].

P. mali Gorlenko & Novobr. See *P. solitum*

P. manginii Duche & R. Heim. [Bed dust (53), cheese (398)].

P. marneffeii Segretain [Outdoor air (425)].

P. martensii Biourge. See *P. aurantiogriseum*

P. megasporum Orpurt & Fennell. [Soil (162), agricultural (44); foodstuff (51, 52, 154)]. Reported as *P. giganteum* R. Y. Roy & G. N. Singh [Indoor air (152)].

P. melinii Thom [Air-indoor (61, 284), outdoor (425); forest soil (55)].

P. miczynskii K. M. Zalessky [Soil (47, 48, 141, 151, 158), burnt forest (49), polluted by cement (45), agricultural (138, 156); foodstuff (51, 52, 154), Air (368), indoor (82), outdoor/indoor (284), outdoor (425); lake water (83), cereal (130), olive (148), apple (169)]. Reported as *P. atrosanguineum* B.X. Dong [Agricultural soil (44)].

P. minioluteum Dierckx [cereal (130)].

P. mirabile Beliakova & Milko [Soil (47, 48, 151)].

P. moldavicum Milko & Beliakova [Soil (141)].

P. montanense M. Chr. & Backus [Soil (56, 162), forest (55), agricultural (150)].

P. multicolor Grig.-Man. & Porad. See *P. sclerotiorum*

P. nalgiovense Laxa [Dust (134), bed (53); foodstuff (51, 52, 123, 125, 154), cereal (130), outdoor/indoor air (135), soil (143, 171), apple (169), drug tablet (265), baby talc powder (271), surgical strings (273)].

P. nigricans Bainier in Thom. See *P. janczewskii*

P. notatum Westling. See *P. chrysogenum*

P. novae-zeelandiae J. F. H. Beyma [Soil (249), agricultural (246)].

P. ochraceum Bainier in Thom. See *P. viridicatum*

P. ochrochloron Biourge [Soil (144), forest (55); apple (169), outdoor air (284)].

P. oligosporum Saito & Minoura. See *Eupenicillium javanicum*

P. olsonii Bainier & Sartory [Soil (99, 141, 228), burnt and normal forest (49), polluted by cement (45, 161, 283), wheat fields (69), agricultural (153); foodstuff (51, 52, 154), outdoor air (60), cake (109), biscuit (168)]. Important metabolites (7, 12): Verrucolone, 2-(4-hydroxyphenyl)-2-oxoacetaldehydeoxime, bis(2-ethylhexyl)phthalate.

P. oxalicum Currie & Thom [**Soil** (117, 158, 191), agricultural (44), polluted by cement (45, 283), orchard (136); **Air** (293), indoor (82, 152), outdoor/indoor (284), outdoor (425); foodstuff (51, 52, 125, 154), grape (41), corn kernel (353, 428), cheese (411)]. Important metabolites (7, 12): Secalonic acid D & F, roquefortune C. Secondary metabolites with unknown toxicity (7): Meleagrins, oxaline, anthglutin, oxalidine, oxalic acid.

P. palitans Westling [Foodstuff (125), apple (169)]. Important metabolites (7, 12): Cyclopiazonic acid, fumigaclavine A & B. Secondary metabolites with unknown toxicity (7): Cyclophenin, cyclophenol, dehydrocyclophenin, cyclophenin, viridicatol, viridicatin, palitantin.

P. pallidum G. Sm. See *Geosmithia putterillii*

Geosmithia putterillii (Thom) Pitt. Reported as *P. pallidum* G. Sm. [Foodstuff (125)].

P. paneum Frisvad [Soils of wheat field (69)]. Important metabolites (7, 12): Patulin, roquefortune C, botryodiploidin. Secondary metabolites with unknown toxicity (7): Marcfortines A, B and C.

P. paraherquei S. Abe ex G. Sm. [**Dust** (134), bed (53); foodstuff (51, 52, 123, 125, 154), outdoor/indoor air (135), pharmaceutical products (142), packaged powder soup (147), apple (169), leather (263), leather goods (264), drug tablet (265), juice of *Citrus* fruits (266), baby talc powder (271), surgical strings (273)].

P. patulum Bainier. See *P. griseofulvum*

P. paxilli Bainier [**Air**-outdoor (425), outdoor/indoor air (85); grape (41), forest soil (55), cereal (130), potato/onion (160), mushroom (172)].

P. pedemontanum Mosca & A. Fontana [Waste water (57)].

P. phialosporum Udagawa See: *Penicillium rugulosum* Thom.

P. phoeniceum J. F. H. Beyma. Indoor air (61). Reported as *P. pusillum* G. Sm. [Agricultural soil (150)]. Teleomorph: *Eupenicillium cinnamopurpureum* D. B. Scott & Stolk].

P. piceum Raper & Fennell. [**Seed**: rape (131), haricot bean (355); soils of wheat fields (69), outdoor air (60), foodstuff (125)]. Reported as *P. ilerdanum* C. Ramirez, A. T. Martinez & Berer [Agricultural soil (156)].

P. pinetorum M. Chr. & Backus [**Soil** (119), greenhouse (42), agricultural (44)]. Teleomorph: *Eupenicillium pinetorum* Stolk

P. pinophilum Hedgc. [Foodstuff (52)].

P. piscarium Westling [**Soil** (119), agricultural (138)].

P. polonicum Westling. See *P. aurantiogriseum*

P. primulinum Pitt [Soil (249)]. Reported as *P. diversum* var. *aereum* Raper & Fennell [Burnt and normal forest soil (49)].

P. psittacinum Thom. See *P. viridicatum*

P. puberulum Bainier. See *P. aurantiogriseum*

P. pulvillorum Turfitt [Soil (47, 48)].

P. purpurens (Sopp) Biourge. [**Soil** (112, 114, 164), greenhouse (42), forest (55); foodstuff (125), **Air** (368), outdoor (284)].

P. purpureum Stolk & Samson [Substrate and/or habitat are unknown (149), drug tablet (265), surgical strings (273)]. Teleomorph: *Talaromyces purpureus* (E. Mull. & Pacha-Aue) Stolk & Samson.

P. purpurogenum Stoll. [**Soil** (6, 46, 112, 116, 119, 143, 162, 191, 249), burnt and normal forest (49), polluted by cement (45, 283), polluted by meat waste (165), forest (55), agricultural (246); substrate and/or habitat are unknown (68, 74), foodstuff (52, 125), human skin wound (63), **Air** (368), outdoor (155, 425)]. Reported as *P. rubrum* Stoll [**Soil** (47, 48, 143, 151, 228), greenhouse (42), orchard (136), soils of corn field

(167), tea field (302); grape (41), substrate and/or habitat are unknown (74, 418), fodder (146), **Air** (293), indoor (152)].

P. pusillum G. Sm. See *P. phoeniceum*

P. putterillii Thom [Grape (41), vineyard soil (70)].

P. raciborskii K. M. Zalesky. [**Soil** (227), greenhouse (42); bed dust (53), drug tablet (265)]. Reported as *P. fagi* C. Ramirez & A. T. Martinez [**Soil** (46, 119), agricultural (156), polluted by cement (45, 283)].

P. raistrickii G. Sm. [Foodstuff (52, 123, 125), soil (47, 48, 112, 114, 119, 151)].

P. ramusculum Bat. & H. Maia. See *P. sublateritium*

P. resedanum McLennan & Ducker. [Burnt and normal forest soil (49)]. Reported as *P. luteo-aurantium* G. Sm. [**Soil** (47, 48, 151), outdoor air (155)].

P. resticulosum Birkinshaw, Raistrick & G. Sm. See *P. expansum*

P. restrictum J. C. Gilman & E. V. Abbott. [**Soil** (6, 46, 76, 78, 112, 114, 119, 120, 141, 144), greenhouse (42), burnt and normal forest (49), forest (55), wheat fields (69), agricultural (138, 150, 246), polluted by cement (161), corn fields (163, 167), polluted by meat waste (165); **Air** (368), indoor (61), outdoor (159); seedling root of vegetables (113), mushroom (172)]. Reported as *P. kurssanovii* Chalab. [**Soil** (56, 119)]. Reported as *P. griseum* (Sopp) Biourge. [**Air** (293), indoor (152), outdoor (159); **Soil** (249), agricultural soil (44)].

P. rolfsii Thom [**Soil** (47, 158), human skin wound (63)].

P. rolfsii var. *sclerotiale* Novobr. See *P. gladioli*

P. roquefortii Thom [**Soil** (46, 99), burnt and normal forest (49), polluted by cement (45, 161, 283), agricultural (138, 153, 156); foodstuff (51, 52, 123, 125, 154), **Cheese** (72, 132, 398, 411), tulum (110, 299), kashar (107, 409); meat products (100), **Air**-outdoor/indoor air (135), outdoor air (284, 425); fig (145), potato/onion (160), apple (169), waste of milk factory (173)]. Important metabolites (7, 12): Roquefortune C, isofumigaclavine A & B, PR-toxin, mycophenolic acid.

P. roseopurpureum Dierckx [Tomato (43), soil (56, 114), air (368)].

P. rubidurum Udagawa & Y. Horie [Foodstuff (51, 52, 123, 125, 154)].

Teleomorph: *Eupenicillium rubidurum* Udagawa & Y. Horie.

P. rubrum Stoll. See *P. purpurogenum*

P. rugulosum Thom [**Soil** (6, 56, 112, 114, 249), wheat fields (69), agricultural (138, 246); **Air**-outdoor (159), outdoor/indoor (135); foodstuff (51, 52, 123, 125, 154), bed dust (53), cereal (130), packaged powder soup (147), hazelnut (166), apple (169), drug tablet (265), baby talc powder (271), eye cosmetics (272)]. Important metabolites (7, 12): Rugulosin. Reported as *Penicillium phialosporum* [Tea field soil (302)].

P. sartoryi Thom. See *P. citrinum*

P. sclerotiorum J. F. H. Beyma [Fig (145), soil (158)]. Reported as *P. multicolor* Grig.-Man. & Porad. [**Soil** (99, 119, 158, 162, 228, 249), burnt and normal forest (49), agricultural (138); indoor air (152)].

P. simplicissimum (Oudem.) Thom [**Soil** (46, 99, 119, 164, 171, 228), black pine and oak forest (62), burnt and normal forest (49), oak forest (75), polluted by cement (45, 283), forest (55), agricultural (138, 150, 153, 156); **Air**-outdoor (275, 301), outdoor/indoor (284); grape (41), foodstuff (52, 125), wheat/barley (128), cereal (130), olive (148), potato/onion (160)].

P. solitum Westling. [Grape (41), wheat seed (54), outdoor air (155)]. Important metabolites (7, 12): Cyclophenin, cyclophenol, dehydrocyclopeptin, viridicatol, viridicatin, compactin, dehydrocompactin, solistatin. Reported as *P. mali* Gorlenko & Novobr. [Indoor air (152), agricultural soil (156)]. Reported as *P. verrucosum* var. *melanochlorum* Samson, Stolk & Hadlok [**Dust** (134), bed (53); foodstuff (123, 125, 154), cereal (130),

pharmaceutical products (142), soil polluted by cement (161), leather goods (264), drug tablet (265), baby talc powder (271), powdered red pepper (274)].

P. soppi K. M. Zalesky [Soil (158), polluted by cement (308)].

P. spinulosum Thom. [Soil (164), burnt and normal forest soil (49), agricultural (138); Air-outdoor (425), outdoor/indoor air (135); foodstuff (51, 52, 123, 125), substrate and/or habitat are unknown (111), cereal (130), hazelnut (166), biscuit (168)]. Reported as *P. abeanum* G. Sm. [Soil (56)].

P. steckii K. M. Zalesky [Soil (71, 88, 89, 99, 158, 227, 228), burnt and normal forest (49), agricultural (138, 153, 156), corn fields (163), tea field (302); foodstuff (51, 52, 125, 154), grape (41), fodder (146), olive (148), moss (*Musci*) (290)].

P. stoloniferum Thom. See *P. brevicompactum*

P. striatisporum Stolk [Soil (112), corn fields (163)].

P. sublateritium Biourge. [Soil (89, 227), forest (49); foodstuff (51, 52, 154)]. Reported as *P. ramusculum* Bat. & H. Maia [Soil (47, 48, 151)].

P. tardum Thom [Soil (164), corn fields (167); outdoor air (60, 155)].

P. terlikowskii K. M. Zalesky [Orchard soil (136)].

P. terrestre Jensen. See *P. crustosum*

P. thomii Maire [Soil (119, 151, 158), greenhouse (42); foodstuff (51, 52, 123, 125, 154), cereal (130), indoor air (152)]. Reported as *P. valentinum* C. Ramírez & A.T. Martínez [Soil (249)].

P. trzebinkianum S. Abe. See *Penicillium lividum* Westling.

P. turbatum Westling [Soil: Agricultural (150), polluted by cement (308); corn kernel (353)].

P. urticae Bainier. See *P. griseofulvum*

P. valentinum C. Ramírez & A.T. Martínez. See *P. thomii*

P. variable Sopp. [Soil (48, 76, 99, 151, 191, 227, 249), burnt and normal forest (49), forest (55), greenhouse (42), agricultural (138, 150, 153, 246); Dust (134), bed (53); foodstuff (51, 52, 123, 125), human skin wound (63), kashar cheese (107), cereal (130), Air (368), outdoor/indoor (135), outdoor (425); leather goods (264), drug tablet (265), juice of *Citrus* fruits (266), baby talc powder (271), eye cosmetics (272), surgical strings (273), powdered red pepper (274)]. Important metabolites (7, 12): Rugulosin.

P. varians G. Sm. [Soil (47, 48), vineyard (70); grape (41)].

P. velutinum J. F. H. Beyma [Soil (46, 141, 162), greenhouse (42), agricultural (44, 138), polluted by cement (45, 283), wheat fields (69), orchard (136); outdoor air (60)].

P. verrucosum Dierckx. [Air-outdoor (155, 226), indoor (58); Soil (249), agricultural (246), greenhouse (42, 119); foodstuff (51, 123, 125, 154), lake water (83), wheat seed (54), packaged powder soup (147), hazelnut (166), apple (169), leather (263)]. Important metabolites (7, 12): Ochratoxin A, citrinin. Secondary metabolites with unknown toxicity (7): Verrucolone (= arabenoic acid) and verrucines. Reported as *P. casei* W. Staub [Soil (162)]. *P. verrucosum* var. *album*. (Westling) Samson, Stolk & Hadlok [Indoor air (152)] Reported as *P. verrucosum* var. *verrucosum* Samson, Stolk & Hadlok [Soil (6), black pine and oak forest (62), polluted by cement (161); Dust (134), bed (53); Air-outdoor/indoor (85), indoor (152); foodstuff (52, 123, 154), cereal (130), pharmaceutical products (142, 183), potato/onion (160), leather goods (264), drug tablet (265), juice of *Citrus* fruits (266), baby talc powder (271), surgical strings (273), powdered red pepper (274)].

P. verrucosum var. *corymbiferum* (Westling) Samson, Stolk & Hadlok. See *P. hirsutum*

P. verrucosum var. *cyclopium* (Westling) Samson, Stolk & Hadlok. See *P. aurantiogriseum*

P. verrucosum var. *melanochlorum* Samson, Stolk & Hadlok. See *P. solitum*

P. verrucosum var. *ochraceum* (Bainier) Samson, Stolk & Hadlok. See *P. aurantiogriseum*

P. verrucosum var. *verrucosum* Samson, Stolk & Hadlok. See *P. verrucosum*

P. verruculosum Peyronel [**Soil** (112, 114), agricultural (44); **Air** (368), outdoor (60); bed dust (53), juice of *Citrus* fruits (266), eye cosmetics (272), lake water (366)].

P. vinaceum J.C. Gilman & E.V. Abbott [**Soil** (117, 249), forest (55), agricultural (246)].

P. viridicatum Westling. [**Air** (368); outdoor (60, 226, 284, 425), indoor (61, 82), outdoor/indoor (135); **Soil** (112, 114, 249), agricultural (246); foodstuff (51, 52, 123, 125, 154), grape (41), red pepper (77), cereal (130), fig (145), olive (148), apple (169)]. Important metabolites (7, 12): Xanthomegnin, viomellein, vioxanthin, xanthoviridicatin D & G, penicillic acid, viridic acid. Secondary metabolites with unknown toxicity (7): Brevianamide A, viridamine. Reported as *P. ochraceum* Bainier in Thom [Foodstuff (51, 52, 125, 154), tomato/tomato paste (43), raw cotton (294, 295), cornflakes (296)]. Reported as *P. psittacinum* Thom [Outdoor air (60)]. Reported as *P. aureum* Corda [Foodstuff, (51, 52, 154)].

P. vulpinum (Cooke & Masee) Seifert & Samson. Reported as *P. claviforme* Bain. [**Soil** (6, 99, 141, 228), greenhouse (42), burnt forest (49), agricultural (150, 153, 156); foodstuff (51, 52, 125), olive (148), **Air** (293), indoor (152); potato/onion (160), lemon (352)].

P. waksmanii K. M. Zalesky [**Soil** (46-48, 76, 115, 158, 191), greenhouse (42), polluted by cement (45, 161, 283), forest (55), tea field (302); **Air** (368), outdoor (60, 425), indoor (61); foodstuff (51, 52), moss (*Musci*) (290)]. Reported as *P. griseo-azureum* C. Moreau & V. Moreau [Outdoor air (155)].

P. wortmannii Klockner. See *P. kloeckeri*

P. yarmokense Baghd. See *P. canescens*

***Emericella* Berk.**

E. quadrilineata (Thom & Raper) C. R. Benj. [Indoor air (424)].

***Eupenicillium* F. Ludw.**

E. baarnense (J. F. H. Beyma) Stolk & D. B. Scott [**Dust** (134), Bed (53); agricultural soil (44), surgical strings (273)]. Anamorph: *Penicillium vanbeymae* Pitt.

E. cinnamopurpureum D. B. Scott & Stolk [Bed dust (53)]. Anamorph: *Penicillium phoeniceum* J. F. H. Beyma

E. egyptiacum (J. F. H. Beyma) Stolk & D. B. Scott [Soil (249)]. Anamorph: *Penicillium nilense* Pitt.

E. euglaucum (J.F.H. Beyma) Stolk & Samson [Lake water (366)].

E. javanicum (J. F. H. Beyma) Stolk & D. B. Scott. Reported as *Penicillium oligosporum* Saito & Minoura [drug tablet (265)]. Anamorph: *Penicillium indonesiae* Pitt.

E. levitum (Raper & Fennell) Stolk & D.B. Scott [Eye cosmetics (272)]. Anamorph: *Penicillium rasile* Pitt.

E. limoneum Goch. & Zlattner [Bed dust (53)]. Anamorph: *Torulomyces lagena* Delitsch.

E. meloforme Udagawa & Y. Horie [Agricultural soil (44)]. Anamorph: *Penicillium meloforme* Udagawa & Y. Horie.

E. meridianum D. B. Scott [Bed dust (53), surgical strings (273)]. Anamorph: *Penicillium meridianum* D. B. Scott.

E. ochrosalmoneum D. B. Scott & Stolk [Bed dust (53)]. Anamorph: *Penicillium ochrosalmoneum* Udagawa.

E. osmophilum Stolk & Veenb.-Rijks [Bed dust (53)]. Anamorph: *Penicillium osmophilum* Stolk & Veenb.-Rijks.

E. pinetorum Stolk [Soil (93), greenhouse (42), surgical strings (273)]. Anamorph: *Penicillium pinetorum* M. Chr. & Backus.

***Gliocladium* Corda**

G. catenulatum J.C. Gilman & E.V. Abbott [Soil (99), substrate and/or habitat are unknown (401)].

G. deliquescens Sopp. [Oak forest soil (75), potato/onion (160)].

G. roseum Bainier [Soil (99, 227), wheat field (69), greenhouse (42), oak forest (75), forest (55), corn fields (167), tea field (302); Air- (293), indoor (82), outdoor (365); cake (109), potato/onion (160), biscuit (168), haricot bean (355), substrate and/or habitat are unknown (401), tomato, cucumber and aubergine (402)].

G. solani (Harting) Petch. [Soil (99)].

G. vermoeseni (Biourge) Thom [Forest soil (55)].

G. virens J.H. Mill., Giddens & A.A. Foster [Tea field soil (302), substrate and/or habitat are unknown (393), tomato, cucumber and aubergine (402)].

***Paecilomyces* Bainier**

P. aerugineus Samson [Soil (47, 48)].

P. byssochlamydoides Stolk & Samson. [Soil polluted by cement (308)].
Teleomorph: *Talaromyces byssochlamydoides* Stolk & Samson.

P. carneus (Duche & R. Heim) A. H. S. Br. & G. Sm. [Soil (47, 48, 99, 228), greenhouse (42), agricultural (44)].

P. farinosus (Holmsk.) A.H.S. Br. & G. Sm. [Soil (47, 48, 99), forest (55)].

P. fulvus Stolk & Samson [Foodstuff (52), Bed dust (53), leather goods (264)].
Teleomorph: *Byssochlamys fulva* Olliver & G. Sm.

P. fumosoroseus (Wize) A.H.S. Br & G. Sm. [Glasshouse? (429)].

P. fuscatus N. Inagaki. See *Scopulariopsis gracilis*

Scopulariopsis gracilis Samson.[drug tablet (265)].

P. javanicus (Frieder. & W. Bally) A. H. S. Br. & G. Sm. [Soil (47, 48)].

P. lilacinus (Thom) Samson [Soil (46, 76, 99, 228, 249), polluted by cement (45, 283), forest (55), agricultural (246), tea field (302); greenhouse (403, 428)]. Reported as *Penicillium lilacinum* Thom [Soil (112, 114-117, 120), polluted by meat waste (165); foodstuff (51, 125, 154), human skin wound (63), Substrate and/or habitat are unknown (310)].

P. marquandii (Masse) S. Hughes [Soil (76), burnt and normal forest (49), forest (55), agricultural (246, 249), tea field (302)].

P. niveus Stolk & Samson. [leather goods (264), drug tablet (265)]. Teleomorph: *Byssochlamys nivea* Westling.

P. ramosus Samson & H. C. Evans [Agricultural soil (246, 249)].

P. variotii Bainier [**Soil** (56, 76, 99, 249), greenhouse (42), forest (55), corn fields (167), agricultural (246); **Dust** (134), bed (53); foodstuff (51, 52), dung (170), human-cerebrospinal fluid specimens of a cancer patient (256), leather goods (264), drug tablet (265), baby talc powder (271), eye cosmetics (272), surgical strings (273), powdered red pepper (274), cornflakes (296), air (368), small animals (430)].

Talaromyces C. R. Benj.

T. bacillisporus (Swift) C.R. Benj. [Eye cosmetics (272)]. Anamorph: *Geosmithia swiftii* Pitt.

T. byssochlamydoides Stolk & Samson [Drug tablet (265)]. Anamorph: *Paecilomyces byssochlamydoides* Stolk & Samson.

T. emersonii Stolk [Bed dust (53), wheat seed (54), baby talc powder (271)]. Anamorph: *Geosmithia emersonii* (Stolk) Pitt.

T. flavus (Klocker) Stolk & Samson [Dust (134)]. Anamorph: *Penicillium dangeardii* Pitt. *T. flavus* var. *flavus* (Klocker) Stolk & Samson [Baby talc powder (271)].

T. helicus (Raper & Fennell) C.R. Benj. var. *helicus*. [Bed dust (53), drug tablet (265), baby talc powder (271), surgical strings (273), powdered white pepper (274)]. Anamorph: *Penicillium spirillum* Pitt. Reported as *T. helicus* var. *major* Stolk & Samson [**Dust** (134); bed (53), drug tablet (265)].

T. helicus var. *major* Stolk & Samson. See *T. helicus*

T. intermedius (Apinis) Stolk & Samson [Bed dust (53)]. Reported as *P. intermedium* Stolk & Samson [Foodstuff (123), soybean seed (126)].

T. luteus (Zukal) C. R. Benj. Reported as *P. luteum* Zukal [Substrate and/or habitat are unknown (68), foodstuff (125)].

T. leycettanus H. C. Evans & Stolk [Soil (47, 48)]. Anamorph: *Talaromyces leycettanus* (H. C. Evans & Stolk) Stolk et al.

T. macrosporus (Stolk & Samson) Frisvad, Samson & Stolk. [Milk, milk products and fruit juices (357)].

T. ohiensis Pitt. [Bed dust (53), greenhouse soil (42)].

T. purpureus E. Mull. & Pacha-Aue) Stolk & Samson [Drug tablet (265)]. Anamorph: *Penicillium purpureum* Stolk & Samson.

T. rotundus (Raper & Fennell) C.R. Benj. [Eye cosmetics (272)].

T. stipitatus (Thom) C. R. Benj. [Bed dust (53), greenhouse soil (42)]. Anamorph: *Penicillium emmonsii* Pitt.

T. udagawae Stolk & Samson Anamorph: *Penicillium udagawae* Stolk & Samson [Bed dust (53)].

T. wortmannii (Klocker) C. R. Benj. [Soils of wheat fields (69), bed dust (53), drug tablet (265), baby talc powder (271), surgical strings (273)]. Anamorph: *Penicillium klockeri* Pitt.

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