

漆斑霉属（丝孢纲）：3 新种、1 新变种暨中国土壤中已知漆斑霉属真菌分种（变种）检索表

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摘 要：报道分离自中国土壤的漆斑霉属 *Myrothecium* 的 3 个新种：杆状漆斑霉 *M. bacilliforme*、二形孢漆斑霉 *M. biforme*、大孢漆斑霉 *M. macrosporum*，和 1 个新变种：外来漆斑霉土栖变种 *M. advena* var. *terricola*，对它们作了较详细的形态描述、图解和讨论。文后列出了中国土壤中 12 个已知漆斑霉分种（变种）检索表。模式种和所有研究过的标本（干制培养物）及活菌种保存在山东农业大学植物病理学标本室（HSAUP）。等模式标本（干制培养物）存放在中国科学院菌物标本馆（HMAS）。

关键词：土壤真菌，分类，杆状漆斑霉，二形孢漆斑霉，大孢漆斑霉，外来漆斑霉土栖变种

Myrothecium (Hyphomycetes): three new species, one new variety and a key to species and varieties of the genus known from soils in China

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Abstract: Three new species, *Myrothecium bacilliforme*, *M. biforme* and *M. macrosporum*, and one new variety, *M. advena* var. *terricola* from soils of China are reported. A key to 12 species and varieties of *Myrothecium* known from soils in China are provided. Holotypes, all other specimens (dried cultures) and living cultures examined are deposited in the

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Herbarium of Shandong Agricultural University: Plant Pathology (HSAUP). Isotypes (dried cultures) are kept in HMAS.

Key words: soil fungi, taxonomy, *Myrothecium bacilliforme*, *Myrothecium bifforme*, *Myrothecium macrosporum*, *Myrothecium advena* var. *terricola*

漆斑霉属 *Myrothecium* Tode (1790), 属无性型真菌 Anamorphic fungi, 丝孢纲 Hyphomycetes, 瘤座孢目 Tuberculariales, 分布广泛, 多营腐生或弱寄生生活, 普遍存在于土壤, 也可分离自死的或活的植物材料, 乃至纺织品 (Preston 1947; Ellis 1976; Bohn 1993)。一些种具有分解纤维素、分泌毒素和抗生素 (Tulloch 1972)、有机酸 (Udagawa & Awao 1984) 的能力。有些种与土壤类型和植被有密切关系 (Tulloch 1972; Agarwall 1980; Rao & Hoog 1983; Castañeda 1985; Sutton 1985; Matsushima 1989; Castañeda & Kendrick 1991)。少数种为植物病原物, 如 *M. roridum* Tode (Schieber & Zentmyer 1968; Tulloch 1972) 可侵染咖啡, 引起树皮溃疡病。

全世界已报道漆斑霉属 30 余个种及变种 (Seifert *et al.* 2011), 至 2012 年, 我国已报道 12 种 (变种) (戴芳澜 1979; 梁晨和吕国忠 2002; 许俊杰和张天宇 2006, 2012; Kong *et al.* 2007; Geng *et al.* 2008; Geng & Zhang 2009, 2010; Yu *et al.* 2008; Pan *et al.* 2009; Wang *et al.* 2009; 吴悦明等 2009; Jiang & Zhang 2009a, b; Wu 2009a, b; Jiang *et al.* 2010; 张伟等 2012a, b), 绝大多数分离自土壤, 包括本文报道的 3 个新种和 1 个新变种。本研究所采用的方法 (土样的采集、菌株的分离、鉴定以及干制培养物的制作) 同姜于兰和张天宇 (2007) 的报道。

外来漆斑霉土栖变种 新变种 图 1

***Myrothecium advena* Sacc. var. *terricola* H.Q. Pan & T.Y. Zhang, var. nov. Fig. 1**

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Colonies on PDA effuse, white at initial stage, later blackish green, reverse pale brown to yellowish brown. Sporodochia often confluent, at first green, later blackish green with a white margin, without setae. Mycelium mostly superficial: hyphae hyaline, smooth, branched, 1–2 μm wide. Conidiophores closely packed to form sporodochia, straight or flexuous, colourless, smooth, 1.5–2 μm wide, with branched apices and arranged penicillately. Conidiogenous cells discrete. Phialides long-cylindrical, 9–16×1.5–2 μm. Conidia unicellular, acrogenous, cylindrical to long-obovoid (L/W=2.5–4), rounded or obtuse at the apex, slightly truncate at the base, smooth, pale green, 4–5×1–2 μm.

From grassland soil, Madoi, Qinghai Province, China. 2007, coll. Pan H.Q., HSAUP II₀₇4154 (dried culture in PDA), holotype; HMAS 196270, isotype.

Other specimens examined: from grassland soil, Yushu and Zadoi, Qinghai Province, China. 2007, coll. Pan H.Q., HSAUP II₀₇4185 and HSAUP II₀₇4301 respectively; from shrub soil, Nangqen, Qinghai Province, China. 2007, coll. Pan H.Q., HSAUP II₀₇4276.

Remarks: the present fungus is basically in keeping with *Myrothecium advena* Sacc. var. *advena* in morphology. However, the colonies of *M. advena* var. *advena* are paler in colour (subhyaline to pale yellow, Wu *et al.* 2009b) and its conidia are bigger than those of the new taxon

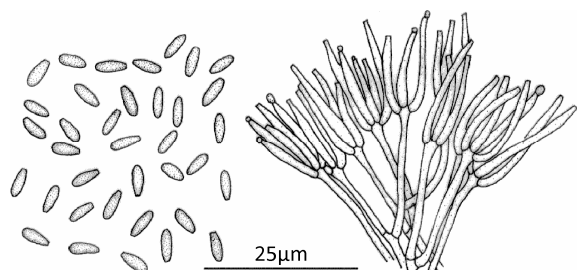


图1 外来漆斑霉土栖变种的分生孢子和分生孢子梗

Fig. 1 Conidia and conidiophores of *Myrothecium advena* Sacc. var. *terricola* H.Q. Pan & T.Y. Zhang.

(5–7×1.5–2µm, Wu *et al.* 2009b).

菌落平展，初白色，后渐变墨绿色，背面浅褐色至黄褐色。分生孢子座显著，常汇合，初白色，后变墨绿色，无刚毛。菌丝体多表生：菌丝无色，光滑，分枝，宽 1–2µm。分生孢子梗聚集形成分生孢子座，上部青霉状分枝，直或弯曲，无色，光滑，宽 1.5–2µm。产孢细胞离生，瓶梗长圆柱形，9–16×1.5–2µm。分生孢子单胞，顶生，柱状至长倒卵形（长：宽=2.5–4），端部圆或钝形，基部稍平截，光滑，浅绿色，4–5×1–2µm。

青海玛多，草原土，海拔 4 180m，潘好芹 2007 年采，HSAUP II₀₇4154（PDA 培养干制培养物标本号），主模式；HMAS 196270，等模式。

其他观测标本：青海玉树，草原湿地土，海拔 3 700m，HSAUP II₀₇4185；杂多，草原土，海拔 4 340m，HSAUP II₀₇4301；囊谦，灌丛土，海拔 3 800m，HSAUP II₀₇4276。

讨论：本分离物与外来漆斑霉原变种 *Myrothecium advena* Sacc. var. *advena* 的主要差别在于：原变种的菌落色泽浅（近无色至浅黄色），分生孢子较大（5–7×1.5–2µm）（Wu *et al.* 2009b），因此将其定为新变种。

杆状漆斑霉 新种 图 2

Myrothecium bacilliforme Y.L. Jiang & T.Y. Zhang, sp. nov. Fig. 2

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Colonies on PDA effuse, flocculent, pale yellow at initial stage, later green to black with the development of sporodochia, reverse yellowish brown, growing slowly reaching 3–4cm diameter at 25°C after two weeks. Mycelium superficial and immersed, composed of hyaline, branched, septate, smooth or partly verruculose, 1–3µm wide hyphae. Sporodochia up to 0.9mm diam., often confluent, at first green, later black with a white margin, without setae. Conidiophores straight or flexuous, branched, with apical branches arranged penicillately. Phialides colourless, smooth or verruculose, 9–23×1.5–2µm. Conidia unicellular, cylindrical or short rod-shaped to oblong (L/W=2.75–4.5), truncate at the ends, smooth, pale greenish brown, 4.5–5.5(5.1)×1–2(1.8)µm, green to black in mass.

From rice field soil, Wuchang, Hubei Province, China. Oct. 13. 2004, coll. Jiang Y.L., HSAUP II₀₄6039 (dried culture in PDA), holotype; HMAS 196271, isotype.

Remarks: the present fungus is similar to *Myrothecium roridum* Tode in conidial morphology. However, the conidia of *M. roridum* are rounded at two ends and its conidial measurement is bigger (5.5–7×1.5–2µm, Domsch *et al.* 2007) than that of *M. bacilliforme*.

菌落平展，絮状，浅黄色，后随产孢渐变为绿色至黑色，背面黄褐色；生长缓慢，在PDA上25℃培养2周直径3–4cm。菌丝体表生或埋

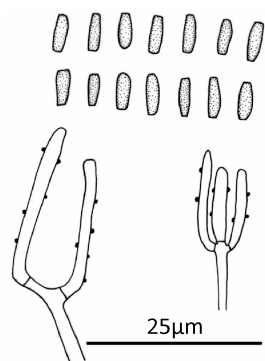


图2 杆状漆斑霉的分生孢子和分生孢子梗

Fig. 2 Conidia and conidiophores of *Myrothecium bacilliforme* Y.L. Jiang & T.Y. Zhang.

生：菌丝无色，分枝，具隔膜，光滑或局部粗糙，宽1–3µm。分生孢子座直径达0.9mm，常合生，初绿色，后变黑色。刚毛缺。分生孢子梗上部青霉状分枝，直或弯曲。瓶梗无色，光滑或粗糙，9–23×1.5–2µm。分生孢子单胞，圆柱形或短杆状（长：宽=2.75–4.5），两端平截，光滑，淡青褐色，4.5–5.5(5.1)×1–2(1.8)µm，粘孢团绿色至黑色。

湖北武昌，稻田土，2004年10月13日，姜于兰采，HSAUP II₀₄6039（PDA培养干制培养基），主模式；HMAS196271，等模式。

讨论：本种分生孢子形态与*Myrothecium roridum* Tode相似，但区别在于后者分生孢子两端钝圆，且量度大（5.5–7×1.5–2µm，Domsch *et al.* 2007），彼此容易区分。

二形孢漆斑霉 新种 图3

Myrothecium biforme Y.L. Jiang & T.Y. Zhang, sp. nov. Fig. 3

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Colonies on PDA effuse, flocculent, white at initial stage, later black, reverse yellowish brown.

Mycelium superficial and immersed, composed of hyaline, branched, septate, 1–2.5µm wide hyphae. Sporodochia usually not more than 1.0mm diameter, often confluent. Setae colourless, smooth, septate, 68–113µm long, 2–3µm thick. Phialides cylindrical, colourless, 7–16×1–2µm. Conidia unicellular, pale greenish brown, smooth, with 1–3 guttulae, green to black in mass, with two kinds: (1) short cylindrical, truncate or rounded at the ends, 4.5–7.5×1–2µm; (2) ellipsoidal to navicular, truncate at the base, pointed or rounded at the apex, 6–9×2–3µm.

From flowerpot soil, Huaxi Park of Guiyang, Guizhou Province, China. Oct. 6. 2005, coll. Jiang Y.L., HSAUP II₀₅1035 (dried culture in PDA), holotype; HMAS196272, isotype.

Remarks: the present fungus differs from all other known species in the genus *Myrothecium* by its two kinds of conidia.

菌落平展，絮状，初白色，后渐变为黑色，

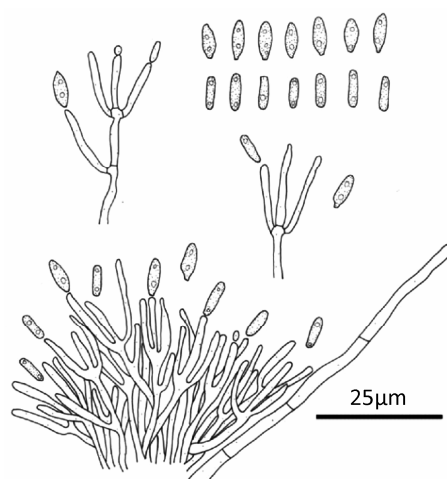


图3 二形孢漆斑霉的分生孢子和分生孢子梗

Fig. 3 Conidia and conidiophores of *Myrothecium biforme* Y.L. Jiang & T.Y. Zhang.

背面黄褐色。菌丝体表生或埋生: 菌丝无色, 分枝, 具隔膜, 宽 $1\text{--}2.5\mu\text{m}$ 。分生孢子座直径通常小于 1mm , 常合生。刚毛无色, 光滑, 具隔膜, 长 $68\text{--}113\mu\text{m}$, 宽 $2\text{--}3\mu\text{m}$ 。瓶梗圆柱状, 无色, $7\text{--}16\times 1\text{--}2\mu\text{m}$ 。产生二种类型的分生孢子, 均单胞, 淡青黄褐色, 表面光滑, 含 $1\text{--}3$ 个油滴, 聚集成团时呈绿色至黑色: (1) 短圆柱状, 两端平截或钝圆, $4.5\text{--}7.5\times 1\text{--}2\mu\text{m}$; (2) 椭圆形至舟形, 基部平截, 顶部尖或钝圆, $6\text{--}9\times 2\text{--}3\mu\text{m}$ 。

贵州贵阳花溪公园, 花盆土, HSAUP II₀₅1035, 主模式; HMAS196272, 等模式。

讨论: 本种因产生2种类型的分生孢子, 而区别于属内其他已描述的种。

大孢漆斑霉 新种 图 4

Myrothecium macrosporum H.F. Wang & T.Y. Zhang, sp. nov. Fig. 4

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Colonies on PDA effuse, greyish white, flocculent or velvety, embellished with blackish green to black points (sporodochia), reverse yellowish brown, growing moderately reaching $6\text{--}8\text{cm}$ diameter at 25°C after three weeks. Sporodochia small, often confluent, without setae. Mycelium mostly superficial. Conidiophores macronematous, branched, septate, colourless, straight or flexuous, smooth, closely packed to form sporodochia, with apical branches arranged penicillately, Phialides $15.5\text{--}34.5\times 2\text{--}3.5\mu\text{m}$. Conidia pale greenish brown to dark greenish brown, obovoid to pyriform, rounded at the apex, truncate at the base, $8\text{--}15\times 3.5\text{--}5.5\mu\text{m}$, dark green to black in mass.

From forest soil, Qilian County, Qinghai Province, China. 2006, coll. Wang H.F., HSAUP II₀₆5189 (dried culture in PDA), holotype; HMAS196273, isotype.

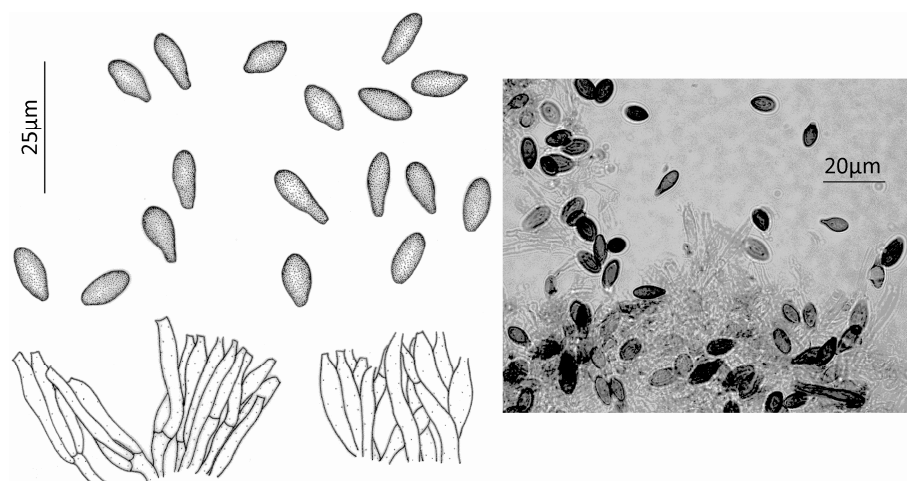


图4 大孢漆斑霉的分生孢子和分生孢子梗

Fig. 4 Conidia and conidiophores of *Myrothecium macrosporum* H.F. Wang & T.Y. Zhang.

Remarks: The closely related species are *Myrothecium verrucaria* (Alb. & Schwein.) Ditmar (Domsch *et al.* 2007) and *M. flavovirens* Sutton (1985). The new taxon can be separated from the two species by the conidial measurement, colour and guttulae. Both of the latter have smaller (6.5–8×2–3.5µm and 5–6×2–2.5µm, respectively) and lighter coloured (pale brown or yellowish brown) conidia which often have two or three guttulae.

菌落平展，灰白色，絮状或绒状，正面布满暗绿色至黑色小点（分生孢子座），背面黄褐色；长速中等，在PDA上25℃培养3周，直径6–8cm。分生孢子座小，无刚毛，常汇合。菌丝体大部分表生，少部分埋生。分生孢子梗较粗大，分枝，

具隔膜，无色，直或弯曲，光滑，聚集形成分生孢子座，上部青霉状分枝，瓶梗15.5–34.5×2–3.5µm。分生孢子淡青黄褐色至深青褐色，倒卵形至梨形，顶端钝圆，至基部变细，基端平截，8–15×3.5–5.5µm，粘孢团暗绿色至黑色。

青海祁连县，林下土，海拔2 840m，2006年王洪凤采，HSAUP II₀₆5189，主模式；HMAS196273，等模式。

讨论：本种分生孢子形态与*Myrothecium verrucaria* (Alb. & Schwein.) Ditmar和*M. flavovirens* Sutton的相似，但是，后二者分生孢子（分别为6.5–8×2–3.5µm和5–6×2–2.5µm）均明显小，色泽较淡（浅褐色或黄褐色），孢内常含2个左右油球，三者容易相互区分。

中国土壤中已知漆斑霉属*Myrothecium*真菌分种（变种）检索表

Key to the species and varieties of *Myrothecium* known from soils in China

1. 分生孢子椭圆形、卵形、梨形、倒卵形或短杆状 2
分生孢子杆状、针状、纺锤形或圆柱形 9
2. 产生两种形态的分生孢子：短圆柱状，两端平截或钝圆，4.5–7.5×1–2µm；另一种，椭圆形至舟形，顶部尖或钝圆，基部平截，6–9×2–3µm 二形孢漆斑霉*M. bifforme*
只产生1种形态的分生孢子 3
3. 分生孢子表面具纵或斜的脊纹，纺锤形至卵形，7–9×3–4.5µm 环绕漆斑霉*M. cinctum*
分生孢子表面光滑 4
4. 分生孢子黄褐色至深青褐色 5
分生孢子无色半透明至淡青色 6
5. 分生孢子黄褐色，椭圆形至卵形，有时含1–2个油球，较小（4.5–6×2–2.5µm）
..... 黄绿漆斑霉*M. flavovirens*
分生孢子淡青黄褐色至深青褐色，倒卵形至梨形，较大（8–15×3.5–5.5µm）
..... 大孢漆斑霉*M. macrosporum*
6. 分生孢子胞中含2个左右油球，倒卵形至阔倒卵形，6–9×2–3µm 疣孢漆斑霉*M. verrucaria*
分生孢子胞中不含油球 7
7. 分生孢子较大，平均长度>4µm 8
分生孢子较小（2–3.5×1–1.5µm），杆状至长卵形 涝生漆斑霉*M. inundatum*

8. 分生孢子略大 ($5-6.5 \times 1.5-2 \mu\text{m}$), 两端钝圆; 菌落近无色至浅黄色 外来漆斑霉原变种 *M. advena* var. *advena*
分生孢子较小 ($4-5 \times 1-2 \mu\text{m}$), 顶端钝圆, 基端平截; 菌落墨绿色 外来漆斑霉土栖变种 *M. advena* var. *terricola*
9. 分生孢子多数呈短杆状 (长:宽=2.75-4.5), 少数呈长形, 两端平截, $4.5-5.5 \times 1-2 \mu\text{m}$; 产孢瓶体表面有时具疣突 杆状漆斑霉 *M. bacilliforme*
分生孢子杆状 (长:宽>4.0) 10
10. 分生孢子杆状 (长:宽=4-6), 两端钝圆, 或基端略平截, 较小, $6-8 \times 1-2 \mu\text{m}$ 露湿漆斑霉 *M. roridum*
多数分生孢子长度> $8 \mu\text{m}$ 11
11. 成长的菌落墨绿色; 分生孢子座中生无色刚毛; 分生孢子 ($7.5-13 \times 1.5-2 \mu\text{m}$) 长度变幅较大 印度漆斑霉 *M. indicum*
菌落白色至浅黄色; 分生孢子座中无刚毛; 分生孢子 ($10-12 \times 1-2 \mu\text{m}$) 长度变幅较小 卡氏漆斑霉 *M. camichaelii*

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