

Nine Species of *Russula* (Basidiomycotina) New to Taiwan

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(Manuscript received 26 January, 2005; accepted 4 March, 2005)

ABSTRACT: Nine *Russula* species of Russulaceae (Basidiomycotina) are described and illustrated as new to Taiwan. They are *R. atropurpurea*, *R. gracillima*, *R. laurocerasi*, *R. omiensis*, *R. pectinatoides*, *R. rubescens*, *R. solaris*, *R. sororia* and *R. subdepallens*.

KEY WORDS: *Russula*, Russulaceae, Basidiomycotina.

INTRODUCTION

The taxonomic studies of Russulaceae in Taiwan have been reviewed by few papers and some books. In the past, 33 species of *Russula* were reported (Wang *et al.*, 1999; Chang *et al.*, 2001). In this paper, nine species of *Russula* are described and illustrated as new to Taiwan. All specimens are deposited at TNM (Herbarium of National Museum of Natural Science, Taiwan).

TAXONOMY

1. *Russula atropurpurea* (Krombh.) Britzelm., Bot. Zbl. 54: 99, 1893.

Fig. 1

Agaricus atropurpureus Krombh., Naturgetr. Abbild. Schwämme (Prague) 9: 6, 1845.

Russula atropurpurea var. *krombholzii* Singer, Botanisches Centralblatt, Beihefte 49: 301, 1932.

Russula depallens var. *atropurpurea* (Krombh.) Melzer & Zvára, Arch. Přírodov. Výzk. Čech. 17(4): 10, 1927.

Russula krombholzii Shaffer, Lloydia 33: 82, 1970.

Pileus 4-8 cm, convex then soon flattened and depressed at center, dark purple-red, slightly orange-yellow at center, smooth, margin slightly striate. Lamellae subfree, crowded, lacking lamellulae, with cross-connections, white. Stipe central, 4-6 x 1-1.5 cm, hollow, white, bruising yellow-brown at base, smooth. Spores elliptic, hyaline to pale green, with verrucae and scattered fine connectives forming a partial reticulum, amyloid, 8-10.5 x 5.5-7.5 μ m. Basidia clavate, 42-45 x 10-12 μ m, with 4 sterigmata. Cystidia cylindrical or subfusiform, attenuated or mucronate at apex, 55-65 x 7-8 μ m. Pileipellis composed of parallel hyphae. Hyphae without clamps.

Habitat: Solitary on ground in mix forest.

Specimen examined: Taichung: Anmashan, W. N. Chou, CWN 05959, Oct. 30, 2002 (TNM F16411).

Distribution: North Hemisphere.

Note: This species is characterized by dark red pileus, white stipe, and the stipe base turning yellow-brown when bruised (Imazeki and Hongo, 1989; Sarnari, 1998).

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2. *Russula gracillima* Jul. Schäff., Z. Pilzk. 10: 105, 1931.

Fig. 2

Pileus 5-6 cm, convex then soon flattened, deep red to deep pink, smooth and viscid when moist, margin entire. Lamellae subfree, crowded, lacking lamellulae, with cross-connections, pale cream-yellow. Stipe central, 5-6 x 1-1.2 cm, solid, white and tinged deep pink, smooth. Spores ovoid, hyaline to pale green, with verrucae and scattered fine connectives forming a partial reticulum, amyloid, 7.5-9 x 6-7.5 μm . Basidia clavate, 42-48 x 11-14 μm , with 4 sterigmata. Cystidia cylindrical or subfusiform, papillate at apex, 50-90 x 7-11 μm . Pileipellis cells globose, with terminal short cylindrical catenate elements. Hyphae without clamps.

Habitat: Solitary on ground in hardwood forest.

Specimens examined: Nantou: Lienhuachih, W. N. Chou, CWN 0986, June 21, 1995 (TNM F3480). Taichung: Tahsuehshan Forest Road 31K, W. N. Chou, CWN 05954, Oct. 30, 2002 (TNM F16408).

Distribution: Europe, North America and Taiwan

Note: This species is characterized by deep pink and viscid pileus, white and tinged deep pink stipe, yellowish spores, fragile textures and an acrid taste. *Russula fragilis* is quite similar in pileus color but has a white stipe (Arora, 1986; Sarnari, 1998).

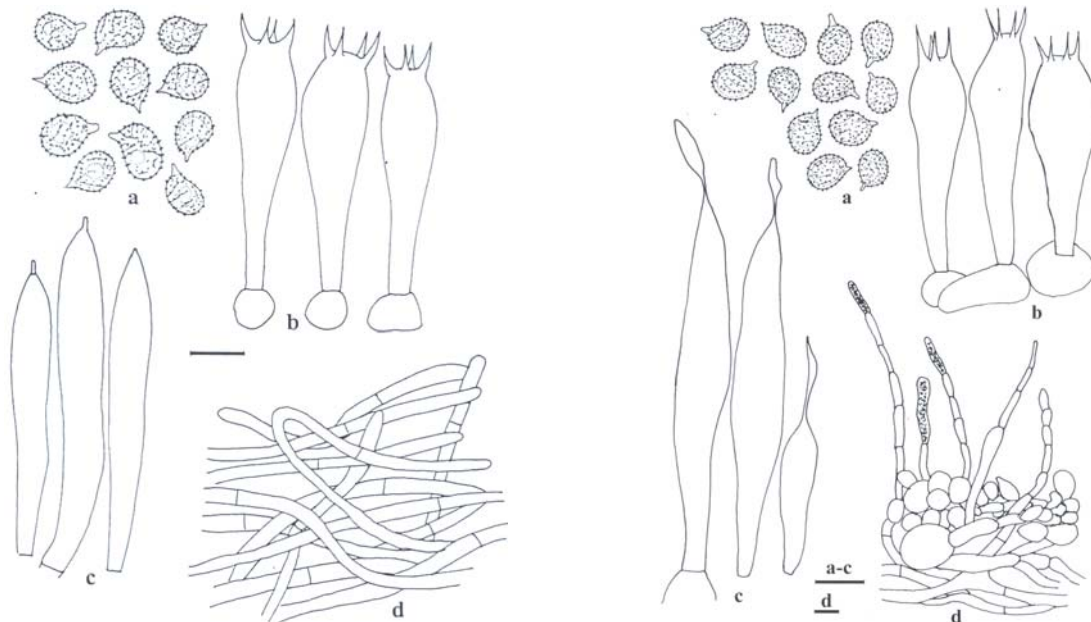


Fig. 1. *Russula atropurpurea*. a: Basidiospores. b: Basidia. c: Cystidia. d: Epidermal cells. Bar = 10 μm .

Fig. 2. *Russula gracillima*. a: Basidiospores. b: Basidia. c: Cystidia. d: Epidermal cells. Bar = 10 μm .

3. *Russula laurocerasi* Melzer, Bull. Soc. Myc. Fr. 48: 200, 1932.

Fig. 3

Russula grata Britzelm., Mém. Soc. Linn. Normandie 9: 239, 1898.

Russula foetens var. *laurocerasi* (Melzer) Sing., Ann. Mycol., Berl. 40: 73, 1942.

Russula subfoetens var. *grata* (Britzelm.) Romagn., Les Russules d'Europe et d'Afrique du Nord, Réimpression supplémentée. With an English translation of the keys by R.W.G. Dennis (Vaduz): 340 (1967).

Pileus 5.5-6 cm, convex then soon flattened, pale yellow-brown, smooth, shiny and viscid when moist, margin tuberculate-striate. Lamellae subfree, crowded, lamellulae rare, with cross-connections, grayish cream to yellowish white. Stipe central, 10-12 x 1.2-1.5 cm, hollow, yellowish white and tinged yellow-brown, smooth. Spores subglobose, hyaline to pale green, with very heavy warts and ridges connectives forming a partial reticulum, amyloid,

8.5-10 x 8-9.5 μm . Basidia clavate, 40-52 x 13-14 μm , with 4 sterigmata. Pleurocystidia cylindrical or subfusiform, papillate at apex, 90-120 x 12-15 μm . Pileipellis composed of parallel hyphae, and cylindrical dermatocystidia. Hyphae without clamps.

Habitat: Solitary on ground in hardwood forest.

Specimens examined: Nantou: Lienhuachih, *W. N. Chou*, CWN 00973, June 21, 1995 (TNM F3467); Nantou: Tsuifeng, *W. N. Chou*, CWN 05504, June 25, 2002.

Distribution: North Hemisphere.

Note: This species is characterized by pale yellow-brown pileus and tuberculate-striate margin, yellowish white and tinged yellow-brown stipe, and a strongly fragrant odor. *Russula foetens* Pers.: Fr. is similar in pileus but has smaller spores (Arora, 1986; Bessette *et al.*, 1997; Imazeki & Hongo, 1989; Sarnari, 1998; Shaffer, 1972; Thiers, 1997).

4. *Russula omiensis* Hongo, Mem. Shiga Univ. 17: 93, 1967.

Fig. 4

Pileus 2-5 cm, convex then soon flattened, grayish purple to deep purple, tinged dark green in center, margin slightly striate. Lamellae subfree, subcrowded, lamellulae rare, with cross-connections, pale cream-white. Stipe central, 2-5 x 0.5-1.5 cm, hollow, pure white, smooth. Spores broadly elliptic to subglobose, hyaline to pale green, with verrucae and scattered fine connectives forming a partial reticulum, amyloid, 9-11 x 7.5-10 μm . Basidia clavate, 30-38 x 11-12 μm , with 4 sterigmata. Cystidia lanceolate to fusoid, mucronate at apex, 50-80 x 8-12 μm . Pileipellis composed of parallel hyphae and globose cells, with cylindrical elect dermatocystidia. Hyphae without clamps.

Habitat: Solitary on ground in hardwood forest.

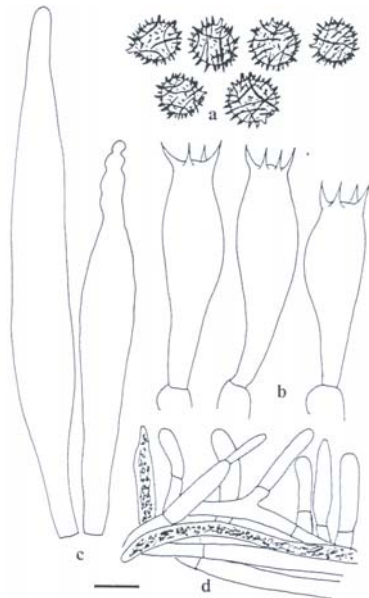


Fig. 3. *Russula laurocerasi*. a: Basidiospores. b: Basidia. c: Pleurocystidia. d: Epidermal cells. Bar = 10 μm .

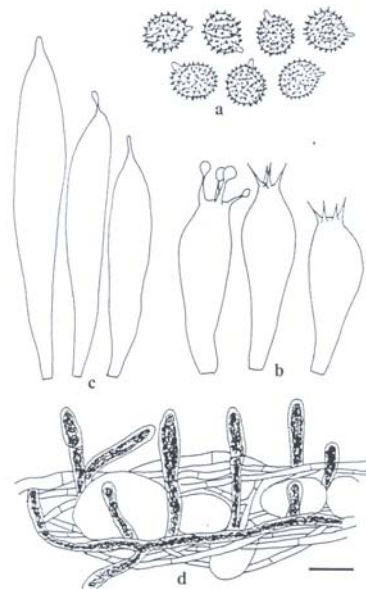


Fig. 4. *Russula omiensis*. a: Basidiospores. b: Basidia. c: Cystidia. d: Epidermal cells. Bar = 10 μm .

Specimens examined: Taichung: Anmashan, *W. N. Chou*, CWN 02136, Mar. 26, 1997 (TNM F7485). Nantou: Meifeng, *W. N. Chou*, CWN 03818, Dec. 3, 1998 (TNM F12581); Nantou: Tsuifeng, *W. N. Chou*, CWN 05364, Apr. 9, 2002.

Distribution: Japan, China and Taiwan

Note: This species is characterized by purple pileus that tinged dark green in center, pure white stipe and lanceolate cystidia. *Russula amoena* is similar in pileus but has a purple stipe (Imazeki & Hongo, 1989).

5. *Russula pectinatoides* Peck, Bull. N. Y. St. Mus. 116: 43, 1907.

Fig. 5

Russula consobrina var. *pectinatoides* (Peck) Singer, Hedwigia 66:205, 1926.

Russula pectinata subsp. *pectinatoides* (Peck) Bohus & Babos, Ann. Hist.-nat. Mus. Hung., 52: 140, 1960.

Pileus 8-9 cm, convex then soon flattened and slightly depressed at center, pale yellow-brown, smooth, and viscid when moist, margin entire or striate. Lamellae subfree, crowded, lacking lamellulae, with cross-connections, yellowish cream. Stipe central, 6-7 x 1-1.2 cm, hollow, white-cream, smooth. Spores subglobose, hyaline to pale green, with verrucae and scattered fine connectives forming a partial reticulum, amyloid, 6-9 x 5-7 μm . Basidia clavate, 32-38 x 8-10 μm , with 4 sterigmata. Cystidia subfusiform, long rostrate at apex, 42-85 x 8-12 μm . Pileipellis distinctly two-layered, an upper epithelial layer composed of subglobose catenate elements, with cystidoid terminal elements, some with cylindrical dermatocystidia and a lower parallel hyphal layer. Hyphae without clamps.

Habitat: Scattered on ground in hardwood forest.

Specimens examined: Shinchu: Kuanwu, W. N. Chou, CWN 01559, June 18, 1998 (TNM F4906); Nantou: Lienhuachih, W. N. Chou, CWN 05782, Sep. 17, 2002 (TNM F16288).

Distribution: North Hemisphere.

Note: This species is characterized by pale yellow-brown pileus, white-cream stipe, and a fragrant odor. *Russula laurocerasi* is similar in pileus and stipe, but has larger, more prominently warty spores (Arora, 1986; Imazeki & Hongo, 1989; Sarnari, 1998 ; Shaffer, 1972; Thiers, 1997).

6. *Russula rubescens* Beardslee, Mycologia 6: 91, fig. 1. 1914.

Fig. 6

Pileus 5-6 cm, convex then soon flattened, yellowish-cream, tinged pink, smooth and viscid when moist, margin entire or striate. Lamellae adnate, crowded, lacking lamellulae, with cross-connections, cream-white, turning black when bruised. Stipe central, 4-5 x 1-1.2 cm, hollow, white and then slightly black when bruised. smooth. Spores ovoid to subglobose, hyaline to pale green, with verrucae and scattered fine connectives forming a partial reticulum, amyloid, 6-7.5 x 5.5-6.5 μm . Basidia clavate, 25-35 x 9-11 μm , with 4 sterigmata. Cystidia cylindrical or subfusiform, some with long rostrate apex, 55-80 x 7-11 μm . Pileipellis composed of parallel hyphae, with cylindrical dermatocystidia. Hyphae without clamps.

Habitat: Scattered on ground in hardwood forest.

Specimen examined: Nantou: Tsuifeng, W. N. Chou, CWN 05506, June 25, 2002.

Distribution: Japan, China, North America and Taiwan

Note: This species is characterized by yellowish-cream and tinged pink pileus, and lamellae and stipe turning black when bruised (Imazeki and Hongo, 1989).

7. *Russula solaris* Ferd. & Winge, Medd. For. Svamp. Fremme: 9, 1924.

Fig. 7

Pileus 5-6 cm, convex then soon flattened, pale orange, tinged yellowish, smooth, margin striate. Lamellae subfree, crowded, lacking lamellulae, with cross-connections, white. Stipe central, 4-5 x 1.2-1.5 cm, hollow, white, smooth. Spores elliptic to ovoid, hyaline to pale

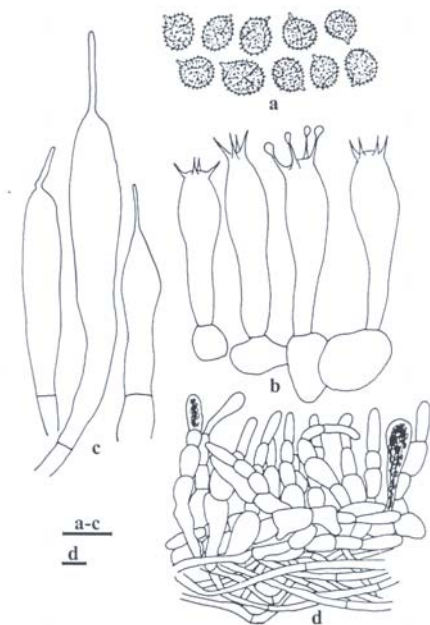


Fig. 5. *Russula pectinatoides*. a: Basidiospores. b: Basidia. c: Cystidia. d: Epidermal cells. Bar = 10 μ m.



Fig. 6. *Russula rubescens*. a: Basidiospores. b: Basidia. c: Cystidia. d: Epidermal cells. Bar = 10 μ m.

green, with verrucae and scattered fine connectives forming a partial reticulum, amyloid, 7.5-9 x 6.5-7.5 μ m. Basidia clavate, 40-52 x 12-14 μ m, with 4 sterigmata. Cystidia subfusiform, some papillate at apex, 60-75 x 7-11 μ m. Pileipellis composed of parallel hyphae, with cylindrical dermatocystidia. Hyphae without clamps.

Habitat: Solitary on ground in hardwood forest.

Specimen examined: Nantou: Tsuifeng, *W. N. Chou*, CWN 05939, Oct. 28, 2002 (TNM F16399).

Distribution: Europe and Taiwan

Note: This species is characterized by pale orange, and tinged yellowish pileus and white stipe (Einhellinger, 1994; Sarnari, 1998).

8. *Russula sororia* Fr., *Epicrisis*: 359, 1838.

Fig. 8

Russula livescens var. *sororia* (Fr.) Qu  let, *Fl. Myc.*: 345, 1888.

Russula consobrina var. *sororia* (Fr.) Gillet, *Hymen.*: 238, 1874

Russula pectinata var. *sororia* (Fr.) Maire, *Fung. Catal. Ser. Alt., Inst. Bot. Barc.*, 3(4): 54, 1937

Russula sororia (Fr.) Romell, *Russ. Eur.*: 358, 1967.

Russula pseudoaffinis Migl. & Nicolaj, *Bollettino del Gruppo Micologico 'G. Bresadola', Trento* 28(3-4): 107, 1985. (= *Russula sororia* f. *pseudoaffinis* (Migl. & Nicolaj) Sarnari, *Micol. Ital.* 23(1): 31, 1994.)

Pileus 5-8 cm, convex then soon flattened, greenish-brown, slightly tinged purple-red, smooth and viscid when moist, margin slightly tuberculate-striate. Lamellae adnate to subfree, subcrowded, lamellulae rare, with cross-connections, white. Stipe central, 5.5-6.5 x 1-2 cm, hollow, white, then turning brown when bruised, smooth. Spores broadly elliptical, hyaline to pale green, with verrucae and scattered fine connectives forming a partial reticulum, amyloid, 8-9.5 x 6.5-8 μ m. Basidia clavate, 35-50 x 10-12 μ m, with 4 sterigmata. Cystidia subfusiform, mucronate at apex, 55-80 x 9-13 μ m. Pileipellis composed of parallel hyphae and cylindrical, elect dermatocystidia. Hyphae without clamps.

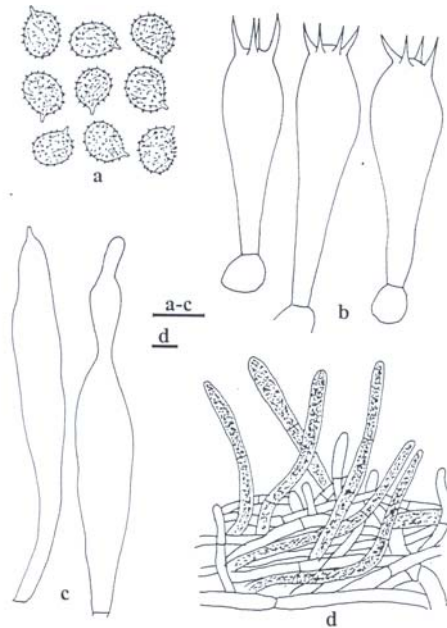


Fig. 7. *Russula solaris*. a: Basidiospores. b: Basidia. c: Cystidia. d: Epidermal cells. Bar = 10 μ m.

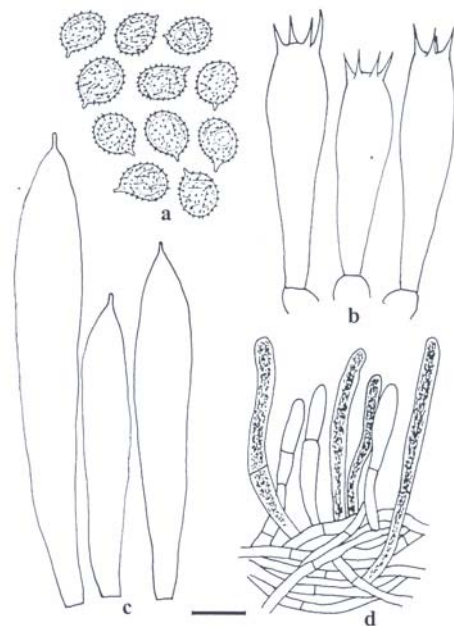


Fig. 8. *Russula sororia*. a: Basidiospores. b: Basidia. c: Cystidia. d: Epidermal cells. Bar = 10 μ m.

Habitat: Scattered on ground in mixed forest.

Specimens examined: Nantou: Meifeng, W. N. Chou, CWN 00599, June 22, 1994 (TNM F2343); Nantou: Yuanfeng, W. N. Chou, CWN 04387, July 20, 1999 (TNM F13314); Nantou: Tsuifeng, W. N. Chou, CWN 05924, Oct. 24, 2002 (TNM F16390).

Distribution: North Hemisphere.

Note: This species is characterized by greenish-brown and tinged purple-red pileus, slightly tuberculate-striate margin, and white stipe which turning brown when bruised (Arora, 1986; Imazeki & Hongo, 1989; Sarnari, 1998).

9. *Russula subdepallens* Peck, Bull. Torr. Bot. Club 23: 411, 1896.

Fig. 9

Pileus 7-8 cm, convex then soon flattened, white slightly tinged purple-red, smooth and viscid when moist, margin striate. Lamellae adnate, subcrowded, lacking lamellulae, with cross-connections, white. Stipe central, 6-8 x 1.5-2 cm, hollow, white, smooth. Spores subglobose, hyaline to pale green, with verrucae and scattered fine connectives forming a partial reticulum, amyloid, 7-8.5 x 7-7.5 μ m. Basidia clavate, 36-42 x 10-14 μ m, with 4 sterigmata. Cheilocystidia narrow fusiform, 50-70 x 7-9 μ m. Pleurocystidia subfusiform, mucronate at apex, 90-120 x 8-10 μ m. Pileipellis composed of subglobose catenate elements with cystidoid, elect, terminals and parallel hyphae. Hyphae without clamps.

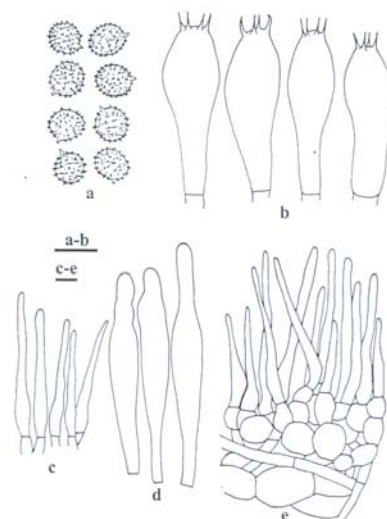


Fig. 9. *Russula subdepallens*. a: Basidiospores. b: Basidia. c: Cheilocystidia. d: Pleurocystidia. e: Epidermal cells. Bar = 10 μ m.

Habitat: Scattered on ground in mix forest.

Specimen examined: Nantou: Aowanta, W. N. Chou, CWN 06147, May 21, 2003.

Distribution: North America, China and Taiwan.

Note: This species is characterized by white and slightly tinged purple-red pileus, and white stipe (Teng, 1996).

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九種紅菇屬(擔子菌)的台灣新記錄

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(收稿日期：2005 年 1 月 26 日；接受日期：2005 年 3 月 4 日)

摘 要

本文描述九種紅菇屬(紅菇科、紅菇目)的台灣新記錄種。它們分別屬於 *Russula atropurpurea*, *R. gracillima*, *R. laurocerasi*, *R. omiensis*, *R. pectinatoides*, *R. rubescens*, *R. solaris*, *R. sororia* 以及 *R. subdepallens*。

關鍵詞：紅菇屬、紅菇科、擔子菌。

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