

Myxomycetes from the Asir Mountains, Saudi Arabia

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Abstract Twenty myxomycetes classified into 10 genera, *Arcyria*, *Badhamia*, *Ceratiomyxa*, *Comatricha*, *Craterium*, *Dictydiaethalium*, *Diderma*, *Didymium*, *Physarum* and *Willkommlangea*, are reported from the Asir Mountains, Saudi Arabia. All species are new to this country. Among them, *Badhamia gracilis* found on cactus debris is a succulenticolous myxomycete.

Key words: Myxomycetes, Saudi Arabia, taxonomy.

The Asir Mountains are located in the south-west of Saudi Arabia (Fig. 1). This range includes many high mountains more than 2,000 m elevation along the Red Sea. Precipitation in some places of this area is more than 200 mm in the spring and summer due to wet winds running

up the steep west side of the mountains. In such places, juniper forests, consisting of *Juniperus procea* Hochst. ex Endl. and various woody and herbaceous species, develop well (Fig. 2). The flora of the Asir Mountains is probably the richest in Saudi Arabia.

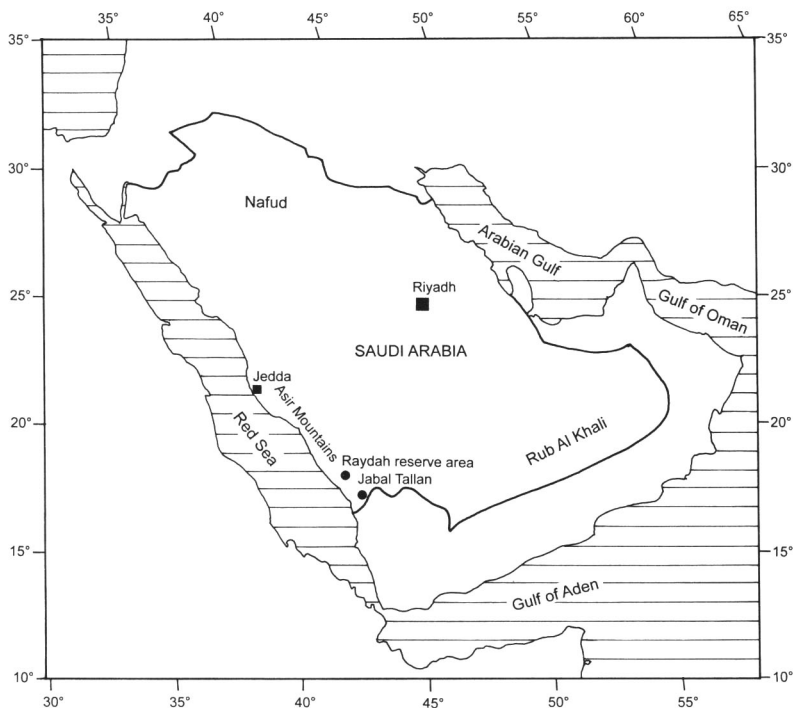


Fig. 1. Map of Saudi Arabia, showing two investigation sites, the Raydah reserve area and Jabal Tallan, in the Asir Mountains.



Fig. 2. Raydah reserve area located near Abha in the Air Mountains. A: Juniper forest. In summer, clouds often spread over the mountains and sometimes yield thunderstorms. B: Old tree of *Juniperus procera* at 2500 m alt. A white bar is a scale of 15 cm long. C: Thicket of *Centaurotamnus maximus* Wagenitz & Dittr. (Compositae) at 2540 m alt. Such herbaceous thickets were developed here and there along the mountain roadway. D: Accumulated decaying leaves under the thicket of Fig. C. Three myxomycetes, *Badhamia populina*, *Physarum bitectum* and *Willkommlangea reticulata*, were found here.

Myxomycetes usually occur on decaying organic matter such as dead wood and leaves on the forest floor. The Asir Mountains are expected to be fertile in myxomycetes, because this area is covered with well-developed forests. The investigation of myxomycetes was performed at the Asir Mountains in September, 2001, as a part of cooperative study for the National Commission for Wildlife Conservation and Development (NCWCD), Riyadh, on "the Conservation of Juniper Woodlands in Saudi Arabia" carried out by the Japan International Cooperation Agency (JICA) from 1999 to 2001. Fifty-seven specimens were collected at the Raydah reserve area near Abha, and 6 at Jabal Tallan near Fayfa. A total of 63 specimens were identified with 20 taxa. Among them, two specimens of *Badhamia gracilis* (T. Macbr.) T. Macbr. were obtained from the debris of decaying cacti by a moist

chamber technique. In the following list, all the taxa are enumerated in alphabetical order.

So far, the myxomycete biota of Saudi Arabia is not well known. Therefore, this is the first report on myxomycetes of this country. All the specimens examined are preserved in the herbarium of the Department of Botany, National Science Museum, Tokyo (TNS), Japan and duplicate specimens are in the herbarium of NCWCD, Riyadh, Saudi Arabia.

List of species

Ceratiomyxales

1. **Ceratiomyxa fruticulosa** (O.F. Muell.) T. Macbr., N. Am. Slime-Moulds, 18 (1899).

SA-M-8 (Asir, Raydah, 2400 m alt., on dead wood, 2 IX 2001, coll. H. Hagiwara)

Scattered columnar sporophores of SA-M-8

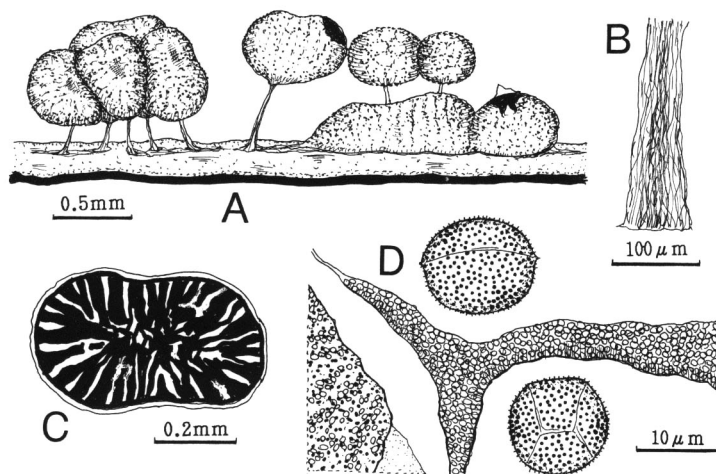


Fig. 3. *Badhamia gracilis* (SA-M-64). A: Various fructifications. B: Stalk. C: Transverse section of sporocarp. D: Part of peridium, capillitium and two spores.

are like those of *C. fruticulosa* var. *descendens* Emoto, but lack polygonal basal mounds.

Liceales

2. ***Dictydiaethalium plumbeum*** (Schumach.) Rostaf., ex Lister f. ***cinnabarinum*** (Berk. & Broome) Y. Yamam., Myxom. Biota Jpn., 81 (1998).

SA-M-66 (Asir, Raydah, 2450 m alt., on plant litter, 1 IX 2001, coll. H. Takayama)

Trichiales

3. ***Arcyria insignis*** Kalchbr. & Cooke, in Kalchbr., Grevillea, 10: 143 (1882).

SA-M-61 (Asir, Raydah, 2450 m alt., on plant litter, 13 IX 2001, coll. H. Hagiwara)

Physarales

4. ***Badhamia gracilis*** (T. Macbr.) T. Macbr., in T. Macbr. & G.W. Martin, Myxom., 35 (1934). (Fig. 3)

SA-M-62 (Asir, Raydah, 1940 m alt., on cactus debris, 15 IX 2001, coll. H. Hagiwara); SA-M-64 & 65 (Asir, Raydah, 1940 m alt., on cactus debris. MC: 1–18 X 2001, coll. Y. Yamamoto)

This species is a succulenticolous myxomycete

ecologically associated with decaying succulent plants such as cacti, agaves and euphorbias (Lado *et al.*, 1999). The last two specimens, SA-M-64 and SA-M-65, were obtained by using a moist chamber technique. In the moist chambers, this species made white well-developed phaneroplasmodia.

5. ***Badhamia populina*** Lister & G. Lister, J. Bot., 42: 129 (1904).

SA-M-42 & 43 (Asir, Raydah, 2540 m alt., on plant litter, 10 IX 2001, coll. H. Hagiwara; mixed with *Physarum bitectum* in SA-M-43); SA-M-50 (Asir, Raydah, 2490 m alt., on plant litter, 10 IX 2001, coll. H. Hagiwara); SA-M-58 (Asir, Raydah, 2500–2760 m alt., on plant litter, 12 IX 2001, coll. H. Hagiwara)

6. ***Craterium leucocephalum*** (Pers. ex J.F. Gmel.) Ditmar var. ***cylindricum*** (Masse) G. Lister, in Lister, Mycet. ed. 2., 97 (1911). (Fig. 4)

SA-M-12 (Asir, Raydah, 2550 m alt., on plant litter, 2 IX 2001, coll. H. Hagiwara); SA-M-17 (Asir, Raydah, 2125 m alt., on plant litter, 6 IX 2001, coll. H. Hagiwara; mixed with *Didymium squamulosum*); SA-M-54 (Asir, Raydah, 2500–2760 m alt., on plant litter, 12 IX 2001, coll. H. Hagiwara)

This variety differs from the type variety, var. *leucocephalum*, in having no yellow crystalline bodies on the peridium.

7. **Craterium leucocephalum** (Pers. ex J.F. Gmel.) Ditmar var. **scyphoides** (Cooke & Balf. ex Massee) G. Lister, in Lister, Mycet. ed. 2., 97 (1911). (Fig. 5)

SA-M-20, 21, 25 & 30 p.p. (Asir, Raydah, 2130 m alt., on plant litter and dead wood, 6 IX

2001, coll. Rabah Al-Harbi; mixed with *Didymium iridis* in SA-M-30)

This variety is different from the type variety, var. *leucocephalum*, in not only making nearly globose to turbinate sporothecae that have not distinct lids, but also in having no yellow crystalline bodies on the peridium. Recently, Lizarraga *et al.* (1999) regarded var. *scyphoides* as an autonomous species, for this variety has larger and more irregularly distributed wartlets on the

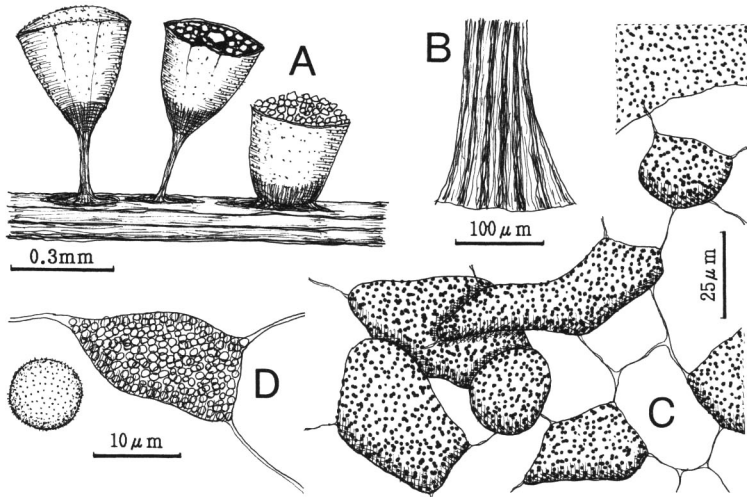


Fig. 4. *Craterium leucocephalum* var. *cylindricum* (SA-M-12). A: Three sporocarps. B: Stalk. C: Part of peridium and capillitium. D: Lime node with connecting threads and a spore.

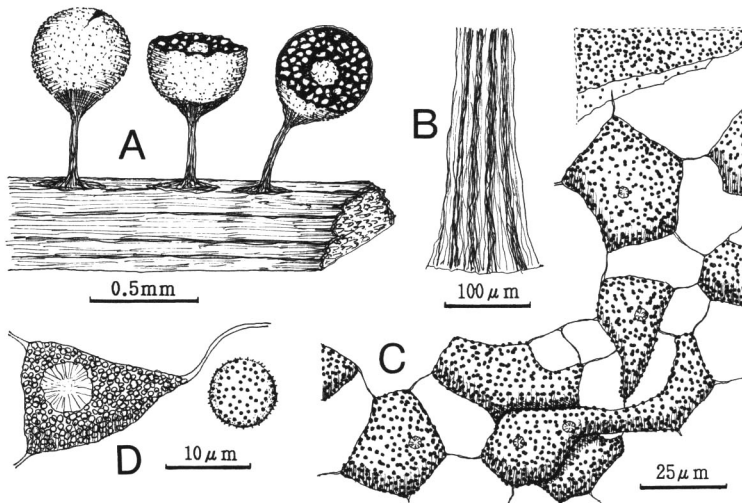


Fig. 5. *Craterium leucocephalum* var. *scyphoides* (SA-M-20). A: Three stalked sporocarps. B: Stalk. C: Part of peridium and capillitium. D: Lime node with connecting threads and a spore.

episore than the type variety. According to our experience, however, morphologically intermediate forms between both varieties are recognized.

8. **Diderma hemisphaericum** (Bull.) Hornem., Fl. Dan., **33**: 13 (1829).

SA-M-22 (Asir, Raydah, 2130 m alt., on plant litter, 6 IX 2001, coll. H. Takayama); SA-M-31 (Asir, Raydah, 2630 m alt., on plant litter, 6 IX 2001, coll. H. Hagiwara); SA-M-35 (Jizan, Jabal Tallan, 2090 m alt., on plant litter, 4 IX 2001, coll. Rabah Al-Harbi); SA-M-53 (Asir, Raydah, 2500–2760 m alt., on plant litter, 12 IX 2001, coll. H. Hagiwara; mixed with *Physarum cinereum*)

9. **Didymium clavus** (Alb. & Schwein.) Rab., Deuts. Krypt.-Fl., **1**: 280 (1844).

SA-M-10 (Asir, Raydah, 2400 m alt., on plant litter, 2 IX 2001, coll. H. Hagiwara); SA-M-23 (Asir, Raydah, 2130 m alt., on plant litter, 6 IX 2001, coll. H. Hagiwara; mixed with *Didymium marineri*); SA-M-47 (Asir, Raydah, 2510 m alt., on plant litter, 10 IX 2001, coll. Rabah Al-Harbi; mixed with *Didymium squamulosum*); SA-M-55 (Asir, Raydah, 2500–2760 m alt., on plant litter, 12 IX 2001, coll. H. Hagiwara)

10. **Didymium iridis** (Ditmar) Fr., Syst. Myc., **3**: 120 (1829).

SA-M-9 (Asir, Raydah, 2400 m alt., on plant litter, 2 IX 2001, coll. H. Hagiwara); SA-M-14 (Asir, Raydah, 2650 m alt., on plant litter, 6 IX 2001, coll. H. Hagiwara); SA-M-30 (Asir, Raydah, 2130 m alt., on plant litter, 6 IX 2001, coll. Rabah Al-Harbi; mixed with *Craterium leucocephalum* var. *scyphoides*); SA-M-51 (Asir, Raydah, 2450 m alt., on plant litter, 11 IX 2001, coll. H. Hagiwara); SA-M-59 (Asir, Raydah, 2450 m alt., on plant litter, 13 IX 2001, coll. H. Hagiwara); SA-M-63 (Asir, Raydah, 2130 m alt., on plant litter, 6 IX 2001, coll. H. Hagiwara)

11. **Didymium marineri** Moreno, Illana & Heykoop, Mycotaxon, **34**: 630 (1989).

SA-M-16 & 23 p.p. (Asir, Raydah, 2130 m alt.,

on plant litter and dead wood, 6 IX 2001, coll. H. Hagiwara; mixed with *Didymium clavus* in SA-M-23)

These specimens have more rounded sporothecae and longer stalks than those of the original description.

12. **Didymium nigripes** (Link) Fr., Syst. Myc., **3**: 119 (1829).

SA-M-6 p.p. (Asir, Raydah, 2450 m alt., on plant litter, 1 IX 2001, coll. H. Hagiwara; mixed with *Didymium squamulosum*); SA-M-19 (Asir, Raydah, 2130 m alt., on plant litter, 6 IX 2001, coll. Rabah Al-Harbi); SA-M-49 (Asir, Raydah, 2260 m alt., on plant litter, 10 IX 2001, coll. Rabah Al-Harbi, mixed with *Didymium squamulosum* and *Physarum cinereum*)

13. **Didymium squamulosum** (Alb. & Schwein.) Fr., Symb. Gast., **19** (1818).

SA-M-5 & 6 (Asir, Raydah, 2450 m alt., on plant litter, 1 IX 2001, coll. H. Hagiwara; mixed with *Didymium nigripes* in SA-M-6); SA-M-17 p.p., 18 & 32 (Asir, Raydah, 2130 m alt., on plant litter, 6 IX 2001, coll. H. Hagiwara; mixed with *Craterium leucocephalum* var. *cylindricum* in SA-M-17); SA-M-24 (Asir, Raydah, 2130 m alt., on plant litter, 6 IX 2001, coll. Rabah Al-Harbi); SA-M-28 (Asir, Raydah, 2130 m alt., on plant litter, 6 IX 2001, coll. H. Takayama); SA-M-46 (Asir, Raydah, 2510 m alt., on plant litter, 10 IX 2001, coll. H. Hagiwara); SA-M-47 p.p. & 48 (Asir, Raydah, 2510 m alt., on plant litter, 10 IX 2001, coll. Rabah Al-Harbi; mixed with *Didymium clavus* in SA-M-47); SA-M-49 p.p. (Asir, Raydah, 2260 m alt., on plant litter, 10 IX 2001, coll. Rabah Al-Harbi; mixed with *Didymium nigripes* and *Physarum cinereum*)

14. **Physarum bitectum** G. Lister, in Lister, Mycet. ed. 2., **78** (1911).

SA-M-13 (Asir, Raydah, 2560 m alt., on plant litter, 2 IX 2001, coll. H. Hagiwara); SA-M-43 p.p. (Asir, Raydah, 2540 m alt., on plant litter, 10 IX 2001, coll. H. Hagiwara, mixed with *Badhamia populina*); SA-M-44 (Asir, Raydah, 2530

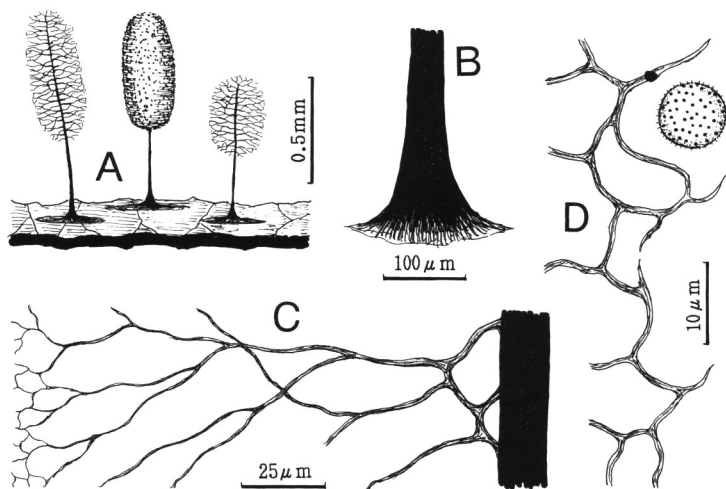


Fig. 6. *Comatricha pulchella* (SA-M-15). A: Three stalked sporocarps. B: Stalk. C: Columella and capillitium. D: Apical part of capillitium and a spore.

m alt., on plant litter, 10 IX 2001, coll. H. Hagiwara); SA-M-57 (Asir, Raydah, 2500–2760 m alt., on plant litter, 12 IX 2001, coll. H. Hagiwara); SA-M-60 (Asir, Raydah, 2450 m alt., on plant litter, 13 IX 2001, coll. H. Hagiwara)

15. ***Physarum cinereum*** (Batsch) Pers., Neues Mag. Bot., **1**: 89 (1794).

SA-M-1 (Asir, Raydah, 1830 m alt., on plant litter, 1 IX 2001, coll. H. Hagiwara); SA-M-2 (Asir, Raydah, 2000 m alt., on plant litter, 1 IX 2001, coll. H. Hagiwara); SA-M-3 (Asir, Raydah, 2050 m alt., on plant litter, 1 IX 2001, coll. H. Hagiwara); SA-M-7 (Asir, Raydah, 2160 m alt., on plant litter, 2 IX 2001, coll. H. Hagiwara); SA-M-27 (Asir, Raydah, 2130 m alt., on plant litter, 6 IX 2001, coll. H. Hagiwara); SA-M-37, 38 & 39 (Jizan, Jabal Tallan, 2090 m alt., on plant litter, 4 IX 2001, coll. Rabah Al-Harbi); SA-M-49 p.p. (Asir, Raydah, 2260 m alt., on plant litter, 10 IX 2001, coll. Rabah Al-Harbi; mixed with *Didymium nigripes* and *D. squamulosum*); SA-M-53 p.p. (Asir, Raydah, 2500–2760 m alt., on plant litter, 12 IX 2001, coll. H. Hagiwara; mixed with *Diderma hemisphaericum*)

16. ***Physarum leucophaeum*** Fr., Symb. Gast., **24** (1818).

SA-M-4 (Asir, Raydah, 2050 m alt., on plant litter, 1 IX 2001, coll. H. Hagiwara); SA-M-11 (Asir, Raydah, 2420 m alt., on plant litter, 2 IX 2001, coll. H. Hagiwara); SA-M-34 (Jizan, Jabal Tallan, 2090 m alt., on plant litter, 4 IX 2001, coll. Rabah Al-Harbi); SA-M-36 (Jizan, Jabal Tallan, 2090 m alt., on plant litter, 4 IX 2001, coll. H. Takayama)

17. ***Physarum leucopus*** Link, Ges. Nat. Freunde Berlin Mag., **3**: 27 (1809).

SA-M-26 (Asir, Raydah, 2130 m alt., on plant litter, 6 IX 2001, coll. Rabah Al-Harbi); SA-M-29 (Asir, Raydah, 2130 m alt., on plant litter, 6 IX 2001, coll. H. Hagiwara)

18. ***Physarum pusillum*** (Berk. & M.A. Curtis) G. Lister, in Lister, Mycet. ed. 2., 64 (1911).

SA-M-56 (Asir, Raydah, 2500–2760 m alt., on plant litter, 12 IX 2001, coll. H. Hagiwara)

19. ***Willkommlangea reticulata*** (Alb. & Schwein.) Kuntze, Rev. Gen. Pl., **3**: 875 (1891).

SA-M-41 (Asir, Raydah, 2540 m alt., on plant litter, 10 IX 2001, coll. Rabah Al-Harbi)

Stemonitales

20. **Comatricha pulchella** (C. Bab.) Rostaf., Mon. App., 27 (1876). (Fig. 6)

SA-M-15 (Asir, Raydah, 2130 m alt., on plant litter, 6 IX 2001, coll. H. Hagiwara); SA-M-52 (Asir, Raydah, 2500–2760 m alt., on plant litter, 12 IX 2001, coll. H. Hagiwara)

This species is quite similar to *Comatricha pulchelloides* Nann.-Bremek. in its habit of growing on fallen leaves and in macroscopic characteristics of the sporocarps, but it is easily distinguished from the latter by its incomplete capillitial nets near the periphery of sporotheca and smaller spores.

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