

## Myxomycetes of Taiwan X. Three New Records of *Didymium*

Chin-Hui Liu<sup>(1,2)</sup> and Ya-Fen Chen<sup>(1)</sup>

(Manuscript received 26 June 1998; accepted 11 August 1998)

**ABSTRACT:** Three new records of *Didymium* were described and illustrated by light and scanning electron micrography. They are *Didymium difforme* (Pers.) S. F. Gray, *D. flexuosum* Yamashiro, and *D. listeri* Masee. All their fruiting bodies were found on plant litters in the mountains of low or medium altitude.

**KEY WORDS:** *Didymium*, Physarales, Slime mold, Myxomycetes, Taiwan.

### INTRODUCTION

Although many species of *Didymium* (Myxomycetes) of Taiwan were listed or enumerated in the early literatures (Nakazawa, 1929, Hattori, 1935, Emoto, 1942), recent publications on the Myxomycetes of Taiwan (Wang *et al.* 1981; Liu, 1982, 1989; Chung & Liu, 1995, 1996a, 1996b, 1997) have increased the number up to 16 species. In this paper we report three additional species collected directly from the mountain area of Taiwan. All specimens are deposited in the Mycological Herbarium, Department of Botany, National Taiwan University, Taipei, Taiwan, R. O. C.

### MATERIALS AND METHODS

Fruiting bodies and their microscopic structures were examined by light and scanning electron microscopy as usual (Chung & Liu, 1997). Identification mainly follows the references of Martin & Alexopoulos (1969) and Nannenga-Bremekamp (1991).

### RESULTS AND DISCUSSION

1. *Didymium difforme* (Pers.) S. F. Gray, Nat. Arr. Brit. Pl. 1: 571. 1821.

Figs. 1-2, 6, 9-12

**Fructifications** sporangiate to short plasmodiocarpous, gregarious to crowded, sessile on a broad base, smooth and white. Sporangia flat-pulvinate, 0.38-0.96mm in diameter,

---

1. Department of Botany, National Taiwan Univ., Taipei 106, Taiwan, Republic of China.

2. Corresponding author.

intermingled with minute sporangia of 50-280 $\mu\text{m}$  in diameter. Plasmodiocarps short, up to ca 3.0mm long. **Peridium** double, outer layer fragile, smooth as eggshell, formed by compacted white lime crystals, inner layer membranous, brownish or purplish, iridescent, remote or closely adhering to outer peridium. Dehiscent circumscissile or irregular. **Hypothallus** inconspicuous or obsolete. **Columella** absent. **Capillitium** scanty, slender, colorless to violaceous or brownish, dichotomously branched, usually short. **Spores** black in mass, violaceous brown by transmitted light, globose or subglobose, wall paler in one area, sometimes with ridges, nearly smooth or minutely warted, the wall ornamentation low, warted to sinuate, in irregular arrangement or partial reticulations under SEM, (10-) 11-12.5 $\mu\text{m}$  in diameter.

Distribution: Cosmopolitan.

**Specimen examined:** Nantou County: Hsi-tou, Lu-ku Hsiang, *CHL B 1348, 1349*, Nov. 7, 1997, On leaves and stem of living and dying herbs under a managed coniferous forest.

This species is newly recorded in Taiwan, characterized by the white and smooth outer peridium, the membranous, dark purple inner peridium, and the minutely warted spores. In our specimens, among the normal sized fruiting bodies, there are many rather small in globose or depressed globose forms (50-280 $\mu\text{m}$  in diameter). Although they are much smaller than the records in the references (Martin & Alexopoulos, 1969; Nannenga-Bremekamp, 1991; Farr, 1976), the morphological characteristics, however, are identical with those of the normal size. Thus, we consider these small fruiting bodies also as *D. difforme*.

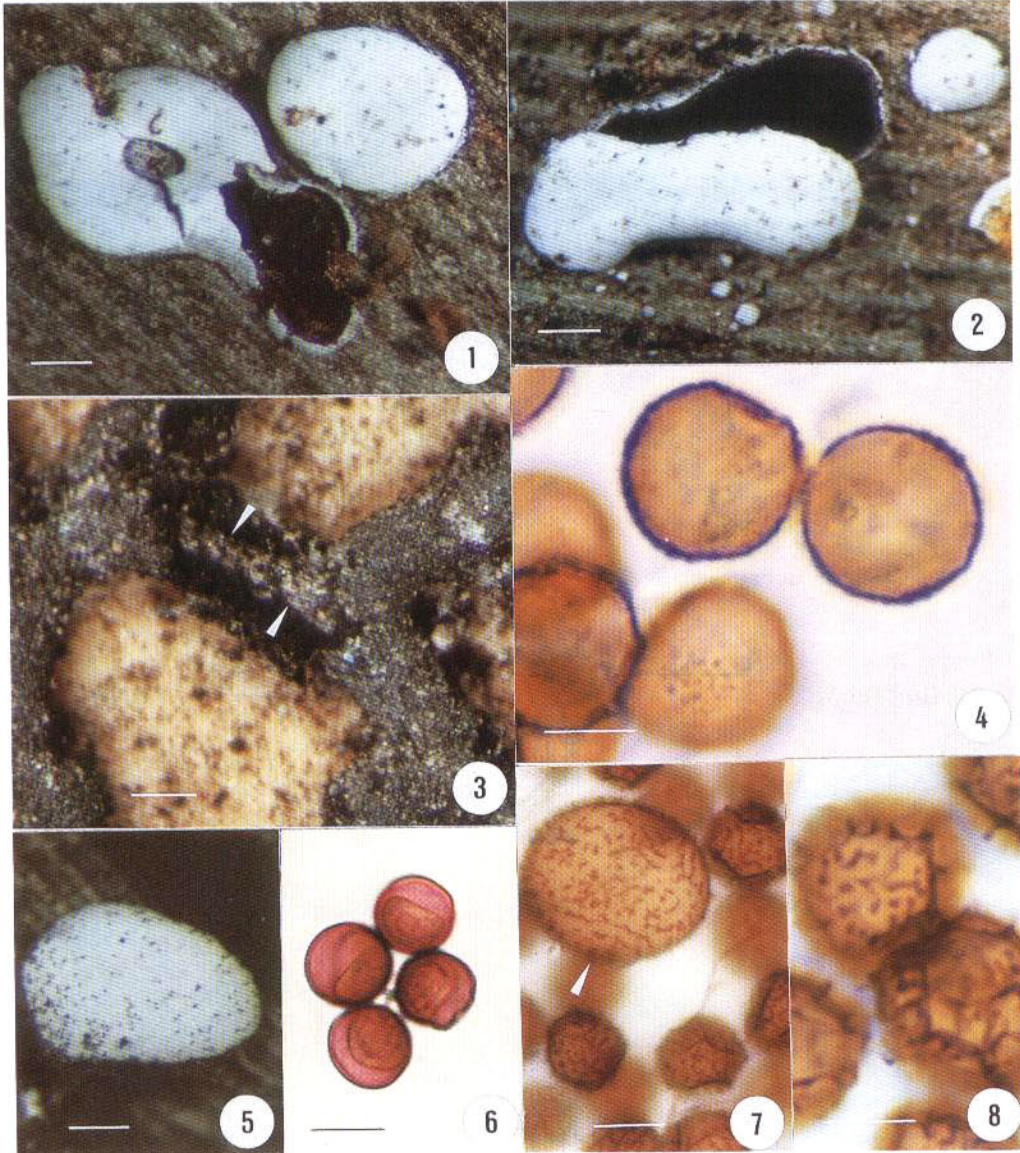
2. **Didymium flexuosum** Yamashiro, Jour. Sci. Hiroshima Univ. Ser. B, 2. 3: 31. 1936.

Figs. 3, 7, 8, 13-17

**Fructifications** plasmodiocarpous, strongly compressed laterally to plump, branching and anastomosing to form an intricate net, rarely sporangiate, white or cinereous, 0.17-0.36mm in diameter. Hypothallus inconspicuous, membranous and colorless, expanded. **Peridium** membranous, transparent, powdered with white lime crystals, slightly iridescent. Dehiscent along the long axis of plasmodiocarp. **Columella** arising as a protuberance of the sporangial base, elongating along nearly the full length of plasmodiocarps, membranous, tubular, flatten, laterally compressed or cylindrical, hollow, with white lime crystals on the inner surface, free in most parts, with several attachment to the basal peridium. **Capillitial threads** slender, sparsely branching and anastomosing. **Spores** nearly black in mass, interspersed with several spore-like but much larger (20-33 $\mu\text{m}$  in diameter) vesicles in elliptical or irregular shape; spores purplish brown by transmitted light, subglobose or polygonaled with ridges on the surface, mostly subreticulate, reticulate in some, with long spines on the surface, 8.5-13 $\mu\text{m}$  in diameter.

Distribution: Japan (Emoto, 1977), North America (Martin & Alexopoulos, 1969), India (Lakhanpal & Mukerji, 1981), Taiwan.

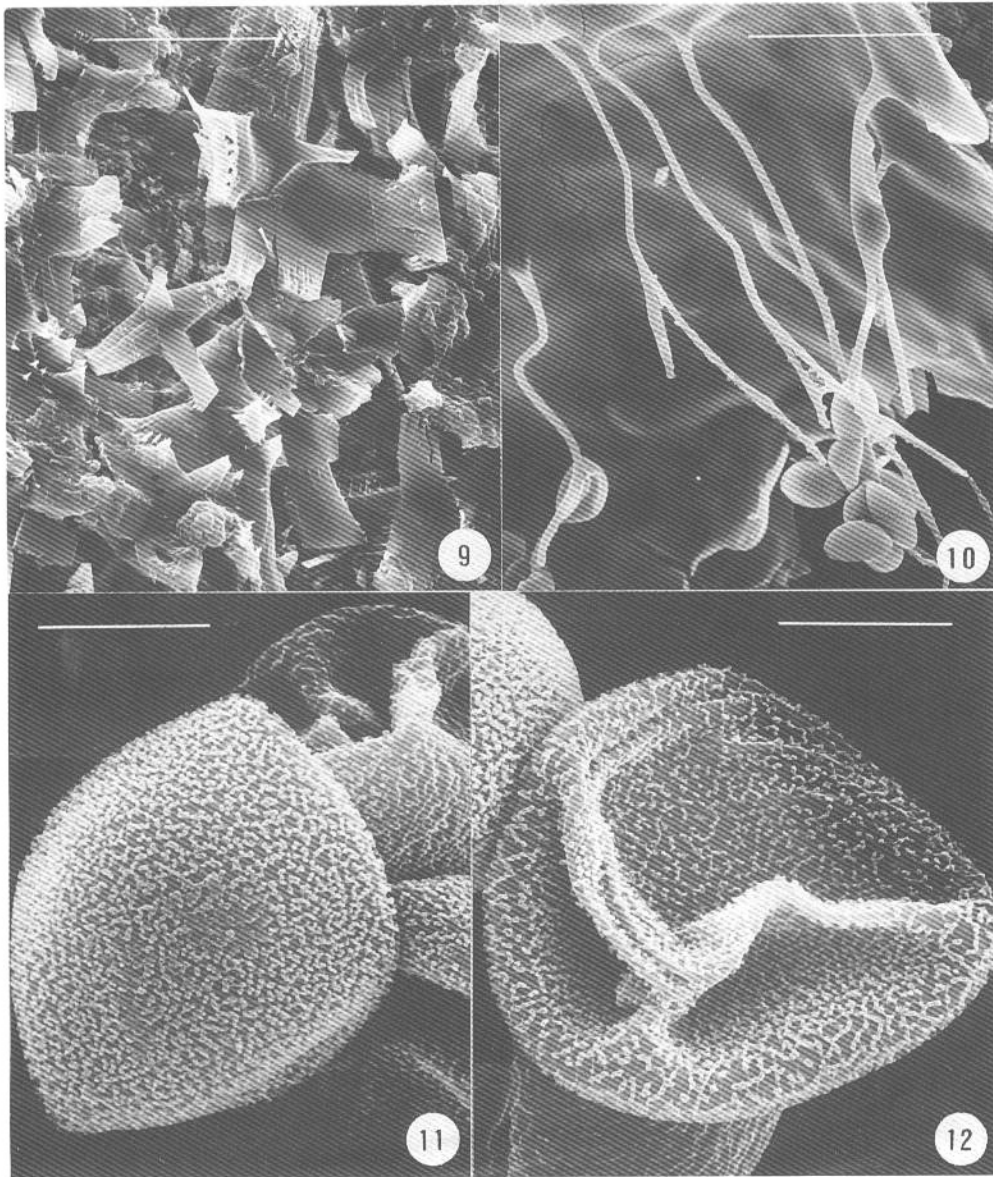
**Specimen examined:** Taipei City: Hua-goun, Shi-lin, *CHL B1446*, Apr. 18, 1996, On dead bamboo leaves.



Figs. 1-2, 6. *Didymium difforme* (Pers.) S. F. Gray. Figs. 1-2: Fruiting bodies, bar =  $300\mu\text{m}$ ; Fig. 6: Spores, bar =  $10\mu\text{m}$ . Figs. 3, 7-8. *D. flexuosum* Yamashiro. Fig. 3: Portion of plasmodiocarp, showing the columella (arrowed), bar =  $200\mu\text{m}$ ; Fig. 7: One vesicle (arrowed) and spores, bar =  $10\mu\text{m}$ ; Fig. 8: Spores, surface view, bar =  $5\mu\text{m}$ . Figs. 4-5. *D. listeri* Masee. Fig. 4: Spores, optical sections, bar =  $5\mu\text{m}$ ; Fig. 5: Fruiting body, bar =  $300\mu\text{m}$ .

The most distinct characteristic of this species is the columella rising to about half of the height of plasmodiocarps. The vesicles in our specimen appear to expand from the capillitial threads, a feature also found in Japanese specimen (Emoto, 1977) but not found in North America (Martin & Alexopoulos, 1969). Spores of our specimen have normal ( $10\text{-}13\mu\text{m}$ ) and much smaller size,  $8.5\mu\text{m}$  in diameter.



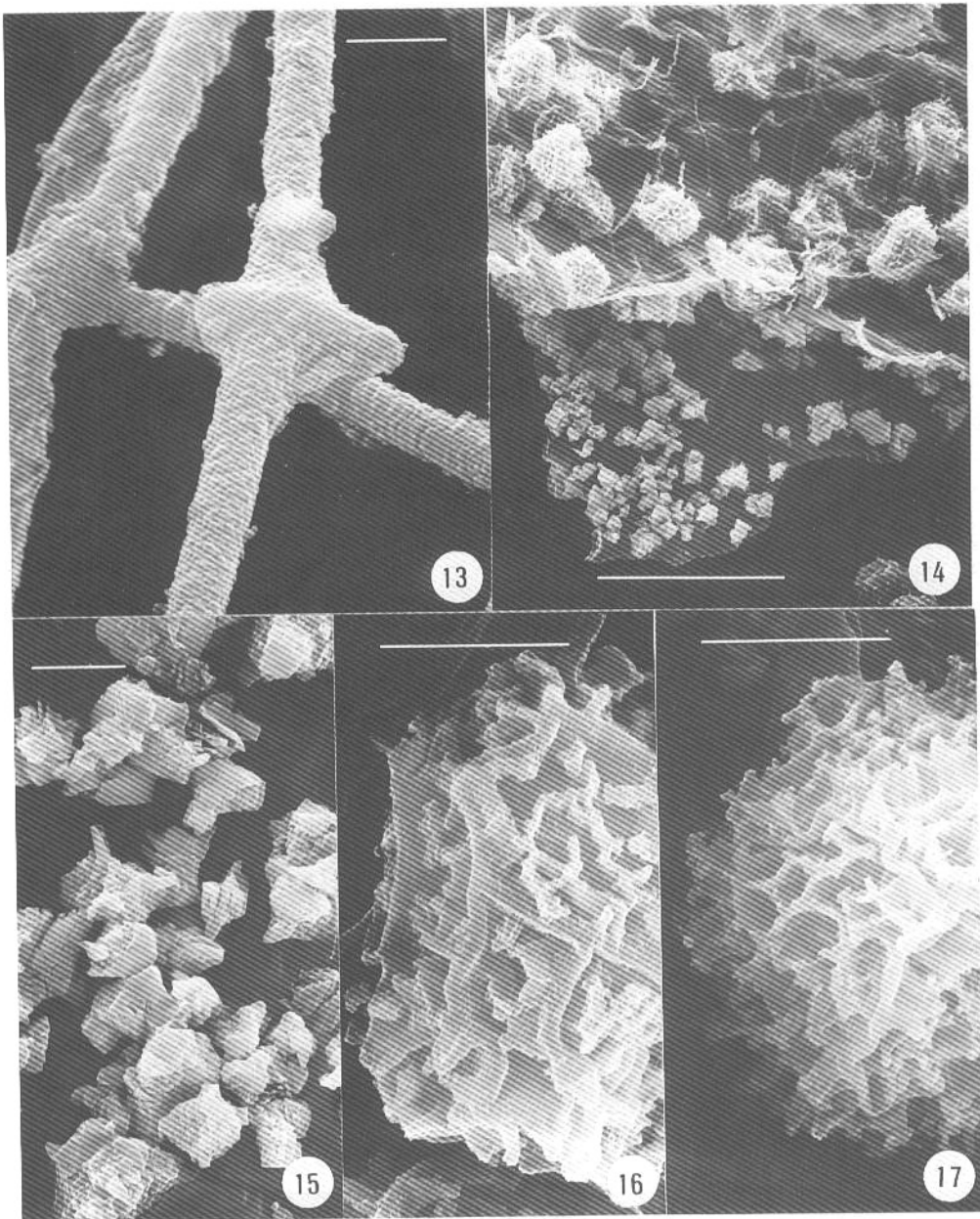


Figs. 9-12. *Didymium difforme* (Pers.) S. F. Gray. Fig. 9: Lime crystals of outer peridium, bar =  $15\mu\text{m}$ ; Fig. 10: Capillitial threads, bar =  $30\mu\text{m}$ ; Fig. 11: Spore ornamentation, bar =  $4\mu\text{m}$ ; Fig. 12: Spores, showing the ridges, bar =  $4\mu\text{m}$ .

3. *Didymium listeri* Masee, Mon. 244. 1892.

Figs. 4, 5, 18-21

**Fructifications** scattered, white, sporangiate and sessile in pulvinate form, varying to plasmodiocarpous, 0.38-0.77mm in diameter, up to 3.2mm long. **Peridium** double, the outer layer white, fragile, shell-like, composed of compacted lime crystals, the inner layer membranous, colorless, adhering closely to the outer peridium. **Hypothallus** obsolete. **Columella** lacking. **Capillitial threads** colorless, rigid, slender in some, with bead-like markings and occasional dark thickenings, connected by transverse bars. **Spores** black in mass, brown by transmitted light, subglobose, 9-11 $\mu\text{m}$  in diameter, slightly ridged on one

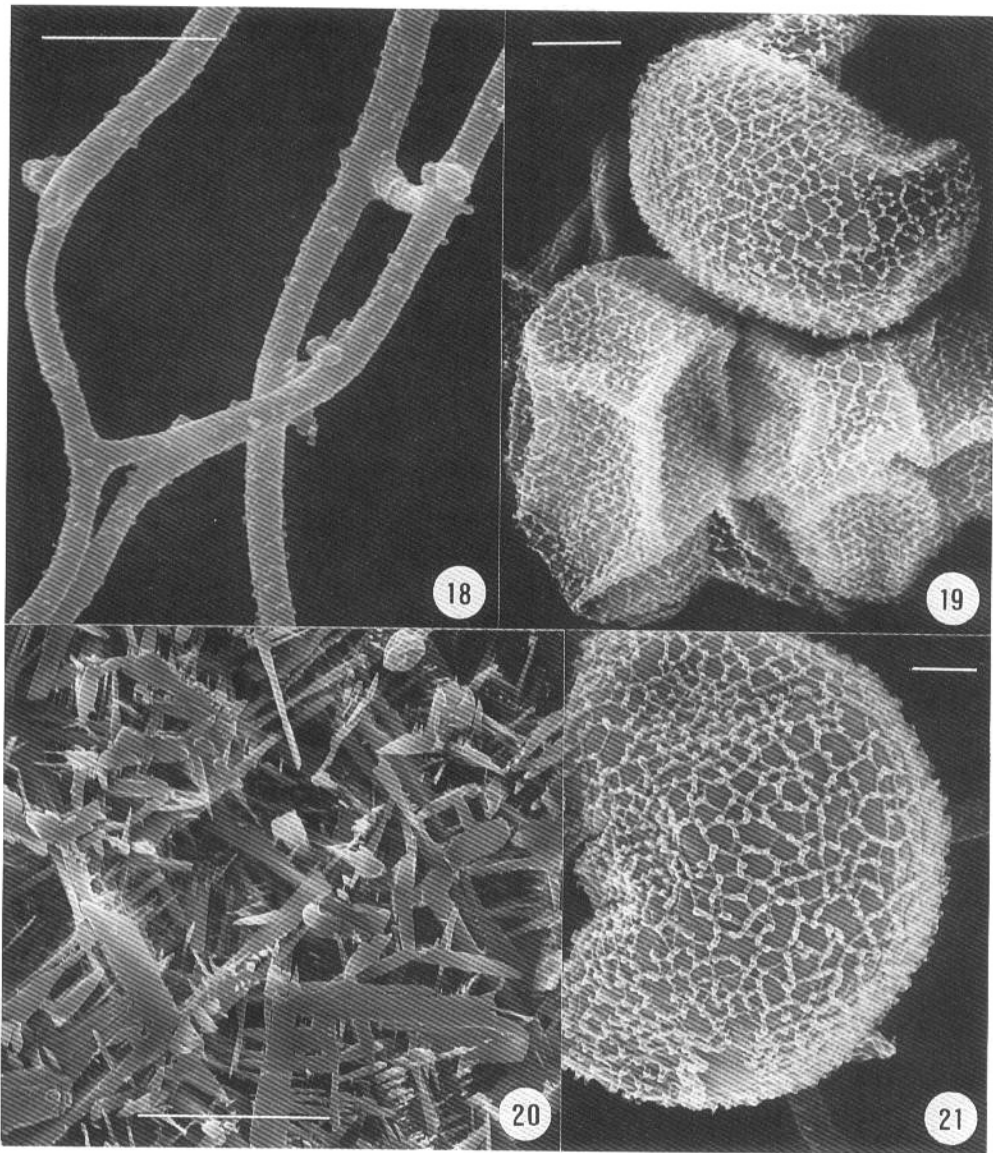


Figs. 13-17. *Didymium flexuosum* Yamashiro. Fig. 13: Capillitium, bar =  $1\mu\text{m}$ ; Fig. 14: Portion of columella (with spores on the outside), showing lime crystals on the inner surface, bar =  $25\mu\text{m}$ ; Fig. 15: Lime crystals on the inner surface of columella, bar =  $3\mu\text{m}$ ; Figs. 16-17: Portions of spores, showing the ridges (Fig. 16) and complete reticulation (Fig. 17), bar =  $3\mu\text{m}$ .

side, minutely warted under high dry lens, delicately and completely warted-reticulate under SEM. **Plasmodium** not seen.

Distribution: Europe, North America, Bermuda, India, West Pakistan, Taiwan.

**Specimen examined:** Nantou County: Hui-sun Forest Station, CHL B491b, Apr. 1, 1985, on dead leaves.



Figs. 18-21. *Didymium listeri* Massee. Fig. 18: Capillitium, bar =  $4\mu\text{m}$ ; Fig. 19: Spores, bar =  $2\mu\text{m}$ ; Fig. 20: Lime crystals of outer peridium, bar =  $10\mu\text{m}$ ; Fig. 21: Surface of spore, bar =  $1\mu\text{m}$ .

This species and *D. difforme* have some features in common: sessile, shell-like and fragile outer peridium, and membranous inner peridium. However they have some differences. In *D. listeri*, the capillitial threads is more rigid and profuse, longer and wider with transverse connections between two neighboring threads, while the capillitial threads of *D. difforme* are usually very short, slender, usually dichotomously branched, sparse and scattered in spore mass, sometimes nearly lacking. Spores of *D. listeri* are smaller, under SEM, the surface is completely warty-reticulate in contrast to the warty to subreticulate spore surface markings of *D. difforme*.

Our specimen appears smaller in dimension than the collections in other places (Martin & Alexopoulos, 1969).

## ACKNOWLEDGEMENT

Grants from the National Science Council and the Council of Agriculture to the senior author are greatly appreciated. The authors also thank Mr. Paul-Ann Yea, the Department of Biology, Chinese Cultural University, Taipei, Taiwan, for his kindly providing the specimen of *Didymium flexuosum* (CHL B1446).

## LITERATURE CITED

- Chung, C.-H. and C.-H. Liu. 1995. *Didymium lenticulare* Thind & Lakhanpal (Physarales, Myxomycetes) — New to Taiwan. *Taiwania* **40**: 375-380.
- Chung, C.-H. and C.-H. Liu. 1996a. *Didymium floccosum* Martin, Thind & Rehill (Physarales, Myxomycetes) — New to Taiwan. *Taiwania* **41**: 175-179.
- Chung, C.-H. and C.-H. Liu. 1996b. Notes on slime molds from Changhua County, Taiwan (I). *Fung. Sci.* **11**: 121-127.
- Chung, C.-H. and C.-H. Liu. 1997. Myxomycetes of Taiwan VIII. *Taiwania* **42**: 274-288.
- Emoto, Y. 1942. Myxomycetes. In: *Nova Flora Japonica*. No. 8. 238 pp. Ed. T. Nakai and M. Honda. Sansendo Co., Ltd. Tokyo & Osaka.
- Emoto, Y. 1977. *The Myxomycetes of Japan*. 263pp. Sangyo Tosho Publ. Co., Ltd., Tokyo, Japan.
- Farr, M. L. 1976. *Flora Neotropica*. Monograph No. 16. Myxomycetes. 305pp. The New York Botanical Garden, New York.
- Hattori, H. 1935. Myxomycetes of Nasu District. 280 pp. Pl. 23. Tokyo, Japan.
- Lakhanpal, T. N. and K. G. Mukerji. 1981. *Taxonomy of the Indian Myxomycetes*. 531pp. J. Cramer, Germany.
- Liu, C.-H. 1982. Myxomycetes of Taiwan III. *Taiwania* **27**: 64-85.
- Liu, C.-H. 1989. Myxomycetes of Taiwan V. Two new records. *Taiwania* **34**: 5-10.
- Martin, G. W. and C. J. Alexopoulos. 1969. *The Myxomycetes*. 560pp. University of Iowa Press, Iowa City.
- Nakazawa, R. 1929. A List of Formosan Mycetozoa. *Trans. Nat. Hist. Soc. Formosa* **19** (100): 16-30.
- Nannenga-Bremekamp, N. E. 1991. *A guide to temperate Myxomycetes*. 409pp. Biopress Limited, Bristol, England.
- Wang, S.-M., Y.-W. Wang and S. Huang. 1981. The revised checklist of Myxomycetes in Taiwan. *Biol. Bull. National Taiwan Normal Univ.* **16** : 1-12.

## 臺灣黏菌(十):鈣皮黏菌(*Didymium*)之參新紀錄種

劉錦惠<sup>(1,2)</sup>、陳雅芬<sup>(1)</sup>

(收稿日期:1998年6月26日;接受日期:1998年8月11日)

### 摘 要

本文報導臺灣鈣皮黏菌屬之三種新紀錄種,分別為 *Didymium difforme* (Pers.) S. F. Gray、*D. flexuosum* Yamashiro 和 *D. listeri* Masee, 除特徵描述外並附光學及掃瞄式電子顯微照片。其子實體是在低至中海拔山區的枯死植物枝條上採獲。

關鍵詞:鈣皮黏菌屬,絨泡黏菌目,黏菌,真黏菌,臺灣。

---

1. 國立台灣大學植物學系,台北市106,台灣,中華民國。

2. 通信聯絡員。