

行政院國家科學委員會專題研究計畫成果報告

計畫編號：NSC 88-2113-M-032-003

執行期限：87年8月1日至88年7月31日

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一、中文摘要

本研究針對採自台灣各地的九個品種苔植物分析，共分離鑑定了十三個已知化合物，五個新化合物，其中三個屬倍半，即2-4，二個雙，即5、6。

另外也針對14個採自台灣、中國及美國各地的蘚植物精油作了初步分析，發現其中6個品種的倍半含量尚稱豐富。

關鍵詞：苔植物化學成分、花葉溪苔、毛地錢、羽枝片葉苔、皺萼苔、合葉苔、石地錢、蘚植物倍半組成

Abstract:

This annual report includes research on the chemical constituents of 9 species of liverworts collected from different locations of Taiwan. Identified new compounds are sesquiterpenes 2~4, diterpenes 5 and 6.

The chemical constituents of 14 moss species were also preliminarily examined by GC-MS and six of them were found to

contain a reasonable amount of sesquiterpenes.

Keywords: Liverworts, Mosses, Hepaticae,

Pellia endiviifolia, *Dumotiera hirsuta*, *Riccardia multifida*, *Ptychanthus striatus*, *Scapania griffithii*, *Reboulia hemisphaerica*, 1,4-guaidien-3-one, 7,10-bisaboladien-9-on-3,4-diol, 7,10-bisaboladien-4,9-dion-3-ol, ptychantin L, ptychantin M,

二、緣由與目的

已知苔類植物含豐富的精油，多為類及芳香族化合物，這些化合物的結構具有兩點特色：其一常有新架構出現，即以往在高等植物中未曾發現過的。其二，大部分類化合物的絕對組態恰為產自高等植物者之鏡像異構物，後者現象在菌、藻類中亦有類似的報告。故研究本省生長的苔類精油，以期達下列目的：

1. 由台灣苔類植物之化學組成, 與世界其他各地所生之同屬或同種者相比較, 探討地理氣候因素對於化學成份演變的影響。
2. 依其特有的化學組成, 再行化學分類, 以別於生物分類或補其不足。
3. 由新化合物之發現及結構的確定, 更進一步瞭解相關化合物生合成間的關係。
4. 辨認這些類化合物之絕對組態, 探討它們的生合成起源及苔類與藻菌類間之演化關係。
5. 合成這些新化合物, 以肯定其立體結構, 並試作生物活性試驗。

植物成份研究有區域之特殊意義, 台灣由於地理與氣候因素的影響, 苔類植物品種相當多。以過去十餘年所研究的四十餘種台灣苔類化學組成來看, 即發現四十多個新的化合物及同一品種常有多種化學類別。為求更完整的探討與比較, 應掌握更多品種的苔類植物成份資料, 否則僅憑零落的結果, 不宜作整體的評斷。

近年發現蘚植物品種的化學並不如過去報導的那般無趣, 有些品種也合成不少倍半及雙。從化學分類的觀點來看究竟有何親緣關係及意義? 蘚植物品種的化學過去極少人研究, 台灣蘚植物的生長比苔植物更為豐富, 因此希望進一步的探討

三、結果與討論

本年度研究針對 8 個採自台灣各地的苔植物品種進行成分分析, 所獲結果如下:

1. *Pellia endiviifolia* (Sheupa) - A known bisbibenzyl, 10'-hydroxyperrottetin E (1), was isolated as the major component from this species. Previously, perrottetin E and many oxygenated sacculatane-type diterpenoids were reported from the Japanese species. In the present Taiwanese species studied, none or very minute of sacculatane-type compounds was observed.
2. *Dumortiera hirsuta* (Yangming Shan) - Two major components, 3,4'-dihydroxybibenzyl and 1,4-guaidien-3-one (2), were isolated and identified from this local species. The latter one is a new compound. Previously, three chemo-types were found for this species. The present YM-species represents the fourth chemo-type.
3. *Riccardia multifida* (Yuenyang Lake) - Two new sesquiterpenoids, 7,10-bisaboladien-9-on-3,4-diol (3) and 7,10-bisaboladien-4,9-dion-3-ol (4), were isolated from this species. Previously, only riccardin-type bisbibenzyls were reported from this species.³

4. *Ptychanthus striatus* - Ptychantins G and M (5) were isolated from the species collected at Sheupa National Park along with the known terpenoid ptychanolide. Ptychantin I was isolated from the Ali Shan species, and ptychantin L (6) from the yuenyang Lake species. Among them, ptychantins M and L are new.
5. *Reboulia hemisphaerica* (Sheupa & Ali Shan) - Three sesquiterpenoids, α -cuparenone, 8,11-dihydro- α -cuparenone, and α -cuparenol, and two triterpenoids, 6,22-hopandiol & 6,11,22-hopantriol, were isolated from the species collected from Sheupa National Park. The species collected from Ali Shan contained the same sesquiterpenoids as those from the Sheupa area. The present two species represent a different chemotype from those collected at Shenkon and Yangming Shan.
6. *Scapania griffithii* (Ali Shan)- Only one sesquiterpene hydrocarbon, trans- β -farnesene, appeared as the sole major component in this plant oil. Besides some fatty acids, no other terpenoids or aromatics were observed even after thorough analysis. This was the first study on this species.

7. Chemical constituents of mosses- Preliminary examination of 14 moss species by GC-MS (Table 1) was carried out. Six of them were found to contain relatively rich amount of sesquiterpenes. It was previously reported that mosses contained rarely any sesquiterpenoids due to lack of oil bodies.

四、計劃成果自評

In the original proposal, the following liverwort species were planned to study: *Porella* sp., *Mastigophora diclada*, *Bazzania tridens* and *Pallavicinia subciliata*. Either due to the drop of graduate students or due to not enough collection of the plant species, the above plants were replaced with *Dumortiera hirsuta*, *Reboulia hemisphaerica* and *Riccardia multifida*.

Although no novel skeleton was found, five new compounds were identified. Some of the moss constituents appeared interesting and worth of further study.

五、參考文獻

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表一 各地的蘚植物化學成分比較表

| No. | Site | Species | C ₁₆ | C ₂₀ |
|-----|------|------------------------------------|-----------------|-----------------|
| → | 陽明山 | 金髮蘚 <i>Polytrichum sp.</i> | → | → |
| → | 陽明山 | 白髮蘚 <i>Leucobryum sp.</i> | → | → |
| → | 陽明山 | unidentified | → | → |
| → | 陽明山 | 曲柄蘚 <i>Campylopus sp.</i> | → | → |
| → | 香港 | <i>Calypers erosum</i> | → | → |
| → | 廣東 | 日本網蘚 <i>Syrhropoden japonicus</i> | → | → |
| → | 長白山 | 沼澤皺蒴蘚 <i>Aulacomnium palustre</i> | → | → |
| → | 長白山 | 仰葉青蘚 <i>Brachythecium reflexum</i> | → | → |
| → | 長白山 | <i>Calliergonella lindbergii</i> | → | → |
| → | 長白山 | 扁灰蘚 <i>Breidleria pratensis</i> | → | → |
| → | 長白山 | 鼠尾蘚 <i>Myuroclada maximoviczii</i> | → | → |
| → | 長白山 | 鈎枝鐮刀蘚 <i>Sanionia uncinata</i> | → | → |
| → | 美國 | unidentified | → | → |
| → | 美國 | 曲尾蘚 <i>Dicranum sp.</i> | → | → |

