

出國報告（出國類別：其他）

參訪泰國「Reliance Tech-Service Co.」
心得報告

服務機關：國立虎尾科技大學生物科技系

姓名職稱：郭賓崇/副教授

派赴國家：泰國

出國期間：104年7月20日至104年7月24日

報告日期：104年8月10日

摘要

本次參訪泰國「Reliance Tech-Service Co.」，進行演講與技術交流，報告題目為「天然物活性成分的純化、鑑定與應用」，內容主要為本研究室近年來的重要研究成果與研發能量。藉由此次參訪，對於泰國地區生物科技產業的發展現況有更進一步的了解，未來希望可以針對泰國地區的生物科技產業深入進行探討，進而討論未來的合作方向與培訓學生計畫。

目 次

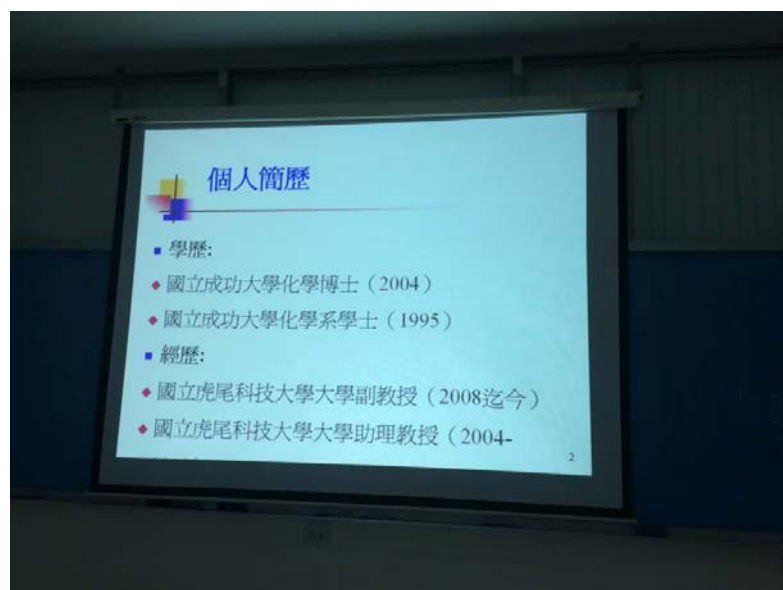
摘要.....	2
目的.....	4
過程.....	5
心得及建議.....	8
附錄	

一、目的

Reliance Tech-Service Co. (公司網址 <http://www.reliance-techservice.com/>)為一間由台商於 1985 年所創立的化工製程設備商，目前主要生產石化、塑膠、材料、農業與食品等各項生產與製程設備。近年來因切入食品與中草藥等生技產品生產領域，亟欲與我方建立產學合作關係，並期待未來可以建立學生實習管道。因此本人受邀前往泰國曼谷近郊龍仔厝府該公司廠址進行演講與技術交流，藉由介紹本研究室的研究成果與研發能量，進而討論未來的合作方向與培訓學生計畫。

二、過程

本人受邀前往泰國曼谷近郊龍仔厝府「Reliance Tech-Service Co.」進行演講與技術交流，參訪時間為 104 年 7 月 23 日至 7 月 24 日，因航班交通與其他私人行程於 7 月 20 日出發抵達泰國曼谷。於 7 月 23 日上午由曼谷前往龍仔厝府公司廠址，在短暫的互相介紹後，本人以「天然物活性成分的純化、鑑定與應用」為題目進行口頭報告，內容主要為本研究室近年來的重要研究成果與研發能量。除了該公司的經營階層參與聽講與進行討論外，亦邀請該公司的研發人員參與並提供相關經驗作為交流。





「Reliance Tech-Service Co.」(公司網址 <http://www.reliance-techservice.com/>)為一間由台商於 1985 年所創立的化工製程設備商，目前主要生產石化、塑膠、材料、農業與食品等各項生產與製程設備。近年來因公司擴大營業項目，切入食品與中草藥等生技產品生產領域，亟欲與我方建立產學合作關係，並期待未來可以建立學生實習管道。因此藉由此次參訪過程，初步建立交流與聯繫窗口，希望透過進一步的討論，延伸未來合作的各種可能性。



7月23日下午則先進行現場考察，過程中參觀該公司現有的生產設施，並與業者進行討論與交流，透過深入的對談更了解該公司的經營理念與未來發展方向。進一步在傍晚的論壇中拜讀該公司的研發人員發表研究成果報告，並與該公司的研發人員進行技術交流，大家亦相當熱烈的進行意見交換與討論。本次參訪遇見許多研究同好共同討論以激盪腦力，是尋找產學合作新議題的一個相當好的機會，對於未來進一步合作有相當大的幫助。論壇結束後於晚間回到曼谷飯店進行休息，7月24日下午由曼谷搭機返回台灣。



三、心得及建議

藉由參加此次參訪報告與論壇交流，讓本人對於泰國地區生物科技產業的發展現況有更進一步的了解，未來希望可以針對泰國地區的生物科技產業深入進行探討，進而討論未來的合作方向與培訓學生計畫。透過此次交流所建立的人際關係，深入進行探討，進一步可以提供本地生物科技產業解決發展瓶頸的借鏡。泰國與東南亞地區目前經濟活動力日益旺盛，東協市場亦相當龐大，泰國政府對於生物科技產業的開發與投資也投注相當心力，並尋求其他相關產業的發展。如能透過雙邊合作，建立產學合作或人員交流的互惠模式，對於本系的大學部學生，不啻為一新的海外實習管道。此次參訪交流的活動，可以初步了解泰國的生物科技產業發展現況，對於促進產學合作，開發新的研究議題，將有非常重要的幫助。

(附錄) 演講稿 ppt

天然物活性成分的 純化、鑑定與應用

虎尾科大生物科技系
郭寶崇
2015.07.23

1

個人簡歷

- 學歷：
 - ◆ 國立成功大學化學博士 (2004)
 - ◆ 國立成功大學化學系學士 (1995)
- 經歷：
 - ◆ 國立虎尾科技大學大學副教授 (2008迄今)
 - ◆ 國立虎尾科技大學大學助理教授 (2004-2008)

2

主要研究成果

- ◆ 天然物抗氧化、抗發炎、抗菌活性成分之研究
- ◆ 烏龍茶製程調整與香氣成分變化之分析
- ◆ 植物保護製劑的開發與生物轉化的應用
- ◆ 具有生理活性的天然化合物與衍生物之合成
- ◆ 中草藥應用於美白與抗老化化妝品的開發

3

Inflammation and Cancer

Nature 2002, 420(6917), 860-867.

4

Inflammation

5

Anti-inflammatory drug

- 類固醇
 - 副作用：月亮臉、水牛角、血管脆弱、免疫力降低、抵抗力衰退
- 非固醇類：aspirin, acetaminophen
 - 主要與抑制環氧化酵素 (cyclooxygenase, COX) 有關

6

Anti-inflammatory drug

- 環氧化酵素 (COX): 細胞受到傷害時合成出前列腺素(prostaglandin, PG) 所需要的一種酵素
- 前列腺素: 造成發炎、疼痛的主因
- COX-1 是維持人體正常前列腺素合成的酵素
- COX-2 是受發炎而誘發的酵素
- 在新藥的開發方面, 希望找到有效度與傳統的非固醇類抗發炎藥物相當並選擇性抑制 COX-2 的藥物, 在抑制發炎疼痛時, 亦能降低副作用的發生

7

野豇豆之成分抽取與分離

Vigna vexillata (4.9 kg)

| MeOH reflux (10L x 5 x 8 hrs)
Filtered concd.

Methanolic extract (900 g)

| CHCl₃ / H₂O

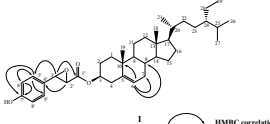
Chloroform layers (VVC, 210g) Water layers (VWV, 690g)

Samples	Inhibition percentage (%) ^a	
	superoxide anion generation	elastase release
methanol extract	22.06 ± 5.66*	19.35 ± 1.52***
chloroform fraction	57.65 ± 3.69***	67.27 ± 3.53***
water fraction	11.08 ± 5.19	11.00 ± 3.37*


8

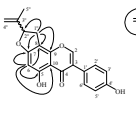
Constituents from *Vigna vexillata* and Their Anti-inflammatory Activity

In our preliminary bioassay, the chloroform layer of methanol extracts of *V. vexillata* demonstrated significant anti-inflammatory bioactivity. Therefore, the present research is aimed to purify and identify the anti-inflammatory principles of *V. vexillata*. One new sterol (1) and two new isoflavones (2-3) were reported from the natural sources for the first time and their chemical structures were determined by the spectroscopic and mass spectrometric analyses. In addition, thirty-seven known compounds were identified by comparison of their physical and spectroscopic data with those reported in the literature.

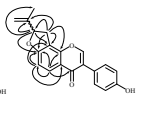


1





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HMBC correlation

9


Inhibitory effects of purified samples from *V. vexillata* on superoxide anion generation and elastase release by human neutrophils in response to FMLP/CB.

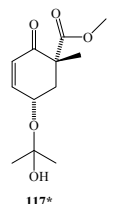
Compounds	IC ₅₀ (µM) ^a or (Inh. %) ^b	
	superoxide anion generation	elastase release
1	(12.58 ± 0.82)***	8.93 ± 1.64
2	(40.57 ± 4.06)***	(17.27 ± 4.19)*
3	4.05 ± 0.66	(12.62 ± 7.17)
9	(6.13 ± 3.26)	(-31.93 ± 1.80)***
10	(2.27 ± 2.70)	(-10.96 ± 5.47)
13	(15.45 ± 1.17)***	(11.59 ± 4.53)
19	1.30 ± 0.27	(42.15 ± 2.85)***
20	(19.26 ± 5.37)*	(11.39 ± 4.98)
22	5.87 ± 0.50	(19.37 ± 4.16)**
23	3.13 ± 0.27	4.29 ± 0.49
25	2.66 ± 0.85	2.71 ± 0.25
27	(-1.35 ± 3.50)	(16.39 ± 2.85)**
30	(37.34 ± 3.26)***	(7.68 ± 5.60)
31	(20.28 ± 4.96)*	(20.11 ± 2.84)**
34	(26.38 ± 6.94)*	(31.49 ± 5.00)**
35	(26.81 ± 6.19)*	(24.43 ± 4.42)**
36	(17.15 ± 3.77)*	(17.88 ± 1.56)***
37	(8.97 ± 2.64)*	(4.34 ± 0.58)**
38	(-0.88 ± 2.98)	(-1.04 ± 7.31)
39	(12.45 ± 5.61)	(-1.30 ± 3.61)
40	4.47 ± 0.76	5.51 ± 1.07
LY294002 ^c	1.38 ± 0.22	1.95 ± 0.35
DPI ^d	0.93 ± 0.52	-

10

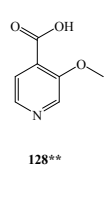
Constituents from *Senecio scandens* and Their Antioxidant Bioactivity

Forty-one compounds including two new constituents senecainin A (1) and 3-methoxy-isonicotinic acid (2) were characterized from the methanol extracts of the whole plant of *Senecio scandens*. The structures of new compounds were comprehensively established with the aids of 1D and 2D NMR spectroscopic and mass spectrometric analyses.





117*

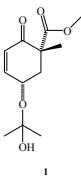


128**

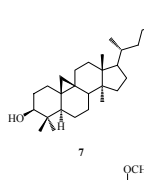
Published paper: *Arch. Pharm. Res.*, 2010, 34, 377-382.

11

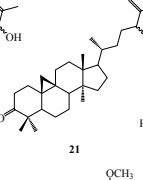
Samples for DPPH assay



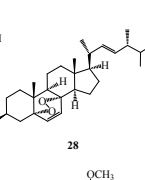
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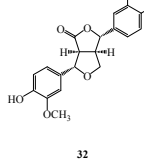
7



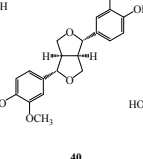
21



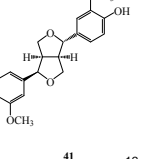
28



32



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41

12

Compounds	DPPH assay	
	IC ₅₀ (μM)	Inhibition percentages at 500 μM
1	–	N. A.
7	–	11.3 % ± 0.7
21	–	10.8 % ± 1.1
28	–	N. A.
32	76.3	78.9 % ± 1.2
40	52.9	84.3 % ± 2.0
41	137.6	76.5 % ± 0.5
Vitamin C	13.2	98.8 % ± 0.2

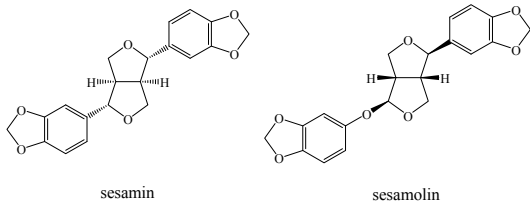
13

Antioxidant Lignans from the Seeds of *Sesamum indicum*



14

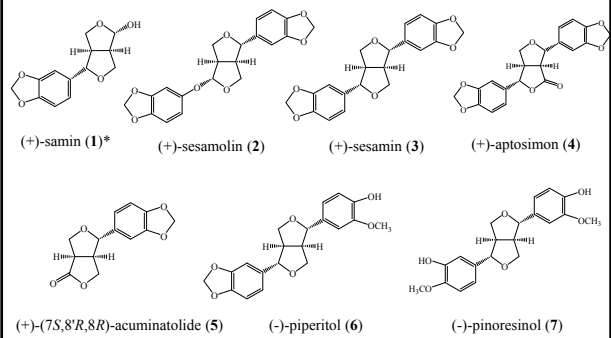
- Major lignans from *Sesamum indicum*: sesamin and sesamol.



The methanol extract of sesame (*Sesamum indicum*) seeds was fractionated and purified with the assistance of conventional column chromatography to afford 29 compounds including seven furofuran lignans.

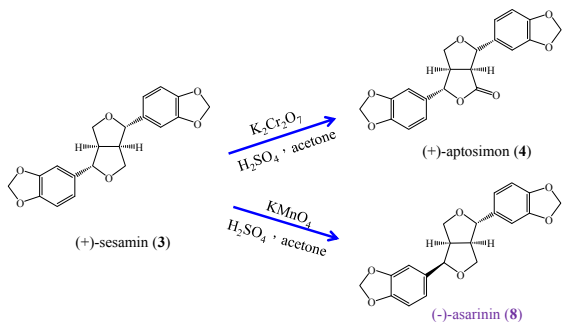
15

Purified Lignans

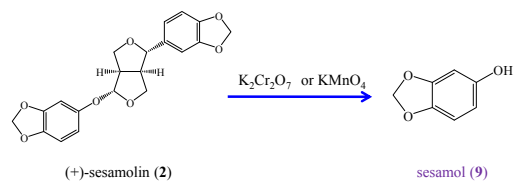


16

Semi-synthesis of Lignan Derivatives



17



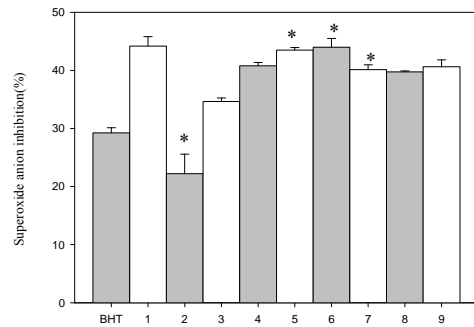
18

DPPH radical scavenging bioactivity

Compounds	IC ₅₀ (μM)	Inhibition percentage (%)	
		at 500 μM	
1	—	40.7 ± 3.0 %	
2	—	29.0 ± 3.7 %	
3	—	27.2 ± 3.1 %*	
4	—	39.5 ± 0.3 %	
5	224.1 ± 0.6	77.4 ± 0.5 %*	
6	49.5 ± 1.2	84.9 ± 0.7 %	
7	34.5 ± 1.1	88.6 ± 0.6 %	
8	—	43.3 ± 2.2 %*	
9	37.3 ± 2.9	88.3 ± 1.4 %	
Vitamin C	38.6 ± 1.8	89.7 ± 0.1 %	

*P < 0.5

Superoxide anions inhibition activity



Samples at 500 μM

*P < 0.5

Published paper: *J. Agric. Food Chem.*, 2011, 59, 3214-3219.

Chemical constituents from the fruits of *Forsythia suspensa* and their antimicrobial activity

植物形態

學名: *Forsythia suspensa*

別名: 黃鍊條花、空翅、黃花樹、黃綏丹、落翅。

基源:

- 被子植物門 (Angiospermae)
- 雙子葉植物綱 (Dicotyledoneae)
- 唇形目 (Lamiales)
- 木樨科 (Oleaceae)
- 連翹屬 (*Forsythia*)

分佈: 中國河北、河南、湖北、山西、陝西、山東及四川等地區。



22

植物形態

性狀: 為落葉灌木, 幹直立叢生, 枝開展。葉卵形金黃色、無毛, 端尖銳。蒴果長卵形至卵形, 頂端狹尖, 長1.5~2.5 cm, 直徑0.5~1.3 cm。表面有不規則的縱皺紋及多數突起的小斑點, 兩面各有一條明顯的縱溝。頂端銳尖, 基部有小果梗或已脫落。“青翅”多不開裂, 表面綠褐色, 凸起的灰白色小斑點較少; 質硬; 種子多數, 黃綠色, 細長, 一個有翅。“老翅”自頂端開裂或製成兩瓣, 表面黃棕色或紅棕色, 內表面多為淺黃棕色, 平滑, 具一縱隔; 質脆; 種子棕色, 多已脫落。氣微香, 味苦。



23

研究動機

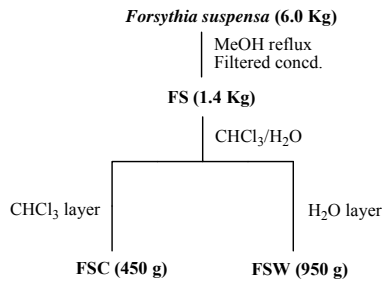
- 由中藥行購得連翹乾燥果實之甲醇粗萃物 (FS)、氯仿分畫層 (FSC) 及水分畫層 (FSW) 經過初步活性篩選, 實驗證實對大腸桿菌 (*E.coli*) 皆具有抑菌活性。

樣品代號	<i>Escherichia coli</i> (BCRC-11634)	
	IC ₅₀ (mg/mL)	
FS (甲醇粗萃物)	5.52	
FSC (氯仿分畫層)	13.63	
FSW (水分畫層)	14.15	

- 因此本研究希望能完成具抑菌活性之分畫層的成分純化, 並針對具有潛力的化合物進行抑菌活性的測定。

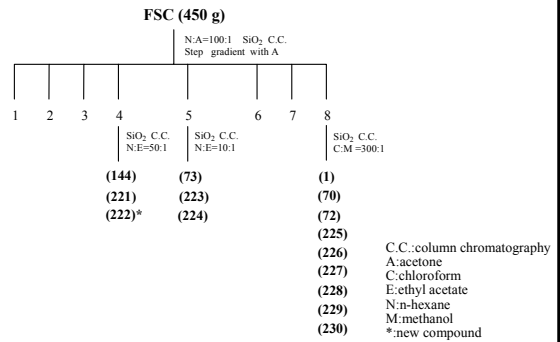
24

連翹果實成分之抽取與分離



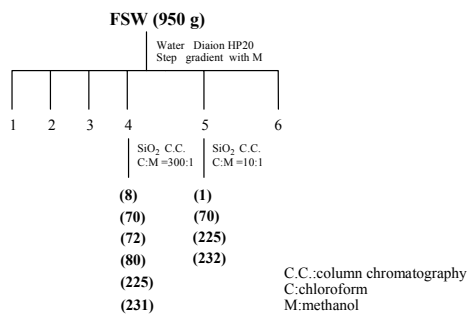
25

連翹果實成分之抽取與分離



26

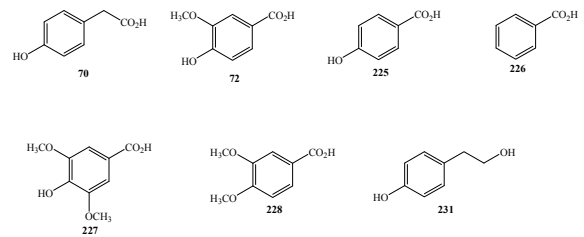
連翹果實成分之抽取與分離



27

純化化合物之結構式

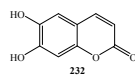
Benzenoids (單苯環類)



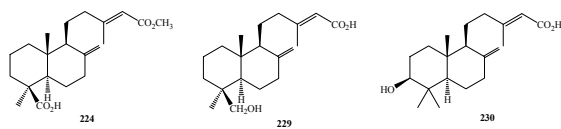
28

純化化合物之結構式

Coumarin (香豆素類)



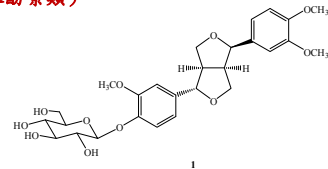
Diterpenoid (二萜類)



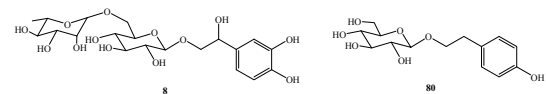
29

純化化合物之結構式

Lignans (木酚素類)



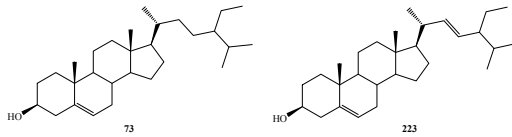
Phenylethanoid glycosides (苯乙醇苷類)



30

純化化合物之結構式

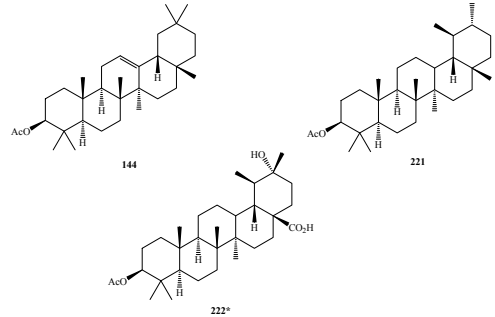
Steroids (固醇類)



31

純化化合物之結構式

Triterpenes (三萜類)



32

連翹純化合物之抑菌試驗

1. 先挑單一菌落大腸桿菌於LB培養基 (Luria-Bertani broth) 中 37 °C 震盪培養四小時。
2. 將各試驗樣品分別添加於LB培養基中再添加菌液，進行37 °C 震盪培養兩小時。
3. 稀釋之並以平板塗佈法 (spread plate) 培養，菌落計數後換算其抑制效果。

33

Escherichia coli (BCRC-11634)	
樣品代號	IC ₅₀ (mg/mL)
1	6.27
144	4.24
222	4.25
229	4.58
230	2.98
β -taraxasterol	1.02
betulinic acid	4.25

34

結論

- 連翹 (*Forsythia suspensa*) 果實甲醇粗萃物之氣仿分畫層分離得到15個化合物，水分畫層分離得到8個化合物，經鑑定確認其結構共19個化合物，其中3 β -acetoxy-20 α -hydroxyursan-28-oic acid (222) 為自然界首次分離得到的化合物。
- 由連翹分離純化之化合物對大腸桿菌抑菌試驗其結果顯示具有抑菌活性，後續將繼續運用分離純化得到的化合物進行其他菌株之試驗，並評估其抑菌活性，提高其研究價值與應用效益，希望未來可應用於食品防腐或藥品開發等天然的抑菌產物。

35

主要研究成果

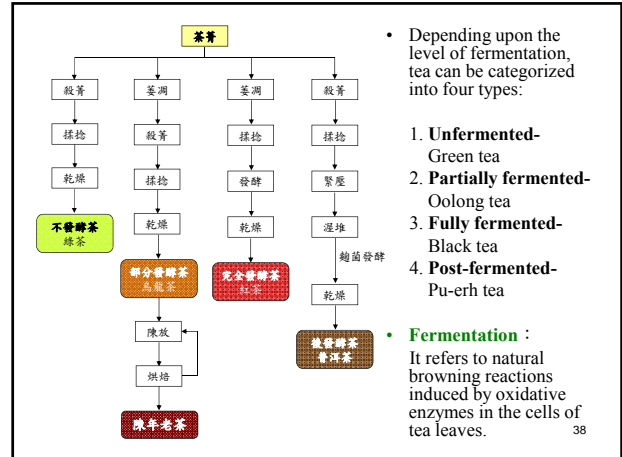
- ◆ 天然物抗氧化、抗發炎、抗菌活性成分之研究
- ◆ 烏龍茶製程調整與香氣成分變化之分析
- ◆ 植物保護製劑的開發與生物轉化的應用
- ◆ 具有生理活性的天然化合物與衍生物之合成
- ◆ 中草藥應用於美白與抗老化化妝品的開發

36

Changes in volatile compounds upon aging and drying in oolong tea production

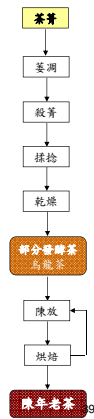
烏龍老茶製備過程中揮發性成分的變化之探討

Published paper: *J. Sci. Food Agric.*, 2010, 91, 293-301.
Food Res. Int., 2013, 53, 732-743.

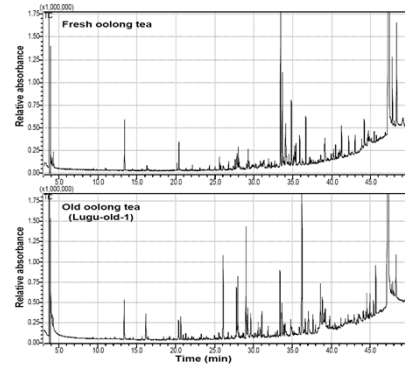


Old oolong tea

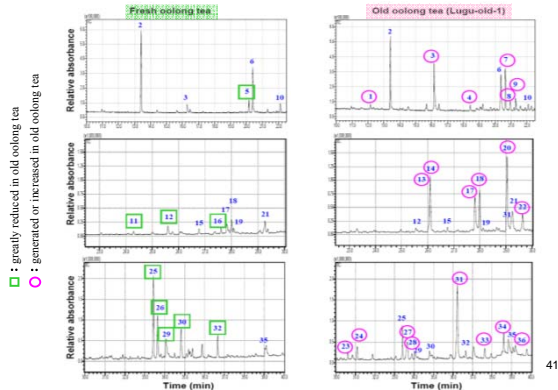
- Old oolong tea is converted from fresh oolong tea by long-term storage (aging) for more than five years and refined at least annually by a professional drying process.
- Old oolong tea, tasting superior and empirically considered beneficial for human health, is prepared by long-term storage accompanied with periodic drying for refinement.
- The time-consuming and labor-intensive preparation of old oolong tea considerably raises its production cost and thus limits its commercialization at a large scale.



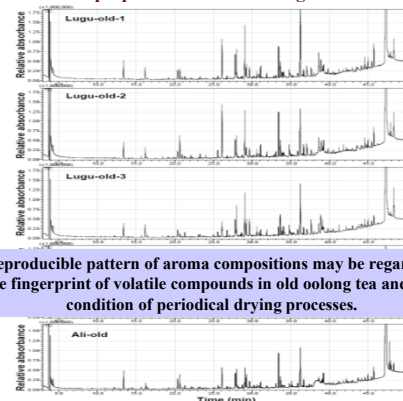
GC/MS chromatograms of the aroma concentrates in fresh and old oolong teas



Expanded GC/MS chromatograms of the aroma concentrates in fresh and old oolong teas

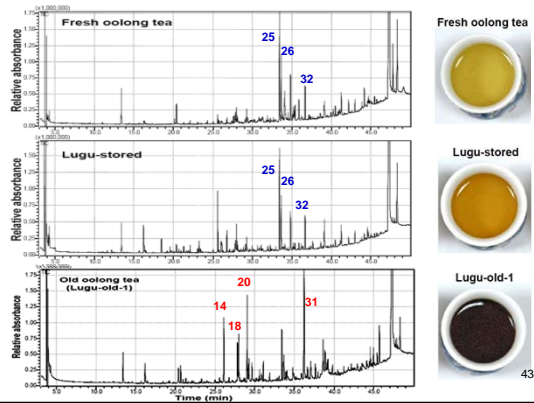


GC/MS chromatograms of the aroma concentrates in five preparations of old oolong tea

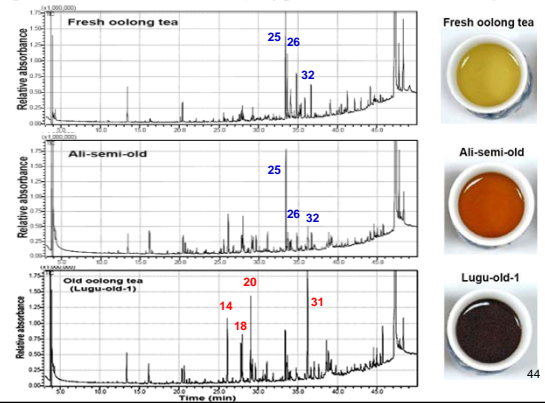


The reproducible pattern of aroma compositions may be regarded as a unique fingerprint of volatile compounds in old oolong tea and defined condition of periodical drying processes.

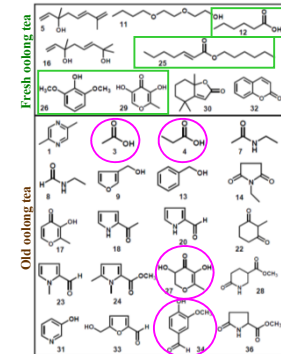
GC/MS chromatograms of the aroma concentrates in oolong tea freshly prepared, stored for 10 years (Lugu-stored) and Lugu-old-1



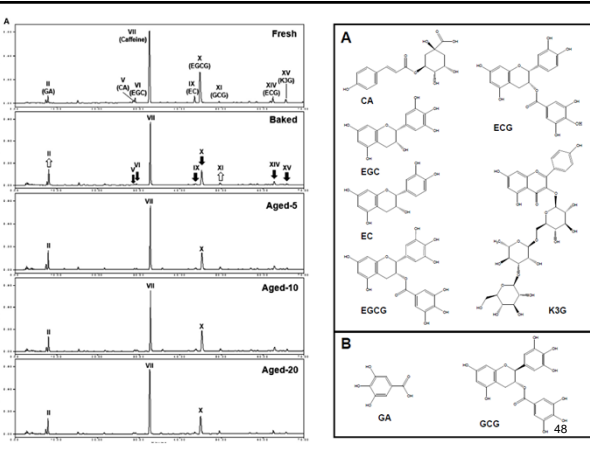
GC/MS chromatograms of the aroma concentrates in oolong tea freshly prepared, treated with a mild drying process (semi-old) and Lugu-old-1

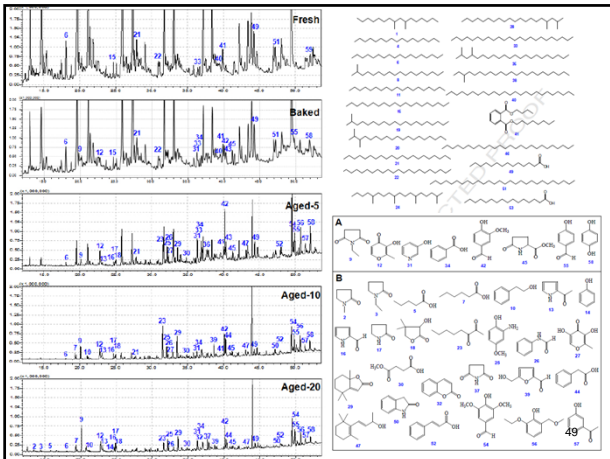


Tea leaves and infusions of four different oolong teas



Fresh Tieguan Yin, Baked Tieguan Yin, Aging after baking 5, 10, 20 year





Summary

- 結果顯示想要獲得甘甜並且具有獨特芳香韻味的烏龍老茶是需要經過長時間儲存並且伴隨週期性烘焙才能獲得，若只經過長時間儲存是無法製造出獨特芳香韻味的烏龍老茶。
- 研究結果觀察到具有再現性的烏龍老茶香味物質組成，亦可做為日後鑑定烏龍老茶品質之指紋圖譜依據。

50

主要研究成果

- ◆ 天然物抗氧化、抗發炎、抗菌活性成分之研究
- ◆ 烏龍茶製程調整與香氣成分變化之分析
- ◆ 植物保護製劑的開發與生物轉化的應用
- ◆ 具有生理活性的天然化合物與衍生物之合成
- ◆ 中草藥應用於美白與抗老化化妝品的開發

51

Bioactive saponins from tea seed pomace with inhibitory effects against *Rhizoctonia solani*

Published paper: *J. Agric. Food Chem.*, 2010, 58, 8618-8622.

52

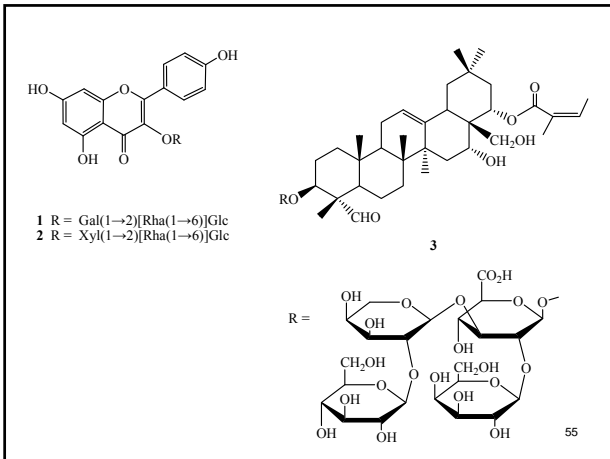
- *Camellia oleifera* was named trivially as tea-oil camellia because it is cultivated in its homeland of East Asia specifically for the seeds, which are extracted for commercial tea oil.
- After the extraction of oil, the seed pomace is discarded as there are no further uses for it. Moreover, no research work related to the tea seed pomace had been published until now.

53

Rhizoctonia solani kühn AG-4

- *Rhizoctonia solani* causes serious damping-off diseases of numerous crops in Taiwan; it is a major problem especially for the commercial production of vegetable seedlings grown in cell-plug systems.
- In our preliminary screening, the methanol extract of tea seed pomace at 100 ppm markedly inhibited the mycelial growth of *R. solani* by 64.68%.
- For the purpose of discovering new plant-derived fungicides for controlling *Rhizoctonia* damping-off of cabbage seedlings, the seed pomace of *C. oleifera* was selected as the target.

54



Antifungal activity of the camelliaside A (1), B (2) and saponin (3) from tea seed pomace on the growth of *Rhizoctonia solani* AG-4 RST-04 on potato dextrose agar (PDA) plates incubated at 27 °C for 48 hrs

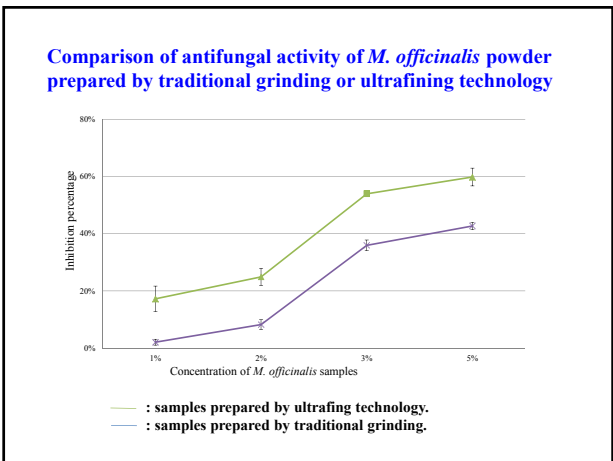
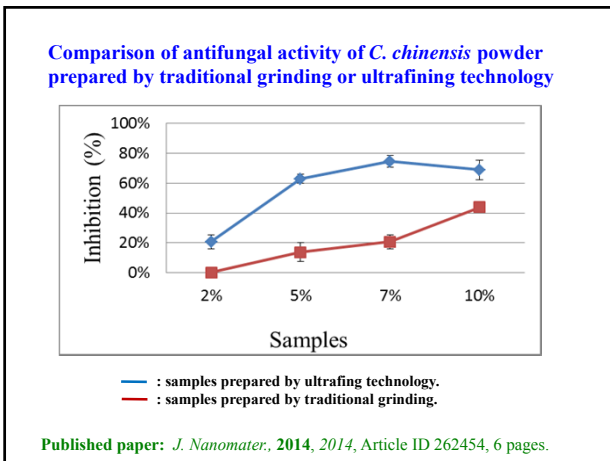
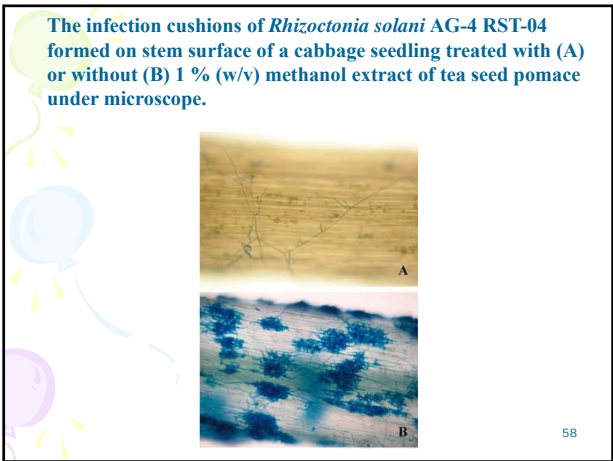
Treatment	Colony size (cm)	Inhibition (%)
Camelliaside A (125 ppm)	8.70 ± 0.12	-14.66
Camelliaside B (125 ppm)	8.69 ± 0.12	-14.50
Saponin (100 ppm)	2.78 ± 0.04	63.43
Saponin (60 ppm)	3.30 ± 0.11	56.51
Saponin (30 ppm)	4.04 ± 0.07	46.79
Saponin (10 ppm)	7.10 ± 0.04	6.43
Pencycuron (250 ppm)	1.38 ± 0.14	81.88
Pencycuron (25 ppm)	1.23 ± 0.12	83.86
Pencycuron (2.5 ppm)	2.00 ± 0.13	73.64
Pencycuron (0.25 ppm)	2.54 ± 0.10	66.56
Check	7.59 ± 0.14	0.00

56

Antifungal activity

Compounds	Antifungal assay	
	IC ₅₀ (ppm)	Inhibition percentages at 125ppm
camelliaside A	ND	< 0
camelliaside B	ND	< 0
Saponin	55.70	65 %
Pencycuron	< 0.25	82 %

57



Biotransformation

- Small organic molecules purified from natural sources provide an incomparable source of inspiration for advances in organic chemistry and disease treatment due to their significant biological properties.
- Although some compounds can be easily synthesized by chemical ways, some issues still remain, including complex operation, safety, pollution, and production cost.

61

Biotransformation

- Biopreparation has been considered to be an economical technology by synthetic organic chemists in the development of new production routes for chemical and pharmaceutical compounds.
- As compared with chemical synthesis, biotransformation is a useful method to produce bioactive compounds with advantages such as high stereo- and regio-selectivity, as well as milder reaction conditions, simple operation procedures, and environmental safety.

Published paper: *Tetrahedron Lett.*, 2013, 54, 6955-6958.

62

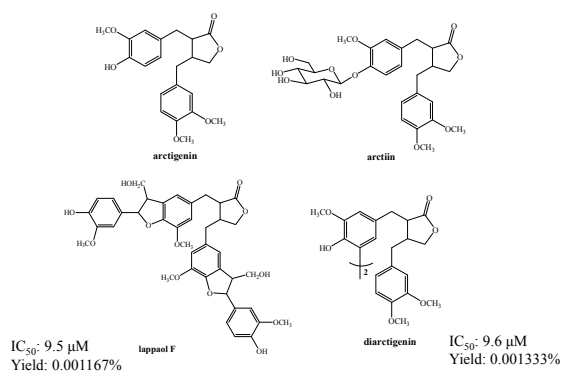
Arctii Fructus

- Arctium lappa* L. is a perennial herb that has been cultivated as a vegetable in many countries for a long time.
- The seeds of *A. lappa* L. are extensively used in traditional medicines as diuretic, anti-inflammatory, and detoxifying agents.



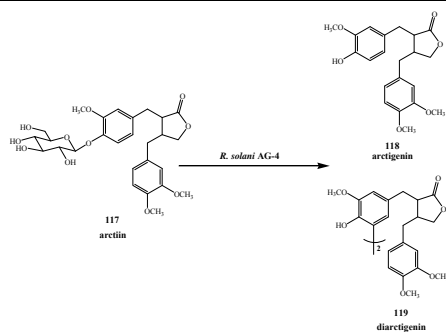
63

NO Inhibitory Principles from the seeds of *A. lappa*



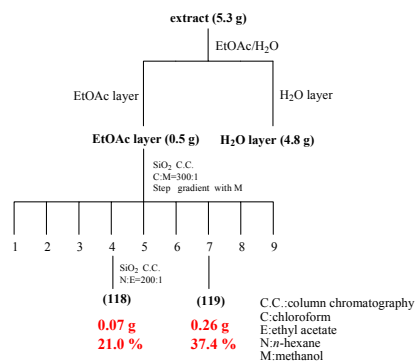
64

Preparative biotransformation of arctiin



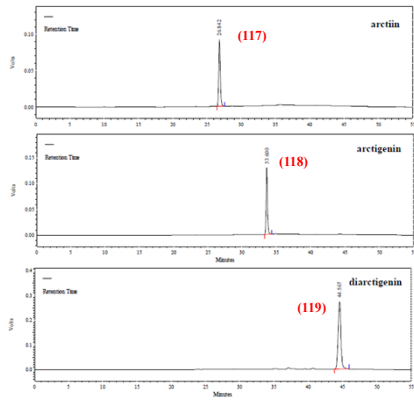
65

Purification and characterization of metabolites



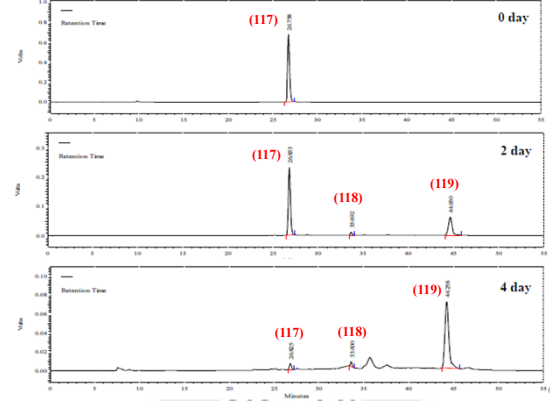
66

Time course of biotransformation of arctiin

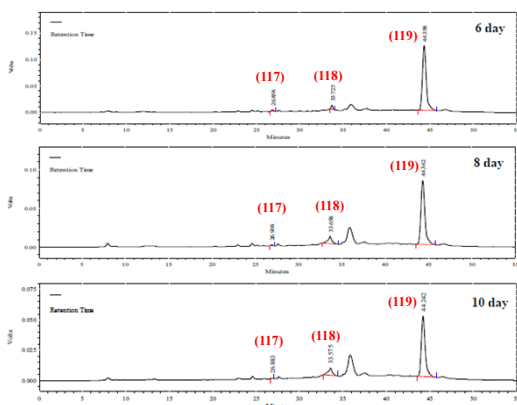


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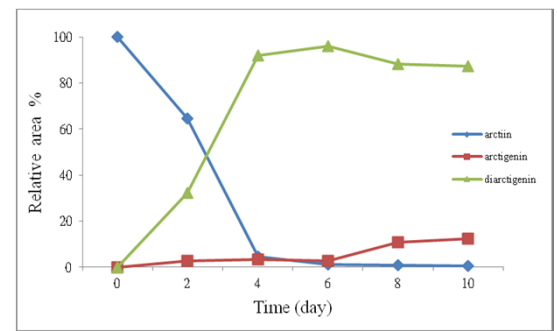
Time course of biotransformation of arctiin



68



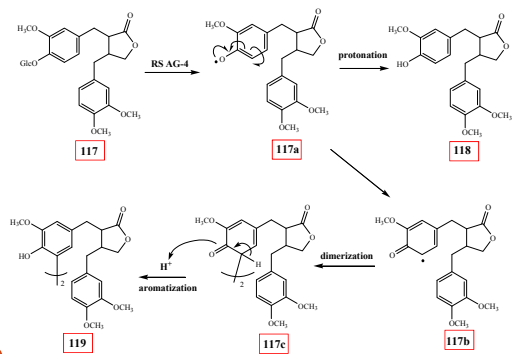
69



The relative abundances of arctiin, arctigenin, and diartigenin in the incubation period (n = 3-5).

70

The plausible metabolic pathway for arctiin



71

Summary

- In the present study RS AG-4 was used as a biocatalyst and arctiin was converted into arctigenin and diartigenin both in satisfied yields.
- The current report would be an excellent method to produce a large scale of diartigenin for the further medicinal and bioactivity examinations.

72

主要研究成果

- ◆ 天然物抗氧化、抗發炎、抗菌活性成分之研究
- ◆ 烏龍茶製程調整與香氣成分變化之分析
- ◆ 植物保護製劑的開發與生物轉化的應用
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- ◆ 中草藥應用於美白與抗老化化妝品的開發

73



74

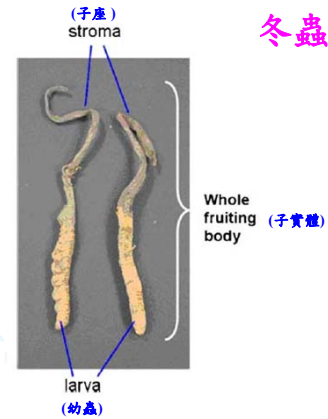
冬蟲夏草



Mycoscience 2001, 42(6), 567-574.

75

冬蟲夏草



J. Ethnopharmacol. 2008, 117(1), 92-101.

76

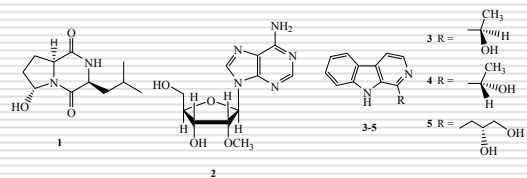
粗抽物及各分畫層抗發炎活性試驗

Sample	Inhibition percentage (%) ^a	
	superoxide anion generation	elastase release
CSE	26.53 ± 4.31*	15.20 ± 1.82**
CSEH	28.38 ± 7.13**	22.79 ± 5.33*
CSEHH	44.02 ± 10.19**	70.76 ± 5.26***
CSEHM	94.99 ± 2.12***	97.10 ± 2.11***
CSEE	82.73 ± 6.82***	97.49 ± 3.96***
CSEW	8.39 ± 2.78*	3.94 ± 2.88

Results are presented as mean ± S.E.M. (n=3-4). *Percentage of inhibition (Inh %) at 10 µg/mL concentration. p < 0.05 ; ** p < 0.01 ; *** p < 0.001 compared with the control value.

77

Anti-inflammatory Principles from *Cordyceps sinensis*



In order to explore the anti-inflammatory principles of the mycelia of *Cordyceps sinensis*, the crude extract and partially purified fractions were examined for their inhibition of superoxide anion generation and elastase release. Further chemical investigation of the bioactive fractions has resulted in the identification of fifty compounds, including five constituents, cordysins A-E (1-5) reported from a natural source for the first time. In addition, compounds were examined for their anti-inflammatory activity. 1-(5-Hydroxymethyl-2-furyl)-β-carboline displayed the most significant inhibition of superoxide anion generation and elastase release with IC₅₀ values of 0.45 ± 0.15 and 1.68 ± 0.32 µM, respectively.

Published paper: *J. Nat. Prod.*, 2011, 74, 1996-2000.

78

Compound	IC ₅₀ (μM) ^a or (Inh %) ^b	
	superoxide anion generation	elastase release
65	NT ^c	NT
170	NT	NT
171	6.19 ± 1.25	(24.22 ± 6.57)
228	5.42 ± 0.50	5.62 ± 0.37
312	NT	NT
313	(28.25 ± 2.73)***	(41.59 ± 6.25)***
318	(5.59 ± 3.26)	(7.03 ± 3.76)
321	(6.59 ± 2.11)	(2.79 ± 3.64)
322	(12.83 ± 6.94)	(10.37 ± 0.55)
326	(5.65 ± 1.64)	(11.72 ± 5.92)
327	(9.61 ± 5.51)	(11.06 ± 6.14)
329	(21.62 ± 6.28)	(7.13 ± 5.55)
331	0.45 ± 0.15	1.68 ± 0.32
336	(6.43 ± 3.72)	(6.83 ± 2.46)
338	(11.34 ± 4.95)	(13.02 ± 3.20)
Indomethacin	38.32 ± 5.38	31.98 ± 6.49
LY294002	1.12 ± 0.20	1.92 ± 0.22


^a Concentration necessary for 50% inhibition.
^b Percentage of inhibition (Inh %) at 10 mg/ml concentration. Results are presented as mean ± S.E.M. (n=3-4). * p < 0.05; ** p < 0.01; *** p < 0.001 compared with the control value.
^c NT means "Not Test".

表12 清除DPPH自由基的活性試驗

Compound	(Inh % at 500 μM) ^a or IC ₅₀ (μM) ^b
114	(34.5 ± 4.09)
170	(40.9 ± 3.17)
171	(25.7 ± 1.89)
218	(17.6 ± 4.67)
228	(29.3 ± 0.54)
269	(29.6 ± 1.90)
318	(37.0 ± 1.11)
319	(31.3 ± 1.08)
320	(28.4 ± 1.64)
321	(12.2 ± 3.43)
322	(26.8 ± 3.08)
326	(29.5 ± 0.90)
327	(27.3 ± 2.04)
328	(20.6 ± 5.01)
330	31.07
331	(25.5 ± 1.02)
336	(25.0 ± 0.54)
338	(38.2 ± 0.89)
Vitamin C	38.63

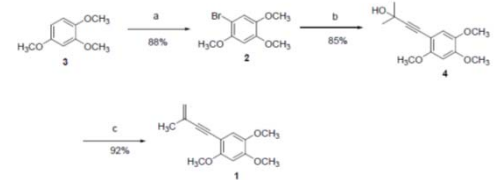
^a Percentage of inhibition (Inh %) at 500 μM concentration. ^b Concentration necessary for 50% inhibition.

Taiwanofungus camphoratus (Niu-chang-chih) (Polyporaceae, Aphyllophorales)



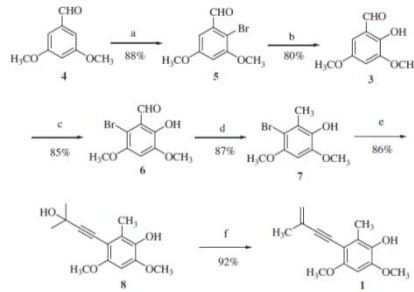
- It is a rare and precious type of medical fungus in Taiwan and it is known as "the national treasure of Taiwan".
- The fruiting bodies of Niu-chang-chih have been used as a Chinese folk medicine for the treatment of liver diseases, food and drug intoxication, diarrhea, abdominal pain, hypertension, itchy skin and tumorigenic diseases in Taiwan.

Figure 4. Synthesis of benzocamphorin F (1).



Reagents and conditions: a) NBS, acetonitrile, room temp. b) 2-methyl-3-buten-2-ol, Pd(PPh₃)₄, CuI, DMF, c) methanesulfonyl chloride, toluene, microwave.

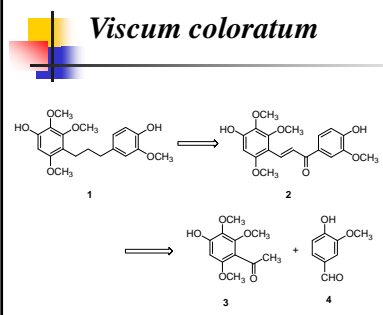
Published paper: *Int. J. Mol. Sci.*, 2012, 13, 10432-10440.



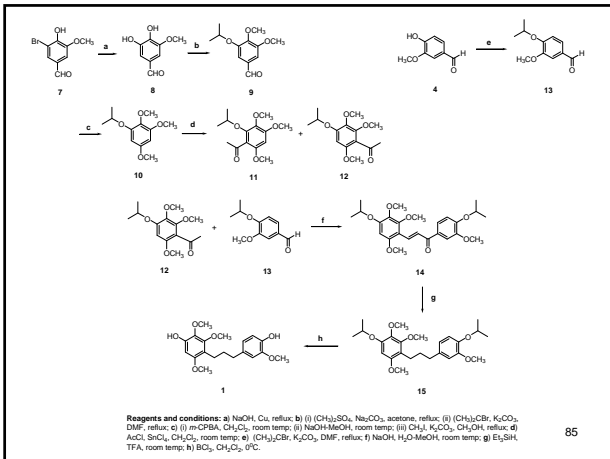
Scheme 1. Reagents and conditions: (a) NBS, acetonitrile, rt; (b) NaOH (aq), Cu, reflux; (c) NBS, acetic acid, rt; (d) H₂, Pd/C, MeOH, rt; (e) 2-methyl-3-buten-2-ol, Pd(PPh₃)₄, CuI, DMF; (f) methanesulfonyl chloride, toluene, microwave.

Published paper: *Tetrahedron Lett.*, 2012, 53, 6202-6204.

Viscum coloratum



Published paper: *Chem. Pharm. Bull.*, 2012, 60, 557-561.



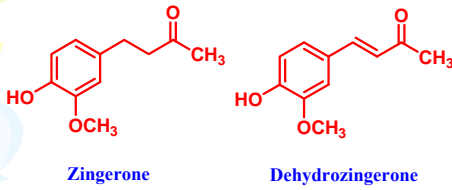
85

主要研究成果

- ◆ 天然物抗氧化、抗發炎、抗菌活性成分之研究
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86

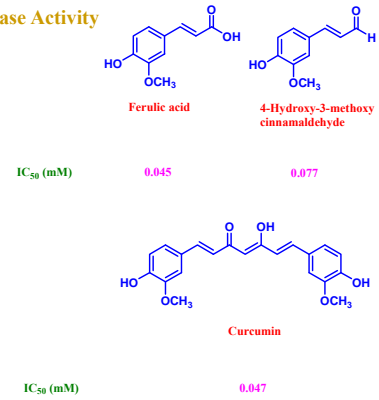
薑酮衍生物之合成研究



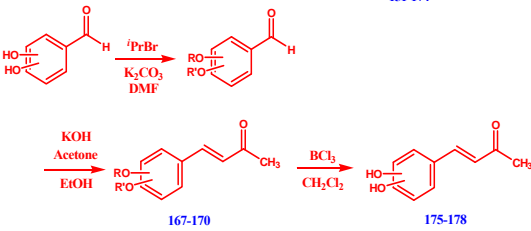
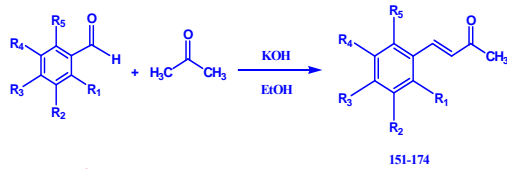
- Isolated from *Zingiber officinale* Rosc.
- IC₅₀ values for inhibiting lipid peroxidation initiated by Fe²⁺-ascorbic acid in rat brain homogenate were 28.2±0.8 and 35.7±1.5 μM.

87

Antityrosinase Activity



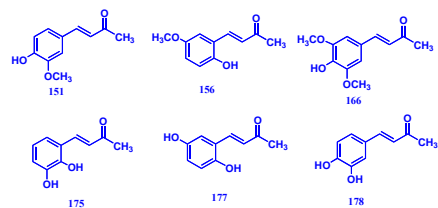
88



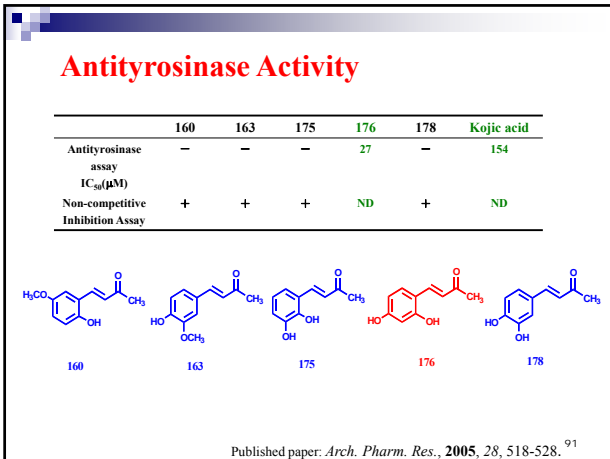
89

Antioxidation Activity

	151	156	166	175	177	178	Vit. C	Vit. E
DPPH assay	12.8	8.7	12.4	3.2	4.9	7.9	23.7	8.3
IC _{50,200} (μM)				6.3±0.4				
Rat brain assay								
IC ₅₀ (μM)	ND	60.2±5.8	58.5±3.2	6.3±0.4	41.8±6.3	12.0±0.8	ND	2.5
Iron chelation assay	-	-	-	-	-	-	ND	ND



90

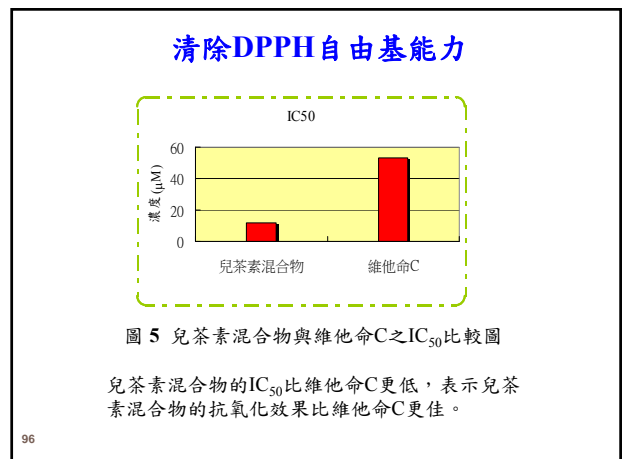
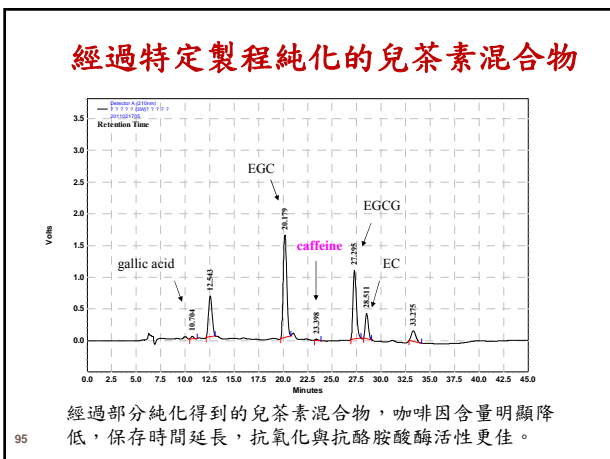
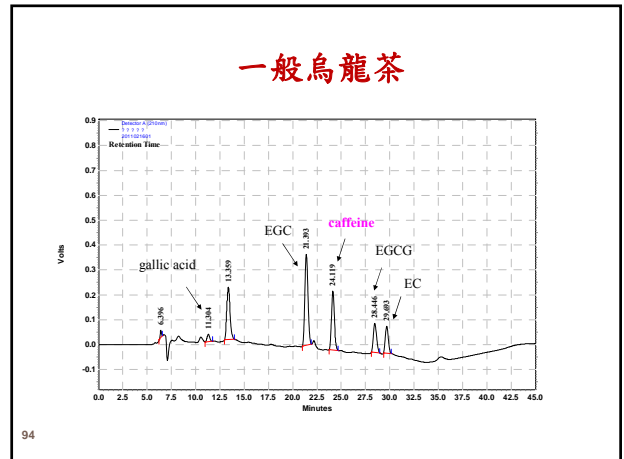
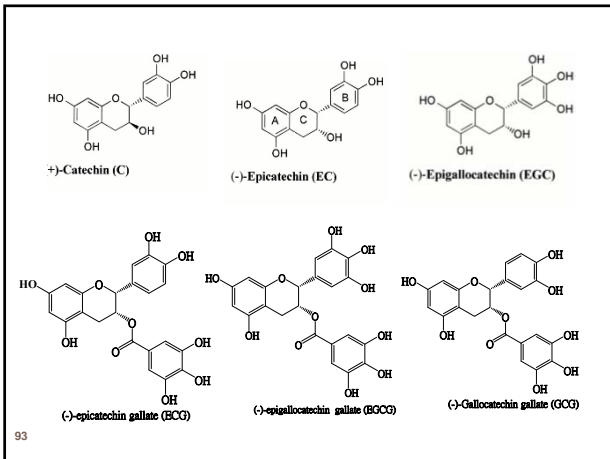


茶葉簡介

- 學名：Camellia sinensis (L.) O. Kuntze
- 基源：屬木蘭植物門 (Magnoliophyta)
-木蘭綱 (Magnoliopsida)
-山茶目 (Theales)
-山茶科 (Theaceae)
-山茶屬 (Camellia)
- 分布：主要分布於亞洲的台灣、中國及日本；中國大陸主要茶區分佈於福建等。
- 形態：多年生常綠喬木或灌木，野外自然生長的樹高可達5至7公尺，花腋生1-3朵，單葉互生，長橢圓狀披針形，花期10-11月。




92 92



添加兒茶素的樣品之皮膚試驗

初製成之樣品用於工研院皮膚檢測試驗，測試塗抹於左手前臂內側(上段)，塗抹乳霜基劑，右手前臂內側(上段)，塗抹美白乳霜，右手前臂內側(下段)，不塗抹(空白組)。

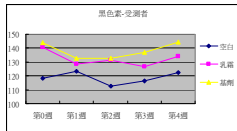


圖 6 皮膚黑色素檢試

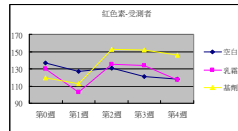


圖 7 皮膚紅色素檢試

97

鳳梨葉



參考資料：淡江大學化學系碩士論文，鳳梨葉萃取物與查耳酮衍生物抗UVB引起的氧化壓力及抗癌活性評估。

98

沉香葉

學名：*Aquilaria sinensis*
 別名：女兒香、白木香、牙香樹
 基源：
 木蘭植物門 (Magnoliophyta)
 木蘭綱 (Magnoliopsida)
 桃金娘目 (Myrtales)
 瑞香科 (Thymelaeaceae)
 沉香屬 (*Aquilaria*)



原產：中國南方及東南亞地區。

99

沉香葉

台灣種苗商及林農居於利益所在，大約10-20年前大量從越南等地引進沉香木種植，原先希望可以從國外引進之沉香木能夠生產高經濟價值之沉香。但是迄今為止，種植在台灣各地的沉香木，因沒有與原產地相同之菌種及環境，以致大部分無法生產沉香。然而目前已有部分廠商開發沉香葉成保健食品販賣，希望可以提高其附加價值。



100

開發標的

項目	指標或規格	功能與應用
添加鳳梨葉、沉香葉萃取物活性劃分的新化妝品產品	製備萃取物活性劃分	活性劃分可以添加於精華露、化妝水、乳液、日霜與夜霜等產品，對於抗氧化、美白與保養等功能都可以有效的提升，有利於開發本土品牌，提升在地企業的形象與產業價值。
鳳梨葉、沉香葉萃取物活性劃分製程開發與專利申請	<ul style="list-style-type: none"> 開發領先業界的活性劃分製備流程 製程專利可以保護產品免於被侵權 	利用活性劃分製備流程可以有效率的監控生產流程，確保產品品質與效能。
活性測試	測試活性劃分的抗氧化與抗酪氨酸酶活性	用以評估鳳梨葉、沉香葉萃取物之生理活性。

101



102