



電子報第 177 期

活動訊息

- ◆ 2021 年「第 20 屆超臨界流體技術應用與發展研討會暨第九屆第二次會員大會」

時間：2021年12月11日(星期六)

地點：高雄蓮潭國際會館102會議室

<https://www.tscfa.org.tw/ec99/rwd1480/news.asp?newsno=10>

專家介紹

- ◆ 凌永健教授(國立清華大學化學系)
- ◆ 林瑞岳董事長(台超萃取洗淨精機股份有限公司)

團體會員介紹

- ◆ 東聯化學股份有限公司

產業新聞

- ◆ 中油高雄煉油廠土壤整治只能用燒的嗎？

資料來源：

<https://tw.news.yahoo.com/%E6%8A%95%E6%9B%B8-%E4%B8%AD%E6%B2%B9%E9%AB%98%E9%9B%84%E7%85%89%E6%B2%B9%E5%BB%A0%E5%9C%9F%E5%A3%A4%E6%95%B4%E6%B2%BB%E5%8F%AA%E8%83%BD%E7%94%A8%E7%87%92%E7%9A%84%E5%97%8E-192459359.html>

- ◆ 田寮咖啡生技莊園陳右直 為了喝杯台灣咖啡，買下一座山林

資料來源：<https://money.udn.com/money/story/5635/5851838>

- ◆ 亞果生醫營收及獲利再躍升

資料來源：<https://wanrich.chinatimes.com/news/20211104900275-420101>

技術文摘

- ◆ A standardized black pepper seed extract containing β -caryophyllene improves cognitive function in scopolamine-induced amnesia model mice via regulation of brain-derived neurotrophic factor and MAPK proteins 含有 β -石竹烯的標準化黑胡椒籽提取物通過調節腦源性神經營養因子和 MAPK 蛋白改善東莨菪鹼誘導的健忘模型小鼠的認知功能
- ◆ Black Bean (Phaseolus vulgaris L.) Polyphenolic Extract Exerts Antioxidant and Antiaging Potential 黑豆 (Phaseolus vulgaris L.) 多酚提取物發揮抗氧化和抗衰老潛力
- ◆ Chicory Extracts and Sesquiterpene Lactones Show Potent Activity against Bacterial and



Fungal Pathogens 菊苣提取物和倍半萜內酯對細菌和真菌病原體顯示出有效的活性

- ◆ Continuous Liquid-Liquid Extraction and in-Situ Membrane Separation of Miscible Liquid Mixtures 混溶液體混合物的連續液-液萃取和原位膜分離
- ◆ Design and Engineering of "Green" Nanoemulsions for Enhanced Topical Delivery of Bakuchiol Achieved in a Sustainable Manner: A Novel Eco-Friendly Approach to Bioretinol 以可持續方式實現增強補骨脂酚局部遞送的“綠色”納米乳液的設計和工程：生物視黃醇的新型生態友好方法
- ◆ Hydroxytyrosol-Fortified Foods Obtained by Supercritical Fluid Extraction of Olive Oil 橄欖油超臨界流體萃取得到羥基酪醇強化食品
- ◆ Influence of Supercritical Carbon Dioxide Extraction Conditions on Extraction Yield and Composition of Nigella sativa L. Seed Oil-Modelling, Optimization and Extraction Kinetics regarding Fatty Acid and Thymoquinone Content 超臨界二氧化碳提取條件對黑種草籽油提取率和成分的影響-脂肪酸和百里醌含量的建模、優化和提取動力學
- ◆ Multi-product biorefinery from Arthrospira platensis biomass as feedstock for bioethanol and lactic acid production 以鈍頂旋藻生物質為原料生產生物乙醇和乳酸的多產品生物精煉廠
- ◆ Resource recovery of lignocellulosic biomass waste into lactic acid - Trends to sustain cleaner production 將木質纖維素生物質廢物資源回收為乳酸 - 維持清潔生產的趨勢
- ◆ Sustainable Extraction Techniques for Obtaining Antioxidant and Anti-Inflammatory Compounds from the Lamiaceae and Asteraceae Species 從唇形科和菊科物種中獲得抗氧化和抗炎化合物的可持續提取技術
- ◆

台灣超臨界流體協會

電話：(07)355-5706

E-mail：tscfa@mail.mirdc.org.tw



2021 年第 20 屆超臨界流體技術研討會暨 110 年度會員大會

台灣超臨界流體協會謹訂於民國 110 年 12 月 11 日(星期六)，假高雄蓮潭國際會館 102 會議室(高雄市左營區崇德路 801 號)，舉辦「第 20 屆超臨界流體技術應用與發展研討會」，並於當日下午 16 時 30 分舉行 110 年度會員大會。 恭請

蒞臨指導

技術研討會暨年會籌備會主任委員 **謝達仁** 理事長

副主任委員 **廖盛焜** 副理事長

台灣超臨界流體協會 全體理監事暨籌備會委員 **敬邀**

110 年度研討會暨會員大會議程

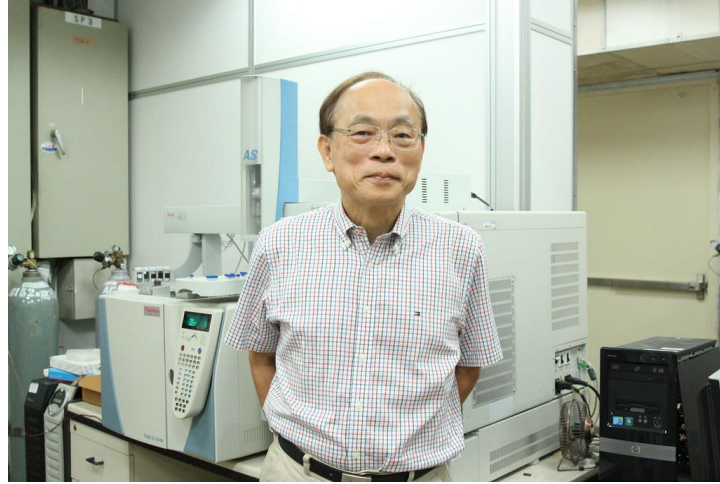
時間	議程內容	
09:30~10:00	報到	
10:00~10:10	開幕式 (主任委員致歡迎詞/貴賓致詞)	
10:10~10:50	專題演講(I) 顏克中經理 (亞果生醫股份有限公司) 異軍突起-超臨界流體開創醫療器材新紀元	
10:50~11:30	專題演講(II) 馮瑞陽助理教授 (國立高雄大學電機工程學系) 超臨界流體技術應用於製備奈米矽薄膜及改質多孔矽結構	
11:40~12:00	場地 A(食品與生技醫藥)	場地 B(能源與綠色製程、材料與精密製造)
	OPA01 吳守方(達諾公司)	OP B01 王莘瑜(高雄大學)
12:00~12:20	OPA02 吳蓁蓁(中央大學)	OP B02 鄭伯韋(東京工業大學)
12:30~13:30	午餐/聯誼時間	
13:30~14:10	專題演講(III) 廖聖茹研究員 (工研院材化所 高分子研究組) 超臨界流體在聚合物發泡之工業應用	
14:10~14:50	專題演講(IV) 董泯言經理 (工研院材化所 纖維暨紡織化學品技術組) 超臨界流體於纖維機能化加工應用	
15:00~15:20	OPA03 顏佑澤(臺北科大)	OP B03 涂翊珈(明志科大)
15:20~15:40	OPA04 陳昱銘(中央大學)	OP B04 崔春山(皮托科技公司)
15:40~16:30	海報論文展示評選及廠商展示區交流/會員大會報到/茶敘	
16:30~18:00	會員大會	
18:00~20:00	晚宴、頒贈捐助廠商感謝狀、研究論文優良及佳作獎	

晚宴地點：高雄蓮潭國際會館花園餐廳 Tel：(07)341-3333(高雄市左營區崇德路 801 號)



專家介紹

【國立清華大學化學系 凌永健教授】



- ❖ 專長：環境、材料(電子和奈米)、藥物/食品樣品之微量與微區分析，製備、清洗等綠色化學製程之研發
- ❖ 研究方向：分析化學、綠色化學
- ❖ email：ycling@mx.nthu.edu.tw

凌永健教授畢業於國立台灣大學化工系，服役二年(海軍陸戰隊預備軍官)之後赴美，1983年獲美國佛羅里達州立大學化工博士學位，畢業後回國前曾任美國康乃爾大學博士後研究員4年，返國後，1989年起任職於國立清華大學化學系任副教授，1994年升等為教授，自2002年起兼任奈米工程及微系統研究所合聘教授乙職至今。

凌永健教授主要從事分析化學的研究，常與環保署、消基會等組織機構合作，應用質譜分析法，揪出無良排放廢棄物的廠商、黑心食品摻偽業者，越深入第一線，他越能感受到廠商在廢棄物處理的無奈，凌教授於2006年開始投入「綠色化學」的研究，為廢棄物處理打造一把再生鑰匙。凌教授的研究團隊開發綠色材質「戊二醛官能化磁性還原氧化石墨烯(MRGOGA)」作為光熱殺菌劑，MRGOGA如同一艘奈米級的航空母艦，可在輸血管內巡航，且能負載不同的捕菌和殺菌武器。這種方法降低了抗生素對身體、環境產生的副作用，也解決細菌抗藥性的問題，2013年研究成果便發表於美國化學學會的奈米期刊(ACS NANO)，獲得近300次的高度被引用率，且獲得兩項美國專利，是利用奈米材料光熱殺菌劑取代化學殺菌劑的經典案例。

近年實驗室導入「流體化學」實驗法，有別於傳統依照實驗方式，一毫不減地加入試劑，一秒不差地掌握攪拌時間，流體化學將「化學方法」變成「連續的生產線」，按



下機器按鈕，反應物與催化劑投放、液體溶解、攪拌加熱等動作通通自動開始，結束後即可取得目標結果，是化學法邁向規模化生產的開始。

目前實驗室正進行保麗龍回收的流體化學實驗，保麗龍如浮冰似地沈入有機溶液中，連串反應自動開始，藉由「磺酸化反應」所得的保麗龍片溶液，烘乾後變成小顆粒，可作為吸附金屬的水質過濾劑，對半導體製程的污水處理相當有幫助。

預計今年退休的凌永健教授，仍持續與團隊擘畫著「以廢止廢」的綠色計畫，實驗室中許多「流體化學機組」的雛形，都是滾動循環經濟的新希望。

凌教授曾擔任本會第 2、3 屆理事，目前擔任環保署環檢所環境檢測機構及車輛檢驗機構評鑑技術委員會委員、環保署環檢所環境檢測標準方法審議委員會委員、環保署環檢所環境檢測機構及車輛檢驗機構現場評鑑專家、衛生署濫用藥物尿液檢驗機構認可審議委員會委員、衛生署管制藥品管理局「濫用藥物尿液檢驗機構」實地評鑑委員、勞工委員會作業環境實驗室認證管理評鑑技術委員會委員、全國認證基金會化學測試領域資深評審員、全國認證基金會化學測試領域評鑑技術委員、財團法人環境品質文教基金會董事、台灣公定分析化學家協會理事、台灣室內空氣品質學會理事、台灣超臨界流體協會理事、台灣質譜學會理事、社團法人台灣層析暨分離科技學會常務理事、社團法人中華民國環境分析學會理事長、Certified Technical Assessor (American Crime Laboratory Directors, Laboratory Accreditation Board)等職務。



專家介紹

【台超萃取洗淨精機股份有限公司 林瑞岳董事長】



❖專長：纖維染色學、織物整理工程、奈米絲光、染顏料合成、染整機械、纖維物理化學、人纖紡絲工程、機能性紡織品暨檢驗、織物分析暨檢驗。

❖email：ray@texray.com

林瑞岳董事長 1977 年畢業於逢甲大學紡織工程學系，是國內知名紡織大廠南緯實業集團董事長，同時也是台灣區製衣公會理事長、台超萃取洗淨精機(股)公司董事長，以及史瓦濟蘭駐台名譽總領事。

林董事長自畢業後即進入紡織產業，堅持「傳產非夕陽、創新譜永續」的信念，成功推動傳統產業轉型，注重創新研發，積極整合上下游產業，建立全球產銷分工體系，提升優勢競爭力。

南緯紡織公司在史瓦帝尼(原名史瓦濟蘭)深耕多年，是史國最大的台商紡織廠，該公司建立一條龍的生產線，雇用當地員工逾 4 千人，對史國經濟、社會發展貢獻卓著。林董事長亦積極參與推動臺史實質合作關係，如南緯公司於史國設有「南緯史瓦濟蘭慈善基金專戶」，每年與慈濟、史瓦濟蘭王母基金會及其它慈善團體共同舉辦慈善賑濟發放活動，並不定時捐贈物資予史國孤兒院，以改善史國貧民生活，充分展現我民間之愛心及企業之社會責任。外交部於 2016 年特頒贈「外交之友貢獻獎」予林董事長，頒贈典禮觀禮貴賓包括多國駐華使節及代表，頒贈儀式隆重溫馨。

林董事長曾任本會第一屆常務理事，第二屆和第三屆理事長，雖然卸下協會的職務，仍然非常關心協會的各項活動與會務，每年的研討會暨年會活動，公司皆大力贊助活動的經費，員工也踴躍報名參與現場活動。



東聯化學股份有限公司

Oriental Union Chemical Corp.



秉持集團立業精神，創造資源永續價值

東聯化學股份有限公司成立於 1975 年，秉持誠信為最高經營原則，以踏實的精神建立內控管理及法規制度，並奠定自律嚴謹的治理文化，為東聯化學的立業之本。

東聯化學創立四十多年來，以生產環氧乙烷及乙二醇等相關化學產品為主，目前擁有臺灣高雄林園廠、子公司中國江蘇揚州二處生產基地，是亞洲地區的化學供應大廠。

東聯化學以生產優質產品、解決客戶問題為目標，於 1987 年在台灣證券交易所掛牌上市，為遠東集團旗下石化能源事業體之一。

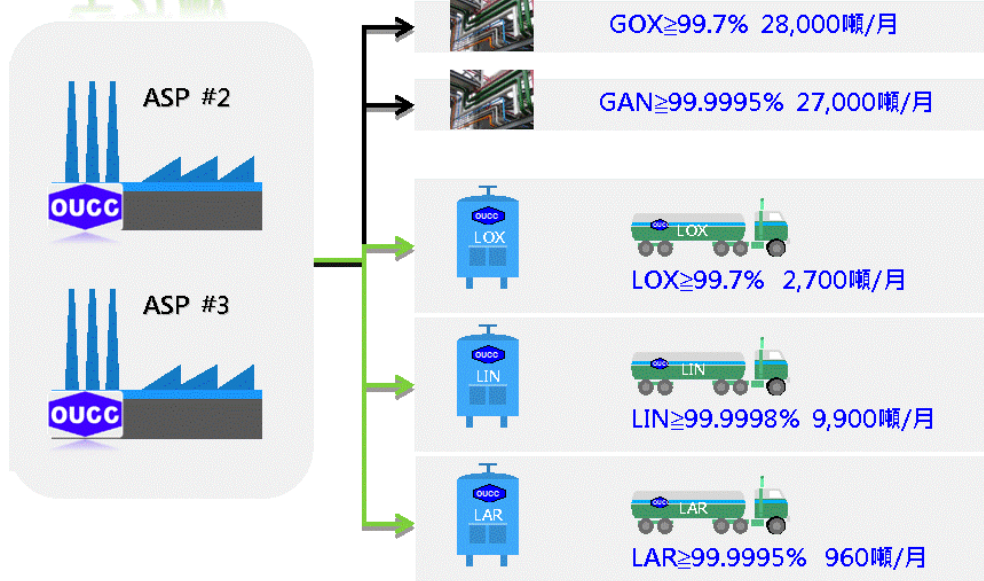
氣體產品介紹

氣體產能：(台灣區)

- 氣體空分廠 2 座+液化機組 1 座：
GN₂+GO₂ 產能 65 萬噸/年，LN₂+LO₂+LO₂ (M)+Lar 產能 17 萬噸/年；
- 二氧化碳廠 3 座：
LCO₂ 電子級 5N+食品級 4N+醫療級 4N+工業級 3N，產能 8.6 萬噸/年；
- On site 製氮機組 3 座，產能 6.5 萬噸/年
- 冷鏈物流氣體應用創新產品。

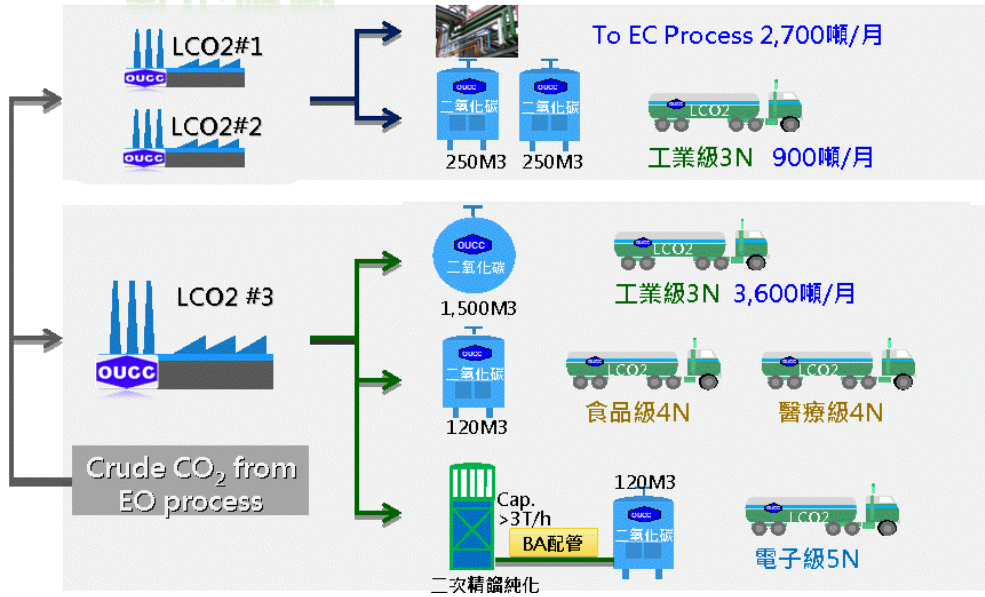
工廠能力：

空分廠





二氧化碳廠



● 產品應用：

- 氧氣: 石化工業、純氧燃燒、金屬切割、廢水處理、焚化爐、醫院及漁業養殖業等。
- 氮氣: 煉油工業、電子及半導體、塑膠、食品冷凍及包裝、化工、金屬熱處理等。
- 氬氣: 焊接、太陽能業、電子及半導體業、金屬製造業等。
- 二氧化碳: 焊接、食品冷凍及包裝、電子及半導體業、碳酸飲料等。

● 立槽、配管及灌裝服務：



本公司擁有液化氣體槽車三十餘輛，液氧、液氮、液氬、LCO2 迅速送達全台各地。



● 遠端液位監控系統：

本公司於全國所有客戶端，斥資安裝遠端監控系統，無線訊號傳輸，24 小時監測客戶端之產品庫存，主動補充庫存服務，全年無休。



中油高雄煉油廠土壤整治只能用燒的嗎？

2021 年 11 月 4 日

郭子禎 / 台灣超臨界流體協會秘書長

高雄市政府為加快中油高雄煉油廠的整治速度，決定現地開挖並在現場以熱脫附或水洗之方法進行土壤復育。這土壤復育方法比不開挖的生物復育法成本更高，卻是可以達到更快速的目的。但是，熱脫附或水洗法明顯存在二次汙染以及處理效果受限的疑慮。煉油廠地下土壤的主要汙染物是以油性的成分為主，尤其有苯汙染的問題，苯不溶於水所以水洗法的效果非常有限。碳氫化合物或苯易溶於有機溶劑，若使用溶劑清洗則有大量廢溶劑需要處理，且有殘留疑慮。

採用熱脫附方式可以有效處理，但是苯的排放將引發更多的二次汙染。另外，高雄煉油廠的歷史悠久，汙染物早已部分氧化並可能擴散至土壤的毛細孔洞中，使得熱脫附的困難度更高。另外，經過熱脫附高溫處理的土壤，如果直接回填肥力恢復相當困難。參考行政院環保署於 104 年出版之「土壤及地下水油品類汙染整治作業參考指引」，專家學者擔心土壤中的一級致癌物苯若處理不慎，將危害附近居民的身體健康。

近日盛傳台積電有意至中油高雄煉油廠現址設置晶圓廠，設廠土地之汙染整治若未採用較先進的綠色整治技術，或在整治過程造成二次汙染引發居民陳抗，恐降低台積電設廠之意願，及違背台積電綠色永續之精神。因此應選擇更節能減碳、低空汙、低廢棄物產生及土壤回填肥力恢復快的復育方式，而超臨界流體萃取法為少數可行方式之一。

超臨界流體萃取法可視為一種溶劑萃取法，最大差異是使用超臨界流體(如：二氧化碳)當作萃取劑，汙染物與萃取劑在降壓後可快速分離且無溶劑殘留問題，萃取溫度低、無空汙排放，濃縮汙染物收集後集中處理，處理後土壤可直接回填種植作物。在現今碳中和議題下許多石化業、煉鋼業排放的二氧化碳將可收集/捕獲，而利用這些收集/捕獲的二氧化碳進行土壤復育，更符合環保署「綠色及永續導向型整治」的精神。

超臨界流體這個專業名詞對一般民眾來說較為陌生，但「超超臨界燃煤發電」這幾個字眼卻常出現在新聞媒體，即使理工背景的讀者也不見得知道這是什麼東西。「超臨界」顧名思義為超過「臨界點」，眾所周知純物質隨著溫度和壓力變化通常以固相、液相、氣相三種相態存在，當三相達成平衡共存時稱為三相點。三相點為固-液、固-氣、液-氣三條共存線的交叉點，在液-氣共存線有一端點就稱為臨界點。此臨界點對應之溫度、壓力分別稱之為臨界溫度、臨界壓力，化學家將高於臨界溫度與臨界壓力之均勻相稱之為超臨界流體。超超臨界則是在遠離臨界點之更高壓力、更高溫度的狀



態，水在此狀態下推動渦輪發電機可有更高的發電效率，發同樣的電可以用較少的煤，因此可以降低空污。

利用超臨界流體萃取清洗汙染土壤，和水洗法或其他液體溶劑清洗汙染土壤的原理相似，但過程中是運用氣體而非水，故無廢水汙染之疑慮，此氣體溶解能力可藉由操控壓力與溫度來調控有無及大小，因此非常適合用於萃取分離用途。超臨界流體最常使用的介質是二氧化碳，超臨界二氧化碳自從 1978 年首度用於啤酒花萃取之商業製程後，陸續應用在咖啡、茶葉之去咖啡因以及香精油萃取等，取代傳統有機溶劑在天然物機能性成分之萃取、分離、純化使用相當廣泛。

超臨界流體適合運用在須離地處理之重度汙染土壤，例如含有高濃度戴奧辛、五氯酚、多氯聯苯、總石油碳氫化合物...等，藉由萃取製程將汙染物從土粒中或礫石表面移除，然後在分離製程中收集濃縮。全部製程均在密閉高壓槽體與管路內進行，無汙染物逸散、空污等二次汙染問題，且操作流體循環回收再使用。處理後的土壤百分之百可回填再使用，而分離收集之高濃度汙染物可進入焚化爐燃燒處理，或以較先進之超臨界水氧化法分解成無害物質後排放。

在商業化處理大量汙染土壤之成本效益評估上，包括建置成本與操作成本，熱脫附法成本高但技術也較成熟，缺點是二次汙染問題需審慎處理。另由於開挖土方量大且汙染程度差異大，為防止得標業者將汙染土壤簡單摻混未受汙染土方，而不加以落實處理汙染土壤。政府必須對於空汙排放及處理後之土壤回填訂定嚴格標準，以保障居民身體健康，及後續興建之廠商的權益，除了廠址派駐勞安與職安人員以外，也應該要有人員專責土壤汙染處理的監工。重度汙染土壤之綠色整治技術可選擇性不多，若要兼顧處理效率、效果(移除率 98%以上)、經濟效益，超臨界流體萃取法為優選方法之一。在實務操作上，超臨界流體萃取法可與熱脫附法搭配使用，對於中高揮發性或總石油碳氫化合物濃度較低者適合用熱脫附法，而低揮發性或總石油碳氫化合物濃度高者則可採用超臨界流體萃取法，兩者併行使用可相對提高處理效益。

台灣超臨界流體協會從 2004 年成立迄今 17 年，致力於超臨界流體技術之工業化應用推廣，在協會成員產學研界的合作努力下，逐步實現技術自主與設備國產化。過去十幾年已經成功將超臨界二氧化碳萃取技術導入保健食品、化妝品業，商業量產設備已可完全自主設計與製造。應用超臨界流體萃取法處理土壤整治復育目前國外已有商業化運用實績，在國內也有相對成功實測經驗，可成為中油高雄煉油廠的最佳解決方案。

資料來源：

<https://tw.news.yahoo.com/%E6%8A%95%E6%9B%B8-%E4%B8%AD%E6%B2%B9%E9%AB%98%E9%9B%84%E7%85%89%E6%B2%B9%E5%BB%A0%E5%9C%9F%E5%A3%A4%E6%95%B4%E6%B2%BB%E5%8F%AA%E8%83%BD%E7%94%A8%E7%87%92%E7%9A%84%E5%97%8E-192459359.html>



田寮咖啡生技莊園陳右直 為了喝杯台灣咖啡，買下一座山林

2021/10/29 經濟日報 吳青常

田寮咖啡生技莊園董事長陳右直，被朋友笑說「為了喝杯台灣咖啡，買下一座山林。」事實上這場美麗的意外，卻成就以 AI 智慧科技農業種植咖啡樹，翻轉高雄月世界泥岩窮山惡地的初心，園區孕育出富含綠原酸的極品阿拉比卡咖啡，淺嘗這一杯甘醇香郁咖啡，絕對是咖啡老饕們解饞的味道。

陳右直說，建置田寮咖啡生技莊園，真是一場美麗的意外，從空中俯瞰高雄田寮的月世界，雖處窮山惡水卻有著荒漠之美，我一下被眼前藍天白雲和特殊的火山景色深深吸引，「在美國多年，五甲地的山林面積，我是真沒有概念，而選定富含多種礦物質土地種植咖啡，運用 AI 智慧科技管理，卻是我的專長。」

陳右直說，五甲的咖啡園全部都是以 AI 智慧種植農業科技，利用智能農業物聯網 (AIOT) 技術擴大經濟面積，藉由大數據提供智能農業應用，整合資源監控滯洪池利用、土壤檢測肥力控制、PH 值，微滴灌系統運作及酸洗滴頭並做土質改良等，可迎合氣候與作物需求，什麼時候該給水、施給何種肥料，均可透過手機 APP 智慧化遠程遙控及自動化控制。

利用大數據管理，可以完全掌握咖啡樹生長的所有實況，透過整個地圖表管理，不僅成功解決農業缺工問題，透過手機全程掌握植物生長供水、用肥的節奏，以園內 700 株咖啡樹為例，導入智慧化自動化農耕模式，從原慣性農法年產能 50 公斤咖啡豆，產能成功提升到 400 公斤以上，所栽種採收的咖啡果，果實碩大飽滿、規格可達如櫻桃般大小。

田寮咖啡生技莊園不僅生產好咖啡，邀請原義守大學化工系教授梁明在，以低溫超臨界二氧化碳萃取技術，歷經 5 年的研發，萃取咖啡豆中的綠原酸，製作成綠原酸相關產品，生物技術和智能科技的完美結合，已經是現在進行式。陳右直說，希望在高雄田寮建立模式，讓更多的年輕人返鄉務農。

資料來源：<https://money.udn.com/money/story/5635/5851838>



亞果生醫營收及獲利再躍升

2021-11-04 工商時報/周榮發

於今年 7 月 27 日經證券櫃買中心核准為興櫃板股票的亞果生醫 (6748) ，由於其應用再生醫學材料所陸續開發的產品契合市場需求，9 月營收較去年同期成長近 53.91% ，毛利率更是直逼 65.81% ；該公司優異的獲利表現，近期獲得法人圈的青睞，已有國內上市櫃企業及國外法人陸續洽談策略合作。

亞果生醫突破傳統之「超臨界二氧化碳」萃取技術，將其應用於動物組織器官之去細胞，其布局全球專利成效驚人，2019 年下半年至今共取得 24 項台灣及國際專利，其中去細胞眼角膜技術發明已經取得台、美、日、韓、中、港、印及歐盟等多國專利。

去細胞軟骨技術發明取得台、日、韓、中、港、印及歐盟等多國專利；去細胞真皮高純度膠原蛋白顆粒技術發明也取得台、美、日、韓等國專利；而剛出爐的「骨基質」產品取得美國 FDA 510 (k) 上市許可以及「去細胞軟骨及其應用」取得美國發明專利，更讓亞果生醫的研發實力受到法人圈的高度肯定。

該公司執行長謝達仁博士表示，除了國際的學理技術發表外，在國內的醫材取證進程也不遑多讓；如膠原蛋白骨基質產品，已取得衛福部 TFDA 第二等級醫材證書及美國 FDA 510 (k) 上市許可，有別於傳統的骨粉填料產品，亞果生醫提供更多元的規格選擇，將有助於拓廣應用範疇。另與三軍總醫院合作組織器官重建再生，動脈重建已經成功完成大鼠動物試驗，未來將造福需要冠狀動脈繞道手術以及血管重建的病患。

亞果生醫具有多項不易取得的國際認證以及正在執行高階醫療器材的人體臨床試驗；這些成果，就企業長遠發展角度，實是相當穩定的支撐，也因為亞果生醫具備多項利基，已獲得投資法人的高度認同與青睞，為下一階段資金募集做好充分準備。

資料來源：<https://wanrich.chinatimes.com/news/20211104900275-420101>



A standardized black pepper seed extract containing β -caryophyllene improves cognitive function in scopolamine-induced amnesia model mice via regulation of brain-derived neurotrophic factor and MAPK proteins

含有 β -石竹烯的標準化黑胡椒籽提取物通過調節腦源性神經營養因子和 MAPK 蛋白改善東莨菪鹼誘導的健忘模型小鼠的認知功能

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Abstract :

β -caryophyllene (BCP), a natural sesquiterpene present in plants, is a selective agonist of cannabinoid receptor type-2 (CB2) of the endocannabinoid system. In this study, we have prepared an extract from *Piper nigrum* (black pepper) seeds using **supercritical fluid** extraction, standardized to contain 30% BCP (Viphyllin™). The beneficial effects of prophylactic treatment with Viphyllin on cognitive functions were demonstrated in Scopolamine-induced dementia model mice. Male Swiss albino mice (25–30 g) were administered with Viphyllin (50 mg and 100 mg/kg body weight *p.o.*) or donepezil (1.60 mg/kg) for 14 days. Subsequently, cognitive deficits were induced by treating the animals intraperitoneally with Scopolamine (0.75 mg/kg). The cognitive behavior of mice was evaluated using a novel object recognition test (NORT) and Morris water maze (MWM) test. The brain homogenates were studied for biochemical parameters including cholinesterase activities and antioxidant status. Western blot analysis was performed to investigate the mechanism of action. Viphyllin dose dependently improved the recognition and spatial memory and cholinergic functions in Scop-treated mice. The extract was found protective against Scop-induced oxidative damage and histopathologic changes in the brain. At 100 mg/kg Viphyllin markedly reduced the proBDNF/mBDNF ratio ($p < .05$) and augmented the TrkB expression ($p < .01$). Viphyllin (100 mg/kg) was found to be neuroprotective by reducing the Scop-induced upregulation of p-JNK and p-p38 MAPK proteins, Bax/Bcl-2 ratio, and caspase activation in the brain. Viphyllin also exerted anti-inflammatory effects by downregulating Cox-2, TNF- α , and NOS-2 in Scop-induced mice ($p < .05$). To summarize, our data encourage Viphyllin as a functional ingredient/dietary supplement for brain health and cognition.



Black Bean (*Phaseolus vulgaris* L.) Polyphenolic Extract Exerts Antioxidant and Antiaging Potential

黑豆 (*Phaseolus vulgaris* L.) 多酚提取物發揮抗氧化和抗衰老潛力

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Abstract :

Phenolic compounds present in common beans (*Phaseolus vulgaris* L.) have been reported to possess antimicrobial, anti-inflammatory and ultraviolet radiation (UVR) protective properties. UVR from sunlight, which consists of UV-B and UV-A radiations, induces reactive oxygen species (ROS) and free radical formation, consequently activating proteinases and enzymes such as elastase and tyrosinase, leading to premature skin aging. The objective of this work was to extract, characterize and evaluate the antioxidant and antiaging potential of polyphenols from a black bean endemic variety. The polyphenolic extract was obtained from black beans by **supercritical fluid** extraction (SFE) using CO₂ with a mixture of water–ethanol as a cosolvent and conventional leaching with a mixture of water–ethanol as solvent. The polyphenolic extracts were purified and characterized, and antioxidant potential, tyrosinase and elastase inhibitory potentials were measured. The extract obtained using the **SFE** method using CO₂ and H₂O–Ethanol (50:50 v/v) as a cosolvent showed the highest total phenolic compounds yield, with 66.60 ± 7.41 mg GAE/g coat ($p > 0.05$) and 7.30 ± 0.64 mg C3GE/g coat ($p < 0.05$) of anthocyanins compared to conventional leaching. Nineteen tentative phenolic compounds were identified in leaching crude extract using ESI-QTOF. Quercetin-3-D-galactoside was identified in crude and purified extracts. The purified SFC extract showed IC₅₀ 0.05 ± 0.002 and IC₅₀ 0.21 ± 0.008 mg/mL for DPPH and ABTS, respectively. The lowest IC₅₀ value of tyrosinase inhibition was 0.143 ± 0.02 mg/mL and 0.005 ± 0.003 mg/mL of elastase inhibition for leaching purified extract. Phenolic compounds presented theoretical free energy values ranging from -5.3 to -7.8 kcal/mol for tyrosinase and -2.5 to -6.8 kcal/mol for elastase in molecular docking (in silico) studies. The results suggest that the purified extracts obtained by **SFE** or conventional leaching extraction could act as antioxidant and antiaging ingredients for cosmeceutical applications.

Keywords: phenolic compounds; black bean; tyrosinase; elastase; antioxidant; **supercritical fluids** extraction



Chicory Extracts and Sesquiterpene Lactones Show Potent Activity against Bacterial and Fungal Pathogens

菊苣提取物和倍半萜內酯對細菌和真菌病原體顯示出有效的活性

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Abstract :

Chicory (*Cichorium intybus* L.) is an important industrial crop cultivated mainly to extract the dietary fiber inulin. However, chicory also contains bioactive compounds such as sesquiterpene lactones and certain polyphenols, which are currently discarded as waste. Plants are an important source of active pharmaceutical ingredients, including novel antimicrobials that are urgently needed due to the global spread of drug-resistant bacteria and fungi. Here, we tested different extracts of chicory for a range of bioactivities, including antimicrobial, antifungal and cytotoxicity assays. Antibacterial and antifungal activities were generally more potent in ethyl acetate extracts compared to water extracts, whereas **supercritical fluid** extracts showed the broadest range of bioactivities in our assays. Remarkably, the chicory **supercritical fluid** extract and a purified fraction thereof inhibited both methicillin-resistant *Staphylococcus aureus* (MRSA) and ampicillin-resistant *Pseudomonas aeruginosa* IBRS P001. Chicory extracts also showed higher antibiofilm activity against the yeast *Candida albicans* than standard sesquiterpene lactone compounds. The cytotoxicity of the extracts was generally low. Our results may thus lead to the development of novel antibacterial and antifungal preparations that are both effective and safe for human use.

Keywords : chicory; bioactivity; antimicrobial; antifungal; biofilm; cytotoxicity



Continuous Liquid-Liquid Extraction and in-Situ Membrane Separation of Miscible Liquid Mixtures

混溶液體混合物的連續液-液萃取和原位膜分離

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Abstract :

Separation operations are critical across a wide variety of manufacturing industries and account for about one-quarter of all in-plant energy consumption in the United States. Conventional liquid-liquid separation operations require either thermal or chemical treatment, both of which have a large environmental impact and carbon footprint. Consequently, there is a great need to develop sustainable, clean methodologies for separation of miscible liquid mixtures. The greatest opportunities to achieve this lie in replacing high-energy separation operations (e.g., distillation) with low-energy alternatives such as liquid-liquid extraction. One of the primary design challenges in liquid-liquid extraction is to maximize the interfacial area between two immiscible (e.g., polar and nonpolar) liquids for efficient mass transfer. However, this often involves energy-intensive methods including ultrasonication, pumping the feed and the extractant through packed columns with high tortuosity, or using a [supercritical fluid](#) as an extractant. Emulsifying the feed and the extractant, especially with a surfactant, offers a large interfacial area, but subsequent separation of emulsions can be energy-intensive and expensive. Thus, emulsions are typically avoided in conventional extraction operations. Herein, we discuss a novel, easily scalable, platform separation methodology termed CLEANS (continuous liquid-liquid extraction and in-situ membrane separation). CLEANS integrates emulsion-enhanced extraction with continuous, gravity-driven, membrane-based separation of emulsions into a single unit operation. Our results demonstrate that the addition of a surfactant and emulsification significantly enhance extraction (by >250% in certain cases), even for systems where the best extractants for miscible liquid mixtures are known. Utilizing the CLEANS methodology, we demonstrate continuous separation of a wide range of miscible liquid mixtures, including soluble organic molecules from oils, alcohols from esters, and even azeotropes.



Design and Engineering of "Green" Nanoemulsions for Enhanced Topical Delivery of Bakuchiol Achieved in a Sustainable Manner: A Novel Eco-Friendly Approach to Bioretinol

以可持續方式實現增強補骨脂酚局部遞送的“綠色”納米乳液的設計和工程：生物視黃醇的新型生態友好方法

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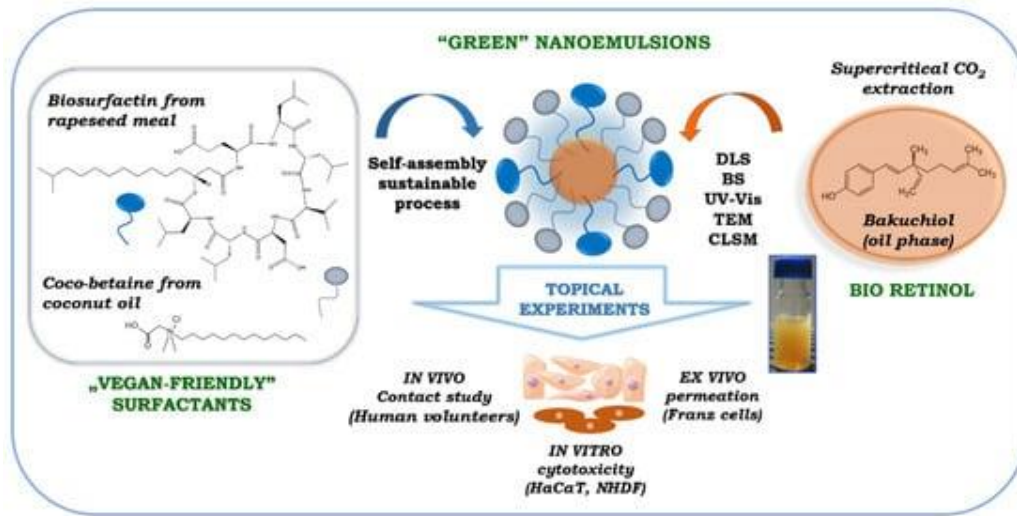
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Abstract :

In the present work, we establish novel “environmentally-friendly” oil-in-water nanoemulsions to enhance the transdermal delivery of bakuchiol, the so-called “bioretinol” obtained from powdered *Psoralea corylifolia* seeds via a sustainable process, i.e., using a **supercritical** fluid extraction approach with pure carbon dioxide (SC-CO₂). According to Green Chemistry principles, five novel formulations were stabilized by “green” hybrid ionic surfactants such as coco-betaine—surfactin molecules obtained from coconut and fermented rapeseed meal. Preliminary optimization studies involving three dispersion stability tests, i.e., centrifugation, heating, and cooling cycles, indicated the most promising candidates for further physicochemical analysis. Finally, nanoemulsion colloidal characterization provided by scattering (dynamic and electrophoretic light scattering as well as backscattering), microscopic (transmission electron and confocal laser scanning microscopy), and spectroscopic (UV–Vis spectroscopy) methods revealed the most stable nanocarrier for transdermal biological investigation. In vitro, topical experiments provided on human skin cell line HaCaT keratinocytes and normal dermal NHDF fibroblasts indicated high cell viability upon treatment of the tested formulation with a final 0.02–0.2 mg/mL bakuchiol concentration. This excellent biocompatibility was confirmed by ex vivo and in vivo tests on animal and human skin tissue. The improved permeability and antiaging potential of the bakuchiol-encapsulated rich



extract were observed, indicating that the obtained ecological nanoemulsions are competitive with commercial retinol formulations. [View Full-Text](#)



Keywords: local delivery; nanoformulations; nanomedicine; [supercritical](#) CO₂ extraction; surfactin; coco-betaine; biosurfactants skin application; HaCaT cell line; NHDF cell line



Hydroxytyrosol-Fortified Foods Obtained by Supercritical Fluid Extraction of Olive Oil

橄欖油超臨界流體萃取得到羥基酪醇強化食品

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Abstract :

A new original process has been set-up to obtain hydroxytyrosol-enriched food by means of CO₂ **supercritical fluid** extraction. The process is based on the direct adsorption of hydroxytyrosol on selected foodstuff (e.g., flour, whole-wheat flour, and sugar) when placed in contact with olive oil (which is known to contain this phenol) under controlled temperature and pressure conditions of **supercritical** CO₂. The transfer of the nutraceutical to the foodstuff was initially evaluated using a fortified olive oil model and was then applied to commercial olive oil and foodstuff. The yield of the hydroxytyrosol transfer was demonstrated to be quantitative. In order to prove the suitability of the final products, hydroxytyrosol-enriched flour was used to prepare a bread roll, which maintained the nutraceutical characteristics after the cooking. Finally, DPPH based experiments were performed to prove the radical scavenging activity of the functionalized foodstuff.

Keywords : hydroxytyrosol; functional foods; CO₂ **supercritical fluid** extraction; flour; whole-wheat flour; sugar



Influence of Supercritical Carbon Dioxide Extraction Conditions on Extraction Yield and Composition of *Nigella sativa* L. Seed Oil-Modelling, Optimization and Extraction Kinetics regarding Fatty Acid and Thymoquinone Content
超臨界二氧化碳提取條件對黑種草籽油提取率和成分的影響-脂肪酸和百里醌含量的建模、優化和提取動力學

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Abstract :

Nigella sativa L. is cultivated in many regions and its seeds have found use in variety of foods, but also in traditional medicine due to high content of biologically active essential oils. In this work optimization of **supercritical** carbon dioxide extraction from *N. sativa* seeds was performed using response surface methodology to describe the influence of extraction conditions on oil yield. Kinetics of oil and thymoquinone extraction were analyzed as well. It was demonstrated that in order to collect thymoquinone-rich *N. sativa* oil fraction, appropriate for health-related applications, the extraction should be carried out at 40 °C and 10–15 MPa. Following application of higher pressure of 35 MPa enables effective extraction of remaining oil rich in polyunsaturated fatty acids suitable for use in food industry.

Thymoquinone-dependent antibacterial activity of the *N. sativa* seed oil was observed against bacterial pathogens: *Haemophilus influenzae*, *Staphylococcus haemolyticus*, *Staphylococcus epidermidis*, *Enterococcus faecalis* and *Escherichia coli*.

Keywords: *Nigella sativa*; thymoquinone; **supercritical fluid** extraction; response surface methodology; antibacterial activity



Multi-product biorefinery from *Arthrospira platensis* biomass as feedstock for bioethanol and lactic acid production

以鈍頂旋藻生物質為原料生產生物乙醇和乳酸的多產品生物精煉廠

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Abstract :

With the aim to reach the maximum recovery of bulk and specialty bioproducts while minimizing waste generation, a multi-product biorefinery for ethanol and lactic acid production from the biomass of cyanobacterium *Arthrospira platensis* was investigated. Therefore, the residual biomass resulting from different pretreatments consisting of **supercritical** fluid extraction (SF) and microwave assisted extraction with non-polar (MN) and polar solvents (MP), previously applied on *A. platensis* to extract bioactive metabolites, was further valorized. In particular, it was used as a substrate for fermentation with *Saccharomyces cerevisiae* LPB-287 and *Lactobacillus acidophilus* ATCC 43121 to produce bioethanol (BE) and lactic acid (LA), respectively. The maximum concentrations achieved were 3.02 ± 0.07 g/L of BE by the MN process at 120 rpm 30 °C, and 9.67 ± 0.05 g/L of LA by the SF process at 120 rpm 37 °C. An economic analysis of BE and LA production was carried out to elucidate the impact of fermentation scale, fermenter costs, production titer, fermentation time and cyanobacterial biomass production cost. The results indicated that the critical variables are fermenter scale, equipment cost, and product titer; time process was analyzed but was not critical. As scale increased, costs tended to stabilize, but also more product was generated, which causes production costs per unit of product to sharply decrease. The median value of production cost was US\$ 1.27 and US\$ 0.39, for BE and LA, respectively, supporting the concept of cyanobacterium biomass being used for fermentation and subsequent extraction to obtain ethanol and lactic acid as end products from *A. platensis*.



Resource recovery of lignocellulosic biomass waste into lactic acid - Trends to sustain cleaner production

將木質纖維素生物質廢物資源回收為乳酸 - 維持清潔生產的趨勢

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Abstract :

Biomass waste generation concerns regulatory authorities to develop novel methods to sustain biotransformation processes. Particularly, lactic acid (LA) is a bulk commodity chemical used in diverse industries and holds a growing global market demand. Recently, lignocellulosic waste biomass is preferred for LA bio-production because of its non-edible and inexpensive nature. However, the information about new pretreatment methods for lignocellulosic feedstock, and novel strains capable to produce LA through fermentation is limited. Therefore, this review highlights the advancement of pretreatments methods of lignocellulosic biomass and biotransformation. Herein, we first briefly explored the main sources of lignocellulosic waste biomass, then we explored their latest advances in pretreatment processes particularly supercritical fluid extraction, and microwave-assisted extraction. Approaches for bioconversion were also analyzed, such as consolidated bioprocessing (CBP), simultaneous saccharification and fermentation (SSF), separate hydrolysis fermentation (SHF), among other alternatives. Also, new trends and approaches were documented, such as metagenomics to find novel strains of microorganisms and the use of recombinant strategies for the creation of new strains. Finally, we developed a holistic and sustainable perspective based on novel microbial ecology tools such as next-gen sequencing, bioinformatics, and metagenomics. All these shed light on the needs to culture powerful microbial isolates, co-cultures, and mixed consortia to improve fermentation processes with the aim of optimizing cultures and feedstock pretreatments.

Keywords: Lignocellulosic waste biomass, Bioconversion, Lactic acid
Amylolytic bacteria, Metagenomics: fermentation, Consolidated bioprocess



Sustainable Extraction Techniques for Obtaining Antioxidant and Anti-Inflammatory Compounds from the Lamiaceae and Asteraceae Species

從唇形科和菊科物種中獲得抗氧化和抗炎化合物的可持續提取技術

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Abstract :

Melissa officinalis L. and *Origanum majorana* L., within Lamiaceae family, and *Calendula officinalis* L. and *Achillea millefolium* L., within the Asteraceae, have been considered a good source of bioactive ingredients with health benefits. In this study, the **supercritical fluid** extraction (SFE) using pure CO₂, and the ultrasound assisted extraction (UAE) were proposed as green techniques to obtain plant-based extracts with potential antioxidant and anti-inflammatory activities. Higher values of total phenolic content and antioxidant activity were achieved in UAE ethanol:water (50:50, v/v) extracts. Meanwhile, UAE pure ethanol extracts showed greater anti-inflammatory activity. RP-HPLC-PAD-ESI-QTOF-MS/MS analysis showed a vast number of phenolic compounds in the extracts, including unreported ones. *O. majorana* ethanol:water extract presented the highest content of phenolics and antioxidant activity; among its composition, both rosmarinic acid and luteolin glucoside derivatives were abundant. The pure ethanol extract of *A. millefolium* resulted in an important content of caffeoylquinic acid derivatives, luteolin-7-O-glucoside and flavonoid aglycones, which could be related to the remarkable inhibition of TNF- α , IL-1 β and IL-6 cytokines. Besides, borneol and camphor, found in the volatile fraction of *A. millefolium*, could contribute to this latter activity. Thus, this study points out that *O. majorana* and *A. millefolium* are considered a promising source of bioactive ingredients with potential use in health promotion.

Keywords: *Achillea millefolium*; *Origanum majorana*; anti-inflammatory activity; antioxidant activity; sustainable extraction; phenolic composition