

近代紅景天的發展和臨床應用

Golden root, Rose root, Arctic root



庫頁紅景天 (俞篤文博士攝)
Rhodiola sachalinensis A. Bor

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1. 從植物分類學認識紅景天

科：	景天科 Crassulaceae
屬：	紅景天屬 Rhodiola
種：	玫瑰紅景天 (薔薇紅景天) <i>R. rosea</i> 庫頁紅景天 (高山紅景天) <i>R. sachalinensis</i> 大花紅景天 <i>R. crenulata</i>
基源:	根及根莖 (roots and rhizomes)

庫頁紅景天的根和根莖

拍攝地點: 吉林省延邊州安圖縣
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認識根和根莖

根莖（英語：Rhizome）是植物在地下變態莖的一種。某些植物的枝幹部分，但是並不在地面以上生長，而是在土壤中生長，從形態上看，又似植物的根。

根的作用是吸收土壤中的水和礦物質
根莖只是擴展植物的體積。類似的現象還有有塊莖。

根莖保留允許新梢向上生長的能力，植物用根莖存儲澱粉，蛋白質和其他營養物質，當新梢過冬，這些營養成分變得對植物有用，這是一個營養繁殖的過程。



紅景天是雌雄異株

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不同年份的紅景天根和根莖



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不同年份的紅景天根和根莖

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四年生的紅景天



庫頁紅景天的地上部

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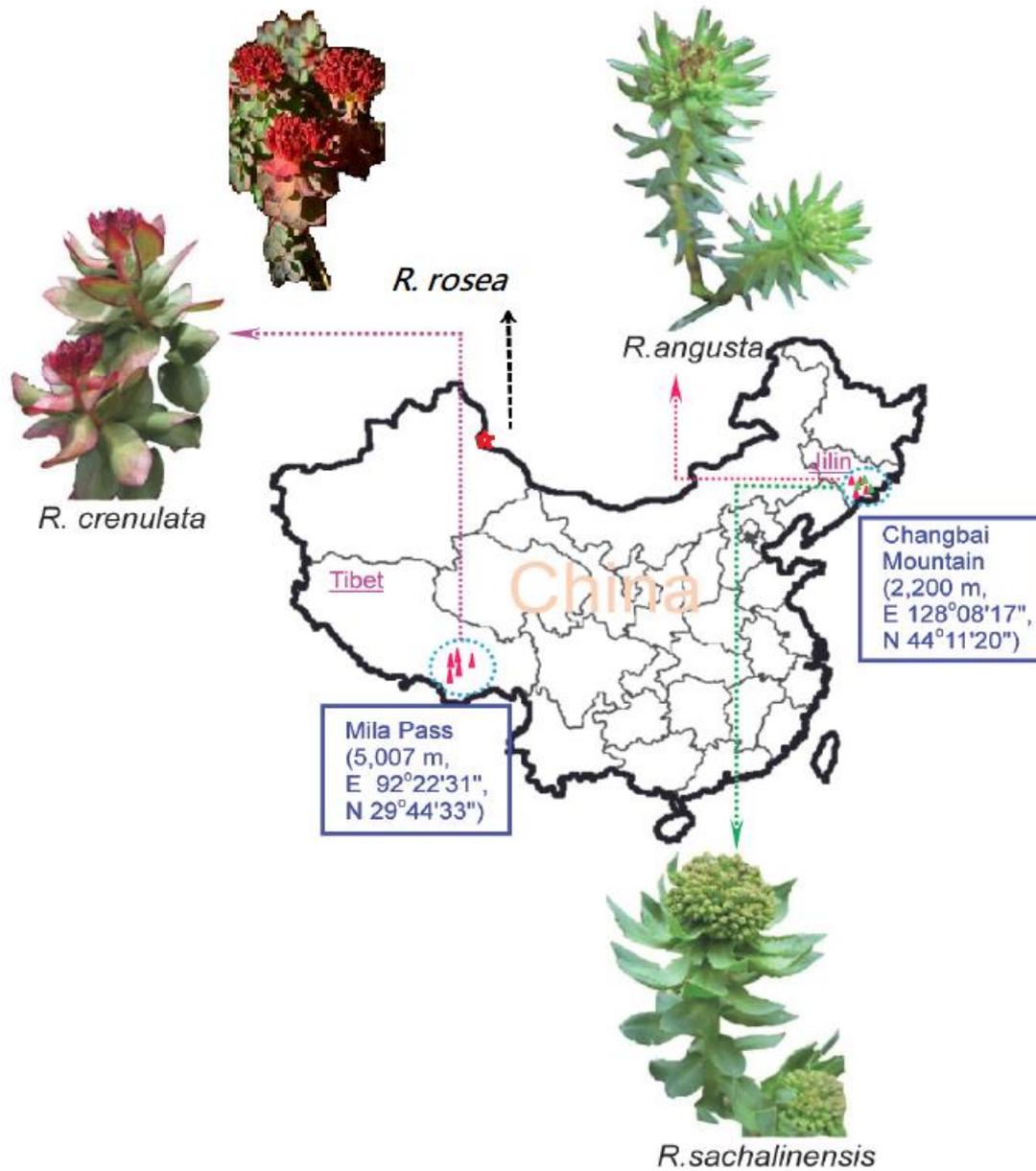
2. 從地理分布認識紅景天

1. 全世界共有90多種紅景天，在中國70多個種
2. 主要分佈于北半球『高寒地帶』，亞洲的北部、朝鮮、日本、北美洲和北歐
3. 常用的有三種: 玫瑰紅景天(*Rhodiola rosea* L.)、庫頁紅景天(*Rhodiola sachalinensis* A. Bor)和大花紅景天(*Rhodiola crenulata* H. Ohba)

紅景天在世界的主要產地

Asia	Europe	North America
Gansu, China	Austria	British Columbia, Canada
Hebei, China	Bulgaria	North-Western Territory, Canada
Jilin, China	Czech Republic	Yukon Territory, Canada
Shanxi, China	Finland	Alaska, USA
Sichuan, China	France	California, USA
Xinjiang, China	Groenland	Colorado, USA
Mongolia	Iceland	Idaho, USA
Kazakhstan	Ireland	Minnesota, USA
Uzbekistan	Italy	Montana, USA
Altai, Russia	Norway	Nevada, USA
Siberia, Russia	Poland	New Mexico, USA
Kamciatka, Russia	Romania	New York, USA
Habarovsk, Russia	Spain	Oregon, USA
Magadan, Russia	Sweden	Tennessee, USA
	Great Britain	Utah, USA
	FormerYugoslavia	Virginia, USA
		Washington, USA
		Wyoming, USA

- The geographical spreading of the species included in the *Rhodiola* genus
- (<http://rhodiolarosea.org/rhodiola-rosea-taxonomy-rhodiola-geographical-distribution>)



3. 從人類使用歷史認識紅景天

紅景天又名「仙賜草」，是由清康熙帝所命名

歷史記載是清康熙時期，準噶爾部的阿拉布坦叛變，康熙帝御駕親征卻不幸中伏，在日夜數日馬不停蹄的逃跑中，因為有紅景天的幫助，消除軍旅疲憊而逃過一難，爾后最終平定了阿拉布坦叛變，因此，清康熙帝親筆手書將紅景天稱之「仙賜草」，這是歷史上可考據的記載，也就是說庫頁紅景天有人體使用經驗可以考究到200年以上。

紅景天藏名「蘇羅瑪寶」，其意為『神草』

藏醫學: 四部醫典和珍珠本草

蘇羅瑪寶（藏語音譯）

生長在西藏高原海拔4000公尺以上高寒地區，無污染環境下生長的一種珍貴藥用植物。兩千年前，人們就已懂得用紅景天克服空氣稀薄帶來的高山症，並有消除疲勞、活血、順氣之療效。



紅景天的斷面血紅色，散發濃厚的奇香，如同玫瑰花香，是喇嘛隨身攜帶之物，具有淨化和灑淨的作用

大花紅景天

紅景天，西方國家稱之為「黃金之根」，「玫瑰之根」及「極地之根」，其又名『高原人參』

Golden root, Rose root, Arctic root

紅景天也是北歐等國傳統的草藥 (traditional herb medicine)，用於改善血液循環和消除疲勞，因為紅景天溶在水中呈現琥珀色，又具有特殊的玫瑰花香，因此有『黃金根』和『玫瑰之根』的美譽。由於紅景天和人參一樣，具有耐寒抗凍的特性，可以在零下40度存活，故又有『極地之根』和『高原人參』的名號。

對於工作能力下降，睡眠障礙，食欲不振、躁動不安、高血壓、頭痛、疲憊等原因導致體力和精神不佳的狀況有很好的效果。

紅景天，蘇聯，太空人

紅景天的近代研究始于20世紀50年代，由於美國和蘇聯的太空競賽，蘇聯為克服太空人在宇宙中的生理狀態，疲勞、專注力、空間壓力和宇宙射線。前蘇聯基洛夫軍事學院在尋找強壯劑時發現，紅景天具有**抗壓力作用及刺激神經系統、降低憂鬱症狀、消除疲勞、預防高原反應**等作用。

1976年蘇聯將紅景天應用於“適應原”樣藥物，作為宇航員、飛行員、潛水員和運動員等消除疲勞和增加活力。

4. 從高山症認識紅景天的效能

高山症：主要的原因是生理缺氧

紅景天最大的特點：增加血液涵氧量 and 組織的耐缺氧



高山症 (Altitude illness)，或稱「**高原反應**」（英語：**Altitude sickness**，**acute mountain sickness**，縮寫「**AMS**」）

高山症發生的原因

隨著高度的增加，大氣壓力逐漸的降低，吸入的氧氣也隨著降低。高山症，就是在低壓缺氧的高山環境裏，所產生的病狀，當上升的速度，超過身體適應的能力時，高山症就會發生。

高山症的病理

人體在高海拔狀態由於氧氣濃度降低而出現的急性病理變化表現。高山症可以發展成肺水腫（英語：High-altitude pulmonary edema）（HAPE, high altitude pulmonary oedema）和腦水腫（HACE, high altitude cerebral oedema），嚴重時可致死。

高山症，只是高山的原因嗎？ 平地和平常也可能發生？

高山症一般發生2000米以上，為什麼爬郊山和平地也會有高山症？

一般講的**高山症**是指：當攀升太高太快，人體內組織缺氧，身體來不及充份適應。這時**和體力好不好、身體強不強壯無關，和身體是否耐缺氧能力才是主要原因。**



高山症，只是高山的原因嗎？ 平地和平常也可能發生？

除了高度，還有其他的因素會影響缺氧？

環境氣壓下降：空氣稀薄，肺部換氧效率降低，造成動脈含氧下降。

運動氣壓下降：在高海拔運動，動脈內氣壓反而會下降。

睡眠氣壓下降：在高海拔睡覺，呼吸的換氧能力在睡眠中會明顯下降很多，
所得到的休息比較沒有效。

緯度氣壓下降：大氣壓力越遠離赤道越低

季節影響氣壓：冬天的大氣壓力比夏天低

日夜影響氣壓：晚上的大氣壓力比白天低



高山症的分級

輕度症狀：**頭痛、頭暈、厭食、失眠、噁心、周邊水腫、全身倦怠**等。

中度症狀：**嘔吐、使用一般止痛藥無法緩解的頭痛、尿量減少**等。

重度症狀：**意識改變、步態不穩、休息時呼吸困難、肺部可聽到囉音、以及發紺**。



為什麼要談高山症？



壓力大，睡不好，好疲倦喔！

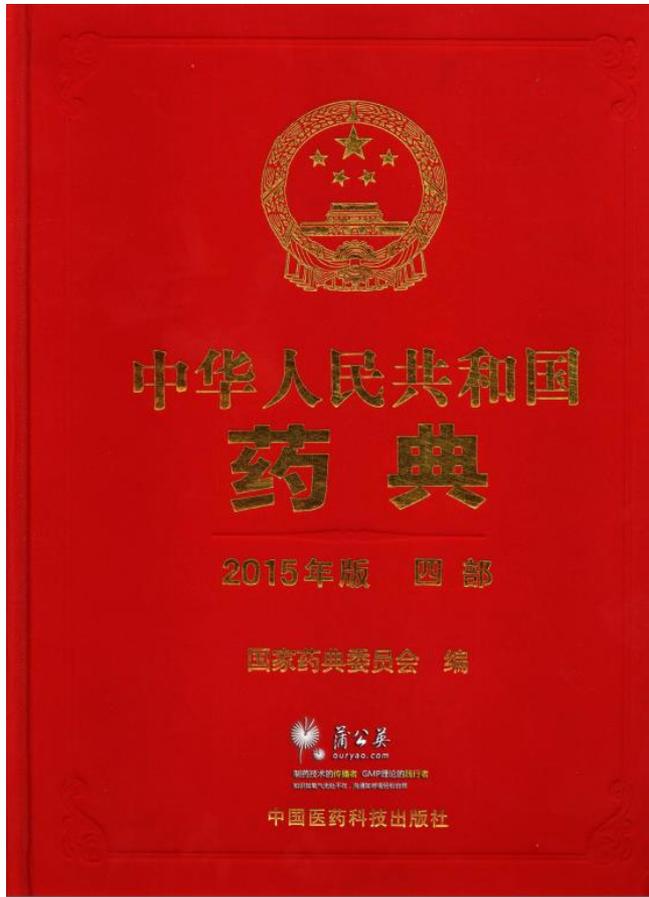
紅景天既然能預防高山症，代表紅景天的藥理作用，俱備對治作用？



即『扶正固本』的『適應原』作用。

所以，紅景天廣泛應用于保健醫學、運動醫學、航太醫學和預防醫學等。對於壓力大、工作時間長、血液循環較差、腎臟病、老年人心衰竭，慢性肺阻塞、記憶力退化等。易於疲勞，缺氧或耗氣量大的環境和崗位上的工作者，作為抗疲勞、抗缺氧和延緩衰老。

5. 藥典對紅景天的記載



中國大陸藥典 2015版

红景天

【性状】 本品为橙红色片状或粉状结晶，片状的一面光滑略具光泽，另一面较粗糙。粉末橙色。质硬，性脆，遇光颜色逐渐变深。气微。

【鉴别】 取本品 0.5g，加水 10ml，搅匀，缓缓滴加适量的盐酸溶解，溶液显汞盐(附录Ⅳ)的鉴别反应。

【检查】 亚砷化合物 取本品 0.5g，加稀盐酸 25ml，溶解后，溶液允许显微法。

氯化物 取本品 0.5g，加水适量与硝酸 3ml，溶解后，加水稀释使至约 40ml，依法检查(附录Ⅳ C)。如显浑浊，与标准氯化钠溶液 3ml 制成的对照液比较，不得更浓(0.006%)。

【含量测定】 取本品约 0.2g，精密称定，加稀硝酸 25ml 溶解后，加水 80ml 与硫酸铁铵指示液 2ml，用硫氰酸铵滴定液(0.1mol/L)滴定。每 1ml 硫氰酸铵滴定液(0.1mol/L)相当于 10.83mg 的氧化汞(HgO)。

本品含氧化汞(HgO)不得少于 99.0%。

【性味与归经】 辛，热，有大毒。归肺、脾经。

【功能与主治】 拔毒，除腐，去腐，生肌。用于痈疽疔疮，梅毒下疳，一切恶疮，肉暗紫黑，腐肉不去，窦道瘰疬，脓水淋漓，久不收口。

【用法与用量】 外用适量，研极细粉单用或与其他药味配成散剂或制成药捻。

【注意】 本品有毒，只可外用，不可内服；外用亦不宜久用；孕妇禁用。

【贮藏】 置于干燥处，遮光，密闭。

红景天

Hongjingtian

RHODIOLAE CRENULATAE RADIX
ET RHIZOMA

本品为景天科植物大花红景天 *Rhodiola crenulata* (Hook. f. et Thoms.) H. Ohba 的干燥根和根茎。秋季花茎凋谢后采挖，除去粗皮，洗净，晒干。

【性状】 本品根茎呈圆柱形，粗短，略弯曲，少数有分枝，长 5~20cm，直径 2.9~4.5cm。表面棕色或褐色，粗糙有褶皱，剥开外表皮有一层膜质黄色表皮且具粉红色花纹；宿存部分老花茎，花茎基部被三角形或卵形膜质鳞片；节间不规则，断面粉红色至紫红色，有一环纹，质轻，疏松。主根呈圆柱形，粗短，长约 20cm，上部直径约 1.5cm，侧根长 10~30cm；断面橙红色或紫红色，有时具裂隙。气芳香，味微苦涩、后甜。

【鉴别】 (1) 本品根横切面：木栓层 5~8 列细胞，栓内层细胞椭圆形、类圆形。中柱占绝大部分，有多数维管束排列成 2~4 轮环，外轮维管束较大，为外韧型；内侧 2~3 轮维管束渐小，为周木型。

根茎横切面：老根茎有 2~3 条木栓层带，嫩根茎无木栓

层带。木栓层为数列细胞，栓内层不明显。皮层窄。中柱维管束为大型的周韧型维管束，放射状环列；维管束中内侧和外轮的维管组织发达呈对列状，中间为薄壁组织，韧皮部和木质部近等长，被次生射线分隔成细长条形，形成层明显。髓部宽广，由薄壁细胞组成，散生周韧型的髓维管束。薄壁细胞含有棕色分泌物。

(2) 照薄层色谱法(附录Ⅵ B)试验，吸取(含量测定)项下的对照品溶液和供试品溶液各 10 μ l，分别点于同一硅胶 G 薄层板上，以三氯甲烷-甲醇-丙酮-水(6:3:1:1)的下层溶液为展开剂，展开，展距 18cm，取出，晾干，置碘蒸气中熏。供试品色谱中，在与对照品色谱相应的位置上，显相同颜色的斑点。

【检查】 水分 不得过 12.0%(附录Ⅳ H 第一法)。

总灰分 不得过 8.0%(附录Ⅳ K)。

酸不溶性灰分 不得过 2.0%(附录Ⅳ K)。

【浸出物】 照醇溶性浸出物测定法(附录Ⅳ A)项下的热浸法测定，用 70%乙醇作溶剂，不得少于 22.0%。

【含量测定】 照高效液相色谱法(附录Ⅵ D)测定

色谱条件与系统适用性试验 以十八烷基硅烷键合硅胶为填充剂；以甲醇-水(15:85)为流动相；检测波长为 275nm。理论板数按红景天苷峰计算应不低于 2000。

对照品溶液的制备 取红景天苷对照品适量，精密称定，加甲醇制成每 1ml 含 0.5mg 的溶液，即得。

供试品溶液的制备 取本品粉末(过三号筛)约 0.5g，精密称定，置具塞锥形瓶中，精密加入甲醇 10ml，密塞，称定重量，超声处理 30 分钟，放冷，再称定重量，用甲醇补足失重的重量，摇匀，滤过，取续滤液，即得。

测定法 分别精密吸取对照品溶液与供试品溶液各 10 μ l，注入液相色谱仪，测定，即得。

本品按干燥品计算，含红景天苷(C₁₅H₂₀O₅)不得少于 0.50%。

饮片

【炮制】 除去须根、杂质，切片，干燥。

【性味与归经】 甘、苦、平。归肺、心经。

【功能与主治】 益气活血、通脉平喘。用于气虚血瘀，胸痹心痛，中风偏瘫，倦怠气喘。

【用法与用量】 3~6g。

【贮藏】 置通风干燥处，防潮，防蛀。

麦冬

Maidong

OPHIPOGONIS RADIX

本品为百合科植物麦冬 *Ophiopogon japonicus* (L. f.) Ker-Gawl. 的干燥块根。夏季采挖，洗净，反复暴晒、堆置，至七八成干，除去须根，干燥。

中华人民共和国卫生部药政管理局
中国药品生物制品检定所 编

现代 实用本草

上册

人民卫生出版社

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宁夏药品检验所 邢世瑞

67 红景天

Hongjingtian
Radix et Rhizoma Rhodiolae
Rhodiola Root and Rhizome

【别名】高山红景天

本品属近年新开发的药材, 为景天科植物库页红景天 *Rhodiola sachalinensis* A. Bor. 的根及根茎。

红景天在我国已有一定的药用历史, 据记载清、康熙皇帝在平息阿拉布坦的叛乱中, 即用红景天消除军旅疲惫。红景天产地用其作滋补强壮药, 消除疲劳, 抵御寒冷。皇室将红景天作为贡品索取, 乾隆时蒙古土尔扈特部从伏尔加河流域回归祖国时给皇室的贡品中就有红景天^[1]。1976年苏联将红景天用为“适应原”样药物, 用于宇航员、飞行员、潜水员、运动员等消除疲劳、增加活力。在此启迪下, 近年国内将其作为强壮药物, 并开发多种制剂、保健食品及饮料, 用于延缓衰老、老年性心衰、镇静、糖尿病等。

红景天原植物始载于1939年《苏联植物志》, 第9卷, 为景天科植物 *Rhodiola sachalinensis* A. Bor., 1980年中国科学院林业土壤研究所编《东北植物志》将其中文名定为: “高山红景天”^[2]; 1984年中国科学院中国植物志编辑委员会编: 《中国植物志》将“高山红景天”中文名改定为: 库页红景天^[3]。我国红景天主产于东北长白山区, 近年已将野生变家种培植成功, 由于植化、药理的研究, 认证了栽培品的药用价值, 为红景天的广泛应用提供了资源保证。

《中国药典》1977年版一部, 收载的红景天不是此种, 而是藏族习用的药材, 该品系大株红景天 *Rhodiola kirilowii* (Regel) Regel 或唐古特红景天 *Rhodiola olgida* (Ledeb.) Fu. var. *tangulica* (Maxim) Fu. 的干燥根及根茎。《中国药典》1985年版与1990年版一部附录中收载的原植物均为大株红景天, 功能主治亦不同^[4]。

1. 中枢抑制作用 红景天水煎剂能明显延长硫贲妥钠对小鼠的催眠作用时间; 拮抗咖啡因对小鼠的惊厥作用。红景天甙能显著的抑制小鼠自发活动, 表现出明显的镇静作用。

2. 抗疲劳作用 红景天水煎剂能延长小鼠在冰水中游泳时间。红景天提取物和红景天甙能延长小鼠负重游泳时间, 红景天提取物能延长小鼠抓棒至疲劳的时间。

3. 强心作用 红景天水煎剂和红景天甙可使心脏收缩幅度增加。红景天甙可使巴比妥钠麻醉的猫血压上升 20~25mmHg。

4. 抗炎作用 红景天水煎剂可抑制右旋糖酐所致的大鼠浮肿。红景天甙能抑制小鼠由于皮下注射松节油引起的白血球增加。红景天浸膏能兴奋肾上腺皮质。

5. 抑制血糖升高作用 红景天水煎剂和红景天甙均能对抗肾上腺素所致的血糖升高作用。

6. 抗过氧化作用 红景天水煎剂和红景天甙在体外实验能抑制大鼠肝匀浆内过氧化脂质的生成。红景天甙元对大鼠脑和心匀浆内过氧化脂质的生成也有抑制作用, 对小鼠多次给药可抑制小鼠血清内过氧化脂质的生成, 对小鼠脑、心和肝内的过氧化物的生成也都有明显的抑制作用。

7. 抗微波辐射作用 红景天甙能预防由微波辐射所致的脑内 5-HT 和脾淋巴细胞转化率下降。

8. 毒性小 红景天水煎剂给小鼠静脉注射, 测得 LD₅₀ 为 328±4.1g/kg。给小鼠注射红景天甙 3g/kg 观察 5 天未见毒性反应和死亡。给小鼠静脉注射红景天甙元, 测得 LD₅₀ 为 1130±23mg/kg^[1]。

【功能与主治】 味甘、性温。有强壮的功能。用于老年性心衰, 抗疲劳、镇静、糖尿病等。

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吉林省药品检验所 任国栋 孙玉彬 袁 坚 钱本余

【药品名称】

通用名称: 大株红景天片

汉语拼音: Dazhu Hongjingtian Pian

【成分】 大株红景天。

【性状】 本品为薄膜衣片, 除去薄膜衣显棕黄色至棕褐色; 味苦。

【功能主治】 活血化痰, 通脉止痛。用于心血瘀阻引起的冠心病、心绞痛, 症见胸痛、胸闷、心慌、气短等。

【规格】 每片重 0.4g

【用法用量】 口服。一次 2 片, 一日 3 次。

【不良反应】 个别患者服药后出现口干、胃部不适。

【禁忌】 孕妇禁用。

【注意事项】 尚不明确。

【贮藏】 密封, 置阴凉干燥处。

【包装】 口服固体药用高密度聚乙烯瓶。每瓶装 60 片。

【有效期】 18 个月

【执行标准】 国家食品药品监督管理局药品标准 YBZ15892005-2009Z

【批准文号】 国药准字 Z20050436

中國大陸紅景天藥品仿單

and dilute with *Solvent* to volume. Centrifuge, or pass through a filter of 0.45- μ m or finer pore size.

Chromatographic system
(See *Chromatography* (621), *System Suitability*.)

Mode: LC

Detector: UV 254 nm

Column: 4.6-mm \times 25-cm; end-capped 5- μ m packing L1

Column temperature: 45°

Flow rate: 1 mL/min

Injection volume: 10 μ L

System suitability

Samples: *Standard solution A* and *Standard solution B*

Suitability requirements

Chromatogram similarity: The chromatogram obtained from *Standard solution A* is similar to the reference chromatogram provided with the lot of USP Powdered Red Clover Extract RS being used.

Tailing factor: NMT 2.0 for the formononetin peak, *Standard solution B*

Relative standard deviation: NMT 2.0%, determined from the formononetin peak in repeated injections, *Standard solution B*

Analysis

Samples: *Standard solution A*, *Standard solution B*, and *Sample solution*

Identify the peaks corresponding to daidzein, genistein, formononetin, and biochanin A in the *Sample solution* chromatogram by comparison with the chromatogram obtained from *Standard solution A* and the reference chromatogram. Measure the areas of the analyte peaks.

Separately calculate the percentage of each isoflavone in the portion of Powdered Extract taken:

$$\text{Result} = (r_u/r_s) \times C_s \times 100$$

r_u = peak response for each relevant isoflavone from the *Sample solution*

r_s = peak response for daidzein, genistein, formononetin, or biochanin A from *Standard solution B*

C_s = concentration of daidzein, genistein, formononetin, or biochanin A in *Standard solution B* (mg/mL)

Acceptance criteria: 90.0%–110.0% of the labeled amount of isoflavones as the sum of daidzein, genistein, formononetin, and biochanin A, calculated on the dried basis

CONTAMINANTS

HEAVY METAL IMPURITIES—PROCEDURES (233)

Acceptance criteria

Arsenic: NMT 1.0 μ g/g

Cadmium: NMT 0.5 μ g/g

Lead: NMT 5.0 μ g/g

Mercury: NMT 1.0 μ g/g

MICROBIAL ENUMERATION TESTS (2021): The total aerobic microbial count does not exceed 10^4 cfu/g, the total combined molds and yeasts count does not exceed 10^3 (fu/g), and the enterobacterial count is NMT 10^3 cfu/g.

ABSENCE OF SPECIFIED MICROORGANISMS (2022): It meets the requirements of the tests for absence of *Salmonella* species and *Escherichia coli*.

SPECIFIC TESTS

LOSS ON DRYING (731)

Analysis: Dry 1 g at 105° for 2 h.

Acceptance criteria: NMT 5.0%

OTHER REQUIREMENTS: It meets the requirements for Packaging and Storage, Residual Solvents, and Pesticide Residues in *Botanical Extracts* (565).

ADDITIONAL REQUIREMENTS

PACKAGING AND STORAGE: Preserve in tight, light-resistant containers, in a cool place.

• LABELING: The label states the Latin binomial and, following the official name, the part of the plant from which the article was prepared. The label also indicates the content of isoflavones, the extracting solvent or solvent mixture used for preparation, and the ratio of the starting crude plant material to Powdered Extract. It meets the requirements for labeling in *Botanical Extracts* (565).

• USP REFERENCE STANDARDS (11)

- USP Biochanin A RS
- USP Daidzein RS
- USP Formononetin RS
- USP Genistein RS
- USP Hyperoside RS
- USP Powdered Red Clover Extract RS

Riboflavin—see *Riboflavin General Monographs*

Riboflavin Tablets—see *Riboflavin Tablets General Monographs*

Riboflavin 5'-Phosphate Sodium—see *Riboflavin 5'-Phosphate Sodium General Monographs*

Rhodiola rosea

DEFINITION

Rhodiola rosea consists of the dried roots and rhizomes of *Rhodiola rosea* L. (Fam. Crassulaceae). It contains NLT 0.3% of phenylpropanoid glycosides calculated as the sum of rosarin, rosavin, and rosin; and NLT 0.08% salidroside; both calculated on the dried basis.

IDENTIFICATION

• A. *Rhodiola rosea* meets the requirements under *Specific Tests, Botanic Characteristics*.

• B. THIN-LAYER CHROMATOGRAPHY

Standard solution A: 1.0 mg/mL of USP Rosavin RS in methanol

Standard solution B: 50 mg/mL of USP *Rhodiola rosea* Root and Rhizome Dry Extract RS in methanol. Sonicate for 10 min, centrifuge, and use the supernatant.

Sample solution: Sonicate for 10 min about 0.5 g of *Rhodiola rosea*, finely powdered, in 5 mL of methanol, centrifuge, and use the supernatant.

Chromatographic system

(See *Chromatography* (621), *Thin-Layer Chromatography*.)

Adsorbent: Chromatographic silica gel with an average particle size of 5 μ m (HPTLC plates)

Application volume: 3 μ L of *Standard solution A*, 5 μ L each of *Standard solution B* and *Sample solution*; as 8-mm bands

Relative humidity: Condition the plate to a relative humidity of about 33% using a suitable device

Developing solvent system: A mixture of ethyl acetate, methanol, water, and formic acid (77:13:10:2)

Developing distance: 6 cm

Derivatization reagent: Dissolve 1 g of diphenylamine in 40 mL of acetone, add 1 mL of aniline, and mix.

Carefully add 7.5 mL of phosphoric acid, and mix.

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Analysis

Samples: *Standard solution A*, *Standard solution B*, and *Sample solution*

Apply the samples as bands to a suitable high performance thin-layer chromatographic plate, and dry in air. Develop the chromatograms in a saturated chamber, remove the plate from the chamber, and dry in air. Derivatize the plate with *Derivatization reagent*, heat at 120° for 5 min, and examine under visible light.

System suitability: The chromatogram of *Standard solution B* exhibits, in the lower half, three gray bands and two brownish bands, one above and the other below the gray bands; the most intense band in the chromatogram is the brownish band with an R_f below the gray bands; the most intense gray band is the lower band at an R_f corresponding to the band due to rosavin in the chromatogram of *Standard Solution A*; the upper gray band due to rosarin is less intense.

Acceptance criteria: The chromatogram of the *Sample solution* exhibits a gray band corresponding to the band due to rosavin in the chromatogram of *Standard Solution A*, and the following bands corresponding to similar bands in the chromatogram of *Standard solution B*: two additional gray bands and two brownish bands, one above and the other below the gray bands; the most intense band in the chromatogram is the brownish band with an R_f below the gray bands; the most intense gray band is the lower band due to rosavin.

• C. HPLC

Analysis: Proceed as directed in the test for Content of Phenylpropanoid Glycosides and Salidroside.

Acceptance criteria: The chromatogram of the *Sample solution* exhibits peaks at the retention times corresponding to the peaks due to salidroside, tyrosol, rosarin, rosavin, rosin, and rosiridin in the chromatogram of *Standard solution C*. The ratio of the content of phenylpropanoid glycosides: rosarin, rosavin, and rosin, to the content of salidroside is about 3:1.

COMPOSITION

• CONTENT OF PHENYLPROPENOID GLYCOSIDES AND SALIDROSIDE

Solution A: Water

Solution B: Acetonitrile

Mobile phase: See *Table 1*.

Time (min)	Solution A (%)	Solution B (%)
0	94	6
6	83	17
7	80.3	19.7
9	80.3	19.7
10	0	100
12	94	6
17	94	6

Solvent: 75% methanol in water

Standard solution A: 1.0 mg/mL of USP Rosavin RS in methanol

Standard solution B: 0.3 mg/mL of USP Salidroside RS in methanol

Standard solution C: 4.0 mg/mL of USP *Rhodiola rosea* Root and Rhizome Dry Extract RS in methanol. Sonicate to dissolve, if necessary. Before injection, pass through a membrane filter of 0.45- μ m or finer pore size.

Sample solution: Transfer about 5.0 g of *Rhodiola rosea*, finely powdered and accurately weighed, to a 25-mL flask. Add 7 mL of *Solvent*, sonicate for 15 min, and

filter into a 10-mL volumetric flask. Wash the residue on the filter paper twice, using 1 mL of *Solvent* each; add the washings to the volumetric flask; adjust the volume using *Solvent*; and mix. Before injection, pass through a membrane filter of 0.45- μ m or finer pore size, discarding the first few mL of the filtrate.

Chromatographic system

(See *Chromatography* (621), *System Suitability*.)

Mode: LC

Detector: UV, 205 nm

Column: 3.0-mm \times 10-cm; 2.5- μ m packing L1

Column temperature: 40 \pm 1°

Flow rate: 1.0 mL/min

Injection volume: 1 μ L

System suitability

Samples: *Standard solution A* and *Standard solution C*

Suitability requirements

Chromatogram similarity: The chromatogram obtained from *Standard solution C* is similar to the reference chromatogram provided with the lot of USP *Rhodiola rosea* Root and Rhizome Dry Extract RS being used.

Resolution: NLT 1.5 between the rosarin and rosavin peaks, *Standard solution C*

Relative standard deviation: NMT 2% determined from the rosavin peak in repeated injections, *Standard solution A*

Analysis

Samples: *Standard solution A*, *Standard solution B*, *Standard solution C*, and *Sample solution*

Using the chromatograms of *Standard solution A*, *Standard solution B*, *Standard solution C*, and the reference chromatogram provided with the lot of USP *Rhodiola rosea* Root and Rhizome Dry Extract RS being used, identify the retention time of the peaks corresponding to salidroside, tyrosol, rosarin, rosavin, rosin, and rosiridin in the *Sample solution*.

Separately calculate the percentages of rosarin, rosavin, rosin, and rosin as rosavin in the portion of *Rhodiola rosea* taken:

$$\text{Result} = (r_u/r_s) \times C_s \times (V/W) \times 100$$

r_u = peak area of the relevant analyte in the *Sample solution*

r_s = peak area of rosavin in *Standard solution A*

C_s = concentration of rosavin in *Standard solution A* (mg/mL)

V = volume of *Sample solution* (mL)

W = weight of *Rhodiola rosea* taken to prepare the *Sample solution* (mg)

Calculate the percentage of phenylpropanoid glycosides as the sum of the percentages of rosarin, rosavin, and rosin.

Calculate the percentage of salidroside in the portion of *Rhodiola rosea* taken:

$$\text{Result} = (r_u/r_s) \times C_s \times (V/W) \times 100$$

r_u = peak area of salidroside from the *Sample solution*

r_s = peak area of salidroside from *Standard solution B*

C_s = concentration of salidroside in *Standard solution B* (mg/mL)

V = volume of the *Sample solution* (mL)

W = weight of *Rhodiola rosea* taken to prepare the *Sample solution* (g)

Acceptance criteria: NLT 0.3% of phenylpropanoid glycosides and NLT 0.08% salidroside; both calculated on the dried basis.

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SCIENCE MEDICINES HEALTH

27 March 2012
EMA/HMPC/232100/2011
Committee on Herbal Medicinal Products (HMPC)

歐洲藥典局 2012年
區

Assessment report on *Rhodiola rosea* L., rhizoma et radix

紅景天

根莖和根

Based on Article 16d(1), Article 16f and Article 16h of Directive 2001/83/EC as amended (traditional use)

Final

使用藥基源 (部分)

Herbal substance(s) (binomial scientific name of the plant, including plant part)	<i>Rhodiola rosea</i> L., rhizomā et radix 根莖和根
Herbal preparation(s)	Dry extract (DER 1.5-5:1), extraction solvent ethanol 67-70% v/v
Pharmaceutical forms	Herbal preparations in solid dosage forms for oral use.
Rapporteur	R. Länger

1.3. Search and assessment methodology

Search term: *Rhodiola rosea*

Databases: Pubmed, Medline and Toxnet.

Libraries: University Vienna, centre of pharmacy; Medical University Vienna, central library.

2. Historical data on medicinal use

運用歷史和運用亞子維

2.1. Information on period of medicinal use in the Community

根和根莖

Herbal preparations in medicinal use reported from the Member States:

A. Liquid extract of **root and rhizome**, DER 1:1, extraction solvent ethanol 40%

Saratikov (1974) reports that in 1969, the Ministry of Health of the former USSR recommended to allow the medical utilisation and industrial production of the liquid extract of the *Rhodiola*. In this paper, a herbal tea and a tincture prepared with ethanol 40% (or vodka) are mentioned as traditional herbal preparations. In 1975, *Rhodiola* fluid extract was accepted in the former USSR as a 'Temporary Pharmacopoeial Article' which allowed the large-scale industrial production of a liquid extract (DER 1:1, extraction solvent ethanol 40%). The products were in use also in those parts of the former USSR, which now belong to the European Union (Estonia, Latvia, Lithuania), as confirmed by the National Medicines Agency of Lithuania.

B. Dry extract of **root and rhizome**, DER 2.5-5:1, first extraction solvent ethanol 70%, second extraction solvent water. On the market in Sweden since 1987 (in Panossian *et al.* 2010, the year 1985 is mentioned). The herbal preparation is named 'SHR-5' in the literature.

C. Dry extract of **root and rhizome**, DER 1.5-5:1, extraction solvent ethanol 60% m/m. On the market as traditional herbal medicinal product according to Directive 2004/24/EC in Austria and UK since 2008, in The Netherlands since 2009, in Sweden and Spain since 2010, in Italy since 2011. The registrations were granted based on the traditional medicinal use of the herbal preparations A and B.

Based on this information on the medicinal use of more than 30 years within the European Union, the requirements laid down in Directive 2004/24/EC are fulfilled.

The herbal preparations B and C are at the moment in medicinal use in the European Union, while there are no reports on the use of the herbal preparation A. Therefore the following specification for the herbal preparation is found for the monograph: Dry extract (DER 1.5-5:1), extraction solvent ethanol 67-70% v/v, with a footnote pointing to the requirement that a narrow range of the DER and a fixed strength for the ethanol used for extraction need to be specified for each herbal medicinal product.

2.2. Information on traditional/current indications and specified substances/preparations

Herbal preparation A (Liquid extract, DER 1:1, extraction solvent ethanol 40%): Asthenia, fatigue, dystonia

Herbal preparation B (Dry extract, DER 2.5-5:1, first extraction solvent ethanol 70%, second extraction solvent water): Traditional herbal medicinal product used as an adaptogen in case of stress related decreased performance ability with symptoms such as fatigue, sensation of weakness, irritability and mild anxiety.



6. 從化學成分組成認識紅景天

Active Constituents

The root of *Rhodiola rosea* has six distinct groups of chemical compounds:

- ☐ Phenylpropanoids: **rosavin, rosin, rosarin**
- ☐ Phenylenethanol derivatives: **salidroside (rhodioloside), tyrosol**
- ☐ Flavonoids: rodiolin, rodionin, rodiosin, acetylrodalgin, tricin
- ☐ Monoterpenes: rosiridol, **rosiridin**
- ☐ Triterpenes: daucosterol, beta-sitosterol
- ☐ Phenolic acids: chlorogenic and hydroxycinnamic, gallic acids.

Standardized extracts that are currently available in the U.S. are most commonly standardized for **rosavin and/or rhodioloside**.

Analysis

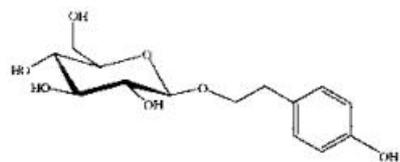
Samples: *Standard solution A, Standard solution B, Standard solution C, and Sample solution*

Using the chromatograms of *Standard solution A, Standard solution B, Standard solution C,* and the reference chromatogram provided with the lot of USP *Rhodiola rosea* Root and Rhizome Dry Extract RS being used, identify the retention time of the peaks corresponding to salidroside, tyrosol, rosarin, rosavin, rosin, and rosiridin from the *Sample solution*.

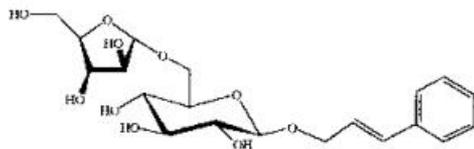
Separately calculate the percentage of rosarin, rosavin, and rosin as rosavin in the portion of Powdered *Rhodiola rosea* Extract taken:

玫瑰紅景天必需被鑑定出6項指標成分

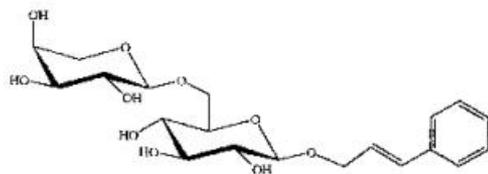
出處: 美國藥典 USP 38ed. 6198 *Rhodiola rosea* / Dietary Supplements



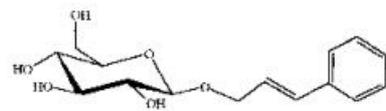
Salidroside (1)



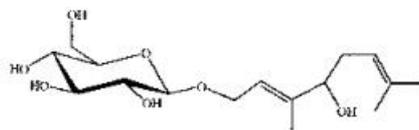
Rosarin (2)



Rosavin (3)



Rosin (4)



Rosiridin (5)

2013年中國科學家發表

Liu et al. *Chemistry Central Journal* 2013, 7:118
<http://journal.chemistrycentral.com/content/7/1/118>



RESEARCH ARTICLE

Open Access

The chemotaxonomic classification of *Rhodiola* plants and its correlation with morphological characteristics and genetic taxonomy

Zhenli Liu^{1†}, Yuanyan Liu^{2†}, Chunsheng Liu², Zhiqian Song¹, Qing Li¹, Qinglin Zha³, Cheng Lu³, Chun Wang¹, Zhangchi Ning², Yuxin Zhang², Cheng Tian² and Aiping Lu^{3,4*}

以高效液相層析儀方法(HPLC)，分析47個樣本，以8種成分組成和比例做親緣鑑別，其中玫瑰紅景天和庫頁紅景天的成分別最為近似

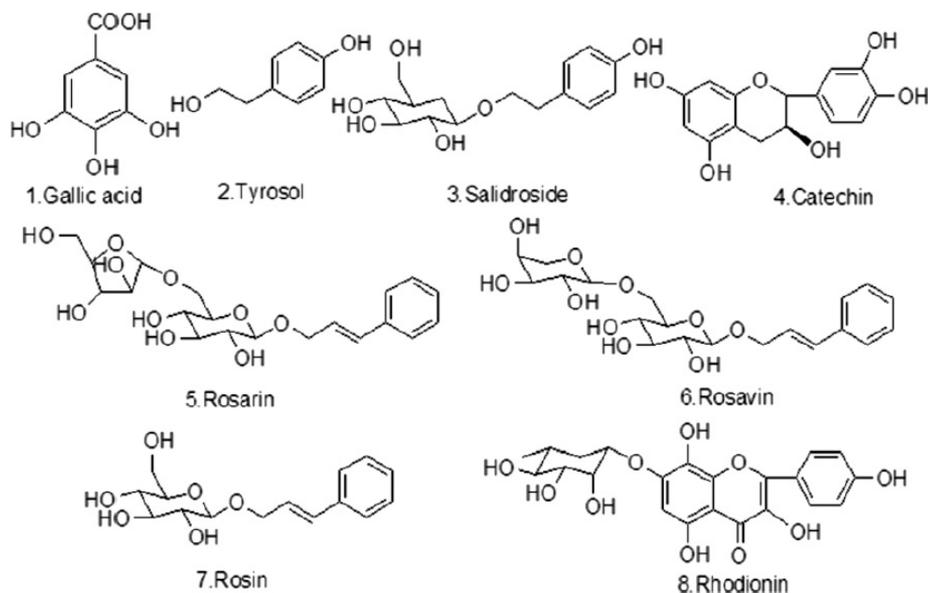
47個紅景天樣本

The 47 authentic *Rhodiola* samples were collected from thirteen local provinces of China: Gansu, Jiangxi, Qinghai, Zhejiang, Heilongjiang, Henan, Hebei, Sichuan, Beijing, Neimeng, Liaoning, Xizang and Xinjiang. They were identified as genuine samples of *R. crenulata* (RC), *R. sachalinensis* (RS), *R. himalensis* (D. Dons) S. H. Fu (RH), *R. serrata* H. Ohba (RSE), *R. rosea* L. (RR), *R. kirilowii* (Regel) Maxim (RK) and *R. fastigiata* (HK. F. et Thoma) S. H. Fu (RF) by Professor Chunsheng Liu. Dried voucher specimens (marked as RC-1~RC-19, RS-20~RS-21, RH-22, RSE-23~RSE-37, RF-38, RR-39 and RK-40~RK-47) were deposited at the Institute of Basic Theory, China Academy of Chinese Medical Sciences, Beijing, P. R. China, as shown in Table 1.

大花紅景天

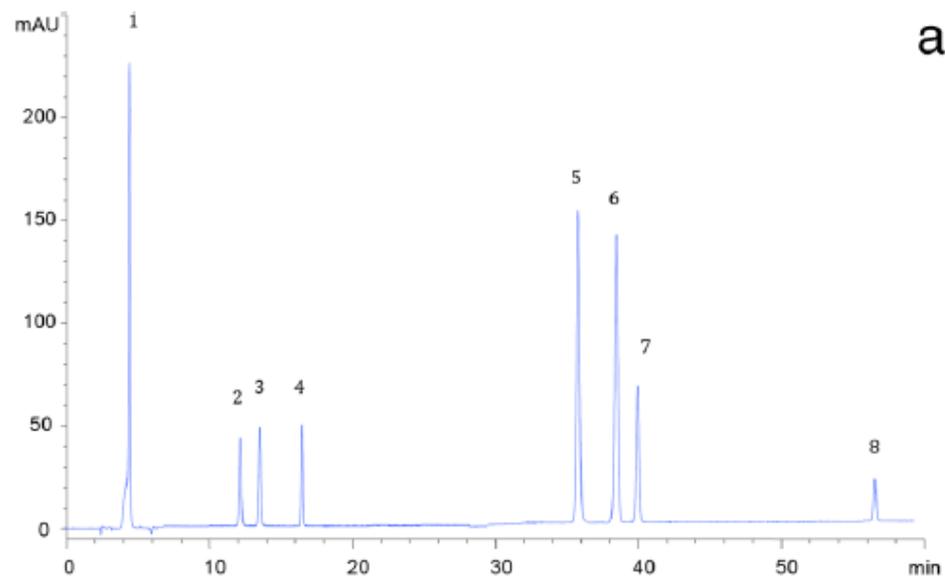
玫瑰紅景天

庫頁紅景天

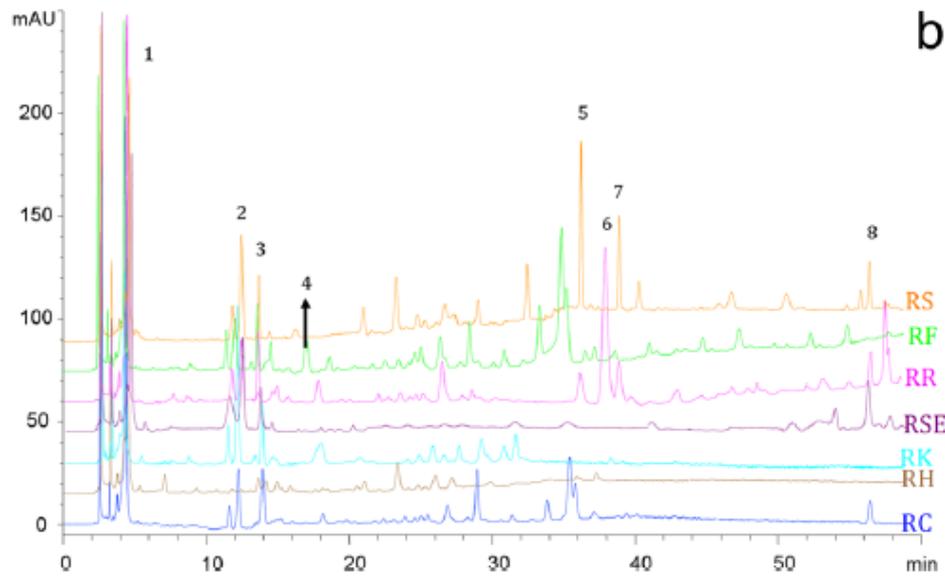


	鑑別的成分	中文成分
1	Gallic acid	沒食子酸
2	Tyrosol	酪醇
3	Salidroside	紅景天苷
4	Catechin	兒茶素
5	Rosarin	絡薩琳
6	Rosavin	絡薩維
7	Rosin	絡林
8	Rhodionin	

Figure 1 Chemical structures of the eight reference marker compounds. Among them, rosarin, rosavin and rosin belong to phenylpropanoids, tyrosol and salidroside belong to phenylethanol derivatives, (+) catechin and rhodionin belong to flavonoids and gallic acid belongs to phenolic acids.



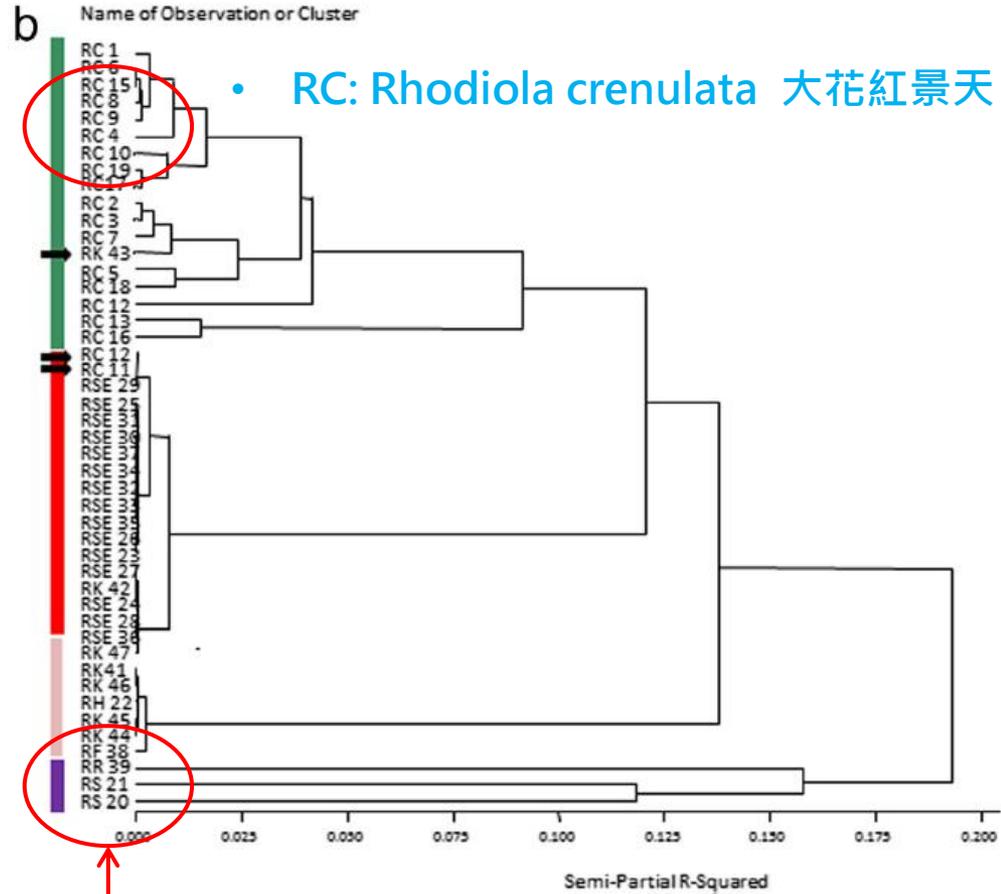
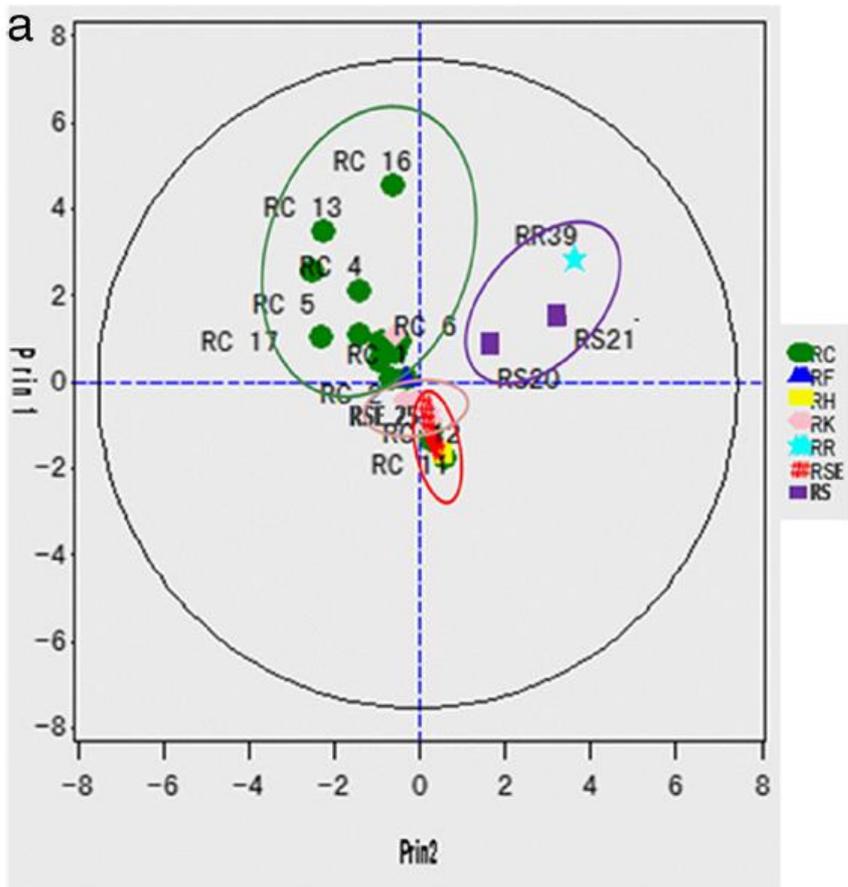
a



b

Figure 3 HPLC-DAD/UV chromatogram of the eight chemotaxonomic markers (a) and overlap chromatogram of each *Rhodiola* species (b). 1, Gallic acid; 2, Tyrosol; 3, Salidroside; 4, (+) Catechin; 5, Rosarin; 6, Rosavin; 7, Rosin; 8, Rhodionin.

以高效液相層析儀方法(HPLC) ,
做8種成分分析圖譜



• RC: *Rhodiola crenulata* 大花紅景天

- RR: *Rhodiola rosea* 玫瑰紅景天
- RS: *Rhodiola sachalinensis* 庫頁紅景天

親緣分類是以遠近判別相似度，愈接近代表相似度愈高，距離愈遠代表差異性愈大，臨床表現就可能不同。

Figure 4 Principal component analysis (PCA) score plot (a) and hierarchical clustering analysis (HCA) dendrogram (b) derived from the HPLC-DAD/UV data set of the *Rhodiola* samples.

玫瑰紅景天和庫頁紅景天 的比較

相似度最高

如何辨別紅景天的真偽？

中國和台灣：紅景天苷 Salidroside

歐洲和美國：絡薩維 Rosavin

中藥女貞子的主要成分也

是紅景天苷？

如何辨別紅景天的真偽？

女贞子指纹图谱研究及红景天苷、特女贞苷的含量测定

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(1. 暨南大学附属第一医院, 广东 广州 510632; 2. 暨南大学生物医药研究院, 广东 广州 510632; 3. 广东药学院药科学院, 广东 广州 510006)

摘要: 目的 建立女贞子药材的高效液相指纹图谱, 并同时测定女贞子中红景天苷和特女贞苷的含量。方法 采用高效液相法测定, 色谱条件: Ultimate AQ C-18 色谱柱(250 mm × 4.6 mm 5 μm); 流动相为乙腈-水 梯度洗脱; 检测波长为 275 nm; 体积流量为 1.0 mL · min⁻¹; 柱温为 35 ℃。结果 红景天苷、特女贞苷分别在进样量 0.113 2~5.66 μg ($r=0.999\ 9$)、0.146 9~7.345 μg ($r=0.999\ 8$) 范围内线性关系良好, 平均回收率分别为 98.3%、100.8%。按此方法建立了女贞子药材的 HPLC 指纹图谱, 包含 12 个共有峰。结论 该试验同时对女贞子的两种成分和指纹图谱进行分析, 快速、简便、准确, 为控制女贞子药材的质量提供了可靠的分析方法。

关键词: 女贞子; 指纹图谱; 红景天苷; 特女贞苷

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中图分类号: R284.2 文献标识码: A 文章编号: 1008-0805(2014)12-2854-03

Study on Fingerprint and Determination of salidroside and specnuezhenide of *Ligustrum lucidum* by HPLCCUI Yun-hui¹, FAN Hua², LI Yi-cheng², WANG Zhi-ping^{3*}

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Abstract: Objective To develop a HPLC method of the chromatographic fingerprint of *Ligustrum lucidum* for quality control. **Methods** HPLC was used to determine the contents. The analytical column was Ultimate AQ C-18 column (250 mm × 4.6 mm, 5 μm). The mobile phase was composed of acetonitrile (A) and water (B) with gradient elution. The detection wavelength was set at 275 nm. The flow rate was 1.0 mL · min⁻¹ and the column temperature was maintained at 35 ℃. **Results** The fingerprint chromatography included 12 mutual peaks. The linear ranges were in the range of 0.113 2~5.66 μg ($r=0.999\ 9$), 0.146 9~7.345 μg ($r=0.999\ 8$) for salidroside and specnuezhenide, respectively. The average recoveries were 98.3%, 100.8%. **Conclusion** The method is simple, precise and accurate and can be used for the quality control of *Ligustrum lucidum*.

Key words: *Ligustrum lucidum*; Fingerprint; Salidroside; Specnuezhenide

女贞子为木犀科植物女贞 *Ligustrum lucidum* Ait. 的干燥成熟果实, 味甘、苦、凉, 具有滋补肝肾、明目乌发的功效。临床常用于肝肾阴虚的目暗不明、视力减退、眩晕耳鸣、腰酸腿软、须发早白、内热消渴、骨蒸潮热等^[1]。其主要化学成分有三萜类化合物、裂环环烯醚萜类和苯乙醇苷类化合物包括女贞酸、女贞苷、红景天苷、特女贞苷、女贞苦苷等^[2]以及多糖、氨基酸、挥发油、脂肪酸、色素、矿物质等多种化学成分^[3]。现代药理研究表明女贞子具有抗肿瘤、护肝、抗炎和升高白细胞等多重药理作用^[4-6]。女贞子产于我国华东、中南、西南等地, 在全国各地也均有种植。当前药材市场出售的女贞子存在以次充好, 甚至以假乱真的现象^[7]。严重危害社会大众的健康, 迫切需要提高对女贞子药材和制剂的检测手段。对于控制药材质量、保障临床用药安全具有重要

意义。本文旨在应用 HPLC 指纹图谱技术对女贞子进行鉴别和质量控制。本实验对来自 12 个不同产地的女贞子样品进行分析, 测定了女贞子药材中红景天苷及特女贞苷的含量, 建立了女贞子药材的 HPLC 指纹图谱, 为其质量评价提供实验依据。

1 仪器与试剂

Waters 高效液相色谱仪, 配备在线脱气机、2487 四元泵、717 自动进样器、2487 检测器; BT25s 型分析天平 (Sartorius)。

红景天苷 (批号: 110818-201005)、特女贞苷 (批号: 111926-201001 纯度 94.4%) 均购于中国食品药品检定研究院; 乙腈为色谱纯; 水为超纯水; 其余试剂为分析纯。12 批女贞子药材经广东药学院王治平博士鉴定均为木犀科植物女贞 *Ligustrum lucidum* Ait. 的干燥成熟果实。

2 方法与结果

2.1 色谱条件 Ultimate AQ C-18 色谱柱(4.6 mm × 150 mm, 5 μm); 检测波长: 275 nm; 流速: 1.0 mL · min⁻¹; 柱温: 35 ℃; 进样量 20 μL; 流动相为 (A) 乙腈 - (B) 水, 梯度洗脱, 洗脱程序: 0~25 min 10% A - 25% A。

2.2 溶液的准备

2.2.1 混合对照品溶液 精密称取红景天苷、特女贞苷对照品分别为 11.32 mg、15.56 mg, 加甲醇分别制成每毫升含红景天苷、

引用 蒋梅香, 陈聪, 杨冬豪, 等. 不同采收月份女贞子中红景天苷和特女贞苷含量动态变化研究[J]. 中药导报, 2018, 24(18): 58-60.

不同采收月份女贞子中红景天苷和特女贞苷含量动态变化研究*

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(湖南中医药大学高等专科学校, 湖南 株洲 412012)

摘要: 目的 研究不同采收月份女贞子中红景天苷和特女贞苷的含量变化规律, 为确定女贞子的最佳采收时间提供依据。方法 女贞子样品以 60% 甲醇超声提取 30 min, 采用高效液相色谱法测定, 色谱条件: ACE Excel 5 C₁₈-AR 色谱柱(4.6 mm × 250 mm, 5.0 μm); 流动相: 乙腈(A)-水(B); 梯度洗脱; 检测波长 275 nm, 柱温 35 ℃, 流速 1.0 mL · min⁻¹。结果 红景天苷和特女贞苷分别在 0.023 74~0.593 6 μg ($R^2=0.999\ 8$)、0.115 8~2.895 μg ($R^2=0.999\ 9$) 内线性关系良好, 不同采收月份的女贞子随着特女贞苷含量逐渐升高(12 月含量最高), 红景天苷含量不断下降(9 月含量最高)。结论 女贞子的生长过程中可能存在“一分子红景天苷和一分子裂环环烯醚萜转化为二分子特女贞苷”的生物代谢途径。综合考虑红景天苷和特女贞苷总含量变化趋势, 建议 12 月作为株洲女贞子药材的适宜采收期。

关键词: 女贞子; 红景天苷; 特女贞苷; 含量; HPLC

中图分类号: R282 [文献标识码] A [文章编号] 1672-951X(2018)18-0058-03

DOI: 10.13862/j.cnki.cn43-1446/r.2018.18.016

Study on Dynamic Changes of Content of Salidroside and Specnuezhenide in *Ligustrum lucidum* fructus at Different Harvest Time

JIANG Mei-xiang, CHEN Cong, YANG Dong-hao, ZENG Xing-xing, CHEN Li, LIU Yi-ting
(Hu'nan Traditional Chinese Medical College, Zhuzhou Hu'nan 412012, China)

Abstract: Objective: To study on content change tendency of salidroside and specnuezhenide in *Nyctezheni* (*Ligustrum lucidum* fructus) at different harvest time, then to provide the experimental basis for determining the reasonable harvest time. Methods: The sample of *Ligustrum lucidum* fructus was extracted 30 min by ultrasonic with 60% methanol; The extractive was determined by HPLC, the analytical column was ACE Excel 5 C₁₈-AR (4.6 mm × 150 mm, 5.0 μm); The mobile phase was composed of acetonitrile (A) and water (B) with gradient elution; The detection wavelength was 275 nm; The column temperature was set at 35 ℃ and the flow rate was 1.0 mL/min. Results: The linear ranges were in the range of 0.02374~0.5936 μg ($R^2=0.9998$), 0.1158~2.895 μg ($R^2=0.9999$) for salidroside and specnuezhenide. The content of salidroside was decreasing with the increase of the content of the specnuezhenide in Zhuzhou. Conclusion: The author speculate that there is a biological metabolic pathway "A molecular salidroside and a molecular secoiridoid were converted into a molecular specnuezhenide" exists in the growth of *Ligustrum lucidum* fructus. Comprehensive consideration of the total content change tendency of salidroside and specnuezhenide, the December is suggested to be the reasonable harvest time for *Ligustrum lucidum* fructus in Zhuzhou.

Keywords: *Ligustrum lucidum* fructus; salidroside; specnuezhenide; content; HPLC

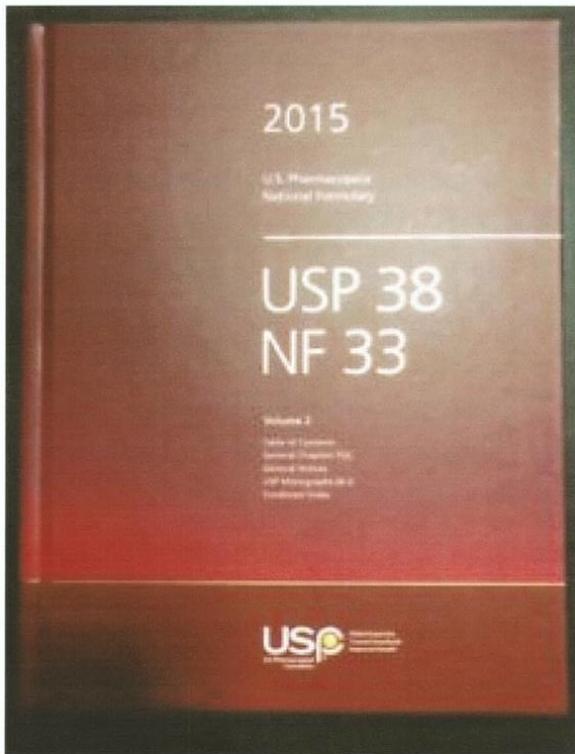
女贞子为木犀科植物女贞 *Ligustrum lucidum* Ait. 的干燥成熟果实, 味甘、苦、凉, 具有滋补肝肾、明目乌发的功效^[1]。女贞子中包括三萜类、裂环环烯醚萜类、黄酮类和苯乙醇苷类等多类化合物, 其中特女贞苷是女贞子中特有的化学成分,

红景天苷是景天科红景天属植物的主要有效成分, 但天然红景天植物资源匮乏导致红景天苷价格昂贵, 限制了其开发利用, 而女贞子中含有红景天苷有望成为其另一有效来源。现代药理研究表明红景天苷具有抗炎、抗肝纤维化、抗氧化等

*基金项目 湖南省大学生研究性学习和创新性实验计划项目(20161013)

看看美國藥典怎麼說？ 辨別紅景天看絡薩維Rosavin

美國藥典第 38 版



USP 38

美國藥典 38ed. 2015

and dilute with *Solvent* to volume. Centrifuge, or pass through a filter of 0.45- μm or finer pore size.

Chromatographic system
(See *Chromatography* (621), *System Suitability*.)

Mode: LC
Detector: UV 254 nm
Column: 4.6-mm \times 25-cm; end-capped 5- μm packing

Column temperature: 45°
Flow rate: 1 mL/min

Injection volume: 10 μL

System suitability

Samples: *Standard solution A* and *Standard solution B*

Suitability requirements

Chromatogram similarity: The chromatogram obtained from *Standard solution A* is similar to the reference chromatogram provided with the lot of USP Powdered Red Clover Extract RS being used.

Tailing factor: NMT 2.0 for the formononetin peak, *Standard solution B*

Relative standard deviation: NMT 2.0%, determined from the formononetin peak in repeated injections, *Standard solution B*

Analysis

Samples: *Standard solution A*, *Standard solution B*, and *Sample solution*

Identify the peaks corresponding to daidzein, genistein, formononetin, and biochanin A in the *Sample solution* chromatogram by comparison with the chromatogram obtained from *Standard solution A* and the reference chromatogram. Measure the areas of the analyte peaks.

Separately calculate the percentage of each isoflavone in the portion of Powdered Extract taken:

$$\text{Result} = (r_i/r_s) \times C_s \times 100$$

r_i = peak response for each relevant isoflavone from the *Sample solution*

r_s = peak response for daidzein, genistein, formononetin, or biochanin A from *Standard solution B*

C_s = concentration of daidzein, genistein, formononetin, or biochanin A in *Standard solution B* (mg/mL)

Acceptance criteria: 90.0%–110.0% of the labeled amount of isoflavones as the sum of daidzein, genistein, formononetin, and biochanin A, calculated on the dried basis

CONTAMINANTS

HEAVY METAL IMPURITIES—PROCEDURES (233)

Acceptance criteria

Arsenic: NMT 1.0 $\mu\text{g/g}$

Cadmium: NMT 0.5 $\mu\text{g/g}$

Lead: NMT 5.0 $\mu\text{g/g}$

Mercury: NMT 1.0 $\mu\text{g/g}$

MICROBIAL ENUMERATION TESTS (2021): The total aerobic microbial count does not exceed 10^4 cfu/g, the total combined molds and yeasts count does not exceed 10^3 cfu/g, and the enterobacterial count is NMT 10^2 cfu/g.

ABSENCE OF SPECIFIED MICROORGANISMS (2022): It meets the requirements of the tests for absence of *Salmonella* species and *Escherichia coli*.

SPECIFIC TESTS

LOSS ON DRYING (731)

Analysis: Dry 1 g at 105° for 2 h.

Acceptance criteria: NMT 5.0%

OTHER REQUIREMENTS: It meets the requirements for *Packaging and Storage*, *Residual Solvents*, and *Pesticide Residues* in *Botanical Extracts* (565).

ADDITIONAL REQUIREMENTS

PACKAGING AND STORAGE: Preserve in tight, light-resistant containers, in a cool place.

Dietary Supplements / *Rhodiola rosea* 6193

LABELING: The label states the Latin binomial and, following the official name, the part of the plant from which the article was prepared. The label also indicates the content of isoflavones, the extracting solvent or solvent mixture used for preparation, and the ratio of the starting crude plant material to Powdered Extract. It meets the requirements for labeling in *Botanical Extracts* (565).

USP REFERENCE STANDARDS (11)

- USP Biochanin A RS
- USP Daidzein RS
- USP Formononetin RS
- USP Genistein RS
- USP Hyperoside RS
- USP Powdered Red Clover Extract RS

Riboflavin—see *Riboflavin General Monographs*

Riboflavin Tablets—see *Riboflavin Tablets General Monographs*

Riboflavin 5'-Phosphate Sodium—see *Riboflavin 5'-Phosphate Sodium General Monographs*

② 使用基源
根和根莖

Rhodiola rosea

① 紅景天學名
厚材

DEFINITION

Rhodiola rosea consists of the dried roots and rhizomes of *Rhodiola rosea* L. (Fam. Crassulaceae). It contains NLT 0.3% of phenylpropanoid glycosides calculated as the sum of rosarin, rosavin, and rosin; and NLT 0.08% salidroside; both calculated on the dried basis.

IDENTIFICATION

A. *Rhodiola rosea* meets the requirements under *Specific Tests*, *Botanic Characteristics*.

B. THIN-LAYER CHROMATOGRAPHY

Standard solution A: 1.0 mg/mL of USP Rosavin RS in methanol

Standard solution B: 50 mg/mL of USP *Rhodiola rosea* Root and Rhizome Dry Extract RS in methanol. Sonicate for 10 min, centrifuge, and use the supernatant.

Sample solution: Sonicate for 10 min about 0.5 g of *Rhodiola rosea*, finely powdered, in 5 mL of methanol, centrifuge, and use the supernatant.

Chromatographic system

(See *Chromatography* (621), *Thin-Layer Chromatography*.)

Adsorbent: Chromatographic silica gel with an average particle size of 5 μm (HPTLC plates)

Application volume: 3 μL of *Standard solution A*, 5 μL each of *Standard solution B* and *Sample solution*; as 8-mm bands

Relative humidity: Condition the plate to a relative humidity of about 33% using a suitable device

Developing solvent system: A mixture of ethyl acetate, methanol, water, and formic acid (77:13:10:2)

Developing distance: 6 cm

Derivatization reagent: Dissolve 1 g of diphenylamine in 40 mL of acetone, add 1 mL of aniline, and mix. Carefully add 7.5 mL of phosphoric acid, and mix.

DS Monographs



GNC
HERBAL PLUSSM

**Rhodiola
Extract 340_{MG}**
HERBAL SUPPLEMENT

*Supports Natural
Well-Being**

Vegetarian
Standardized Extract

100 CAPSULES

CODE 193922 SR0

Directions: As a dietary supplement, take one to two capsules daily.

Supplement Facts	
Serving Size One Capsule	
Amount Per Serving	
Rhodiola rosea Root Extract	340 mg*
(3% Rosavins = 10.2 mg)	

* Daily Value not established.

Other Ingredients: Vegetable Cellulose Capsule, Cellulose.

WARNING: Consult your physician prior to using this product if you are pregnant, nursing, taking medication, or have a medical condition. Discontinue use two weeks prior to surgery.

Potency verified by GNC procedure #5340. Conforms to USP <2091> for weight. Meets USP <2040> disintegration.

No Sugar, No Artificial Colors, No Artificial Flavors, Sodium Free, No Wheat, Gluten Free, No Soy, No Dairy, Yeast Free.

* This statement has not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.

KEEP OUT OF REACH OF CHILDREN. Store in a cool, dry place.

For More Information: 1-800-421-2548

SHOP NOW @ GNC.COM

Distributed by: General Nutrition Corporation, Pittsburgh, PA 15222

48107 12733 0

FPO

Each Capsule Contains

<i>Rhodiola rosea</i> Root Extract	340 mg
(3% Rosavins)	

<https://www.gnclivewell.com.my/gnc-herbal-plus-rhodiola-extract-340-mg-100-capsules.html>

Directions

Traditionally used to support natural well-being, **adults to take one capsule once daily after meal.**

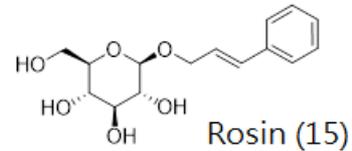
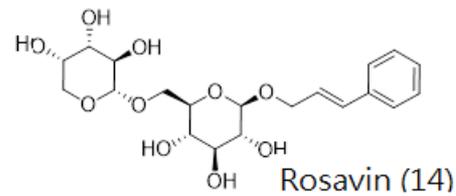
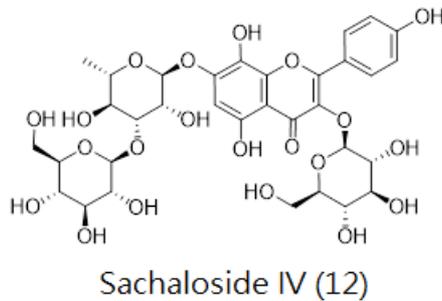
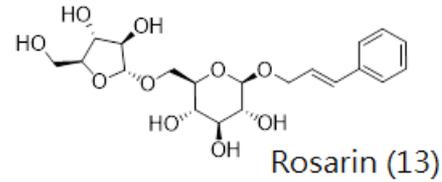
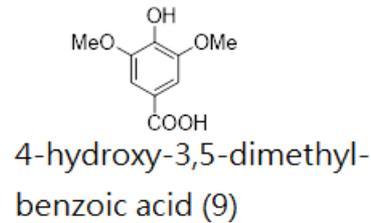
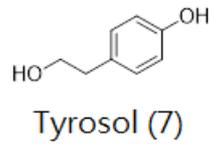
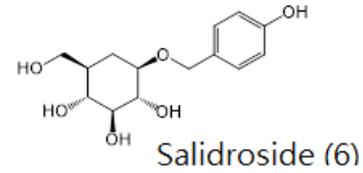
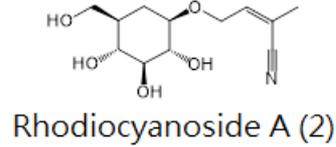
美國紅景天產品：標示 Rosavin 劑量



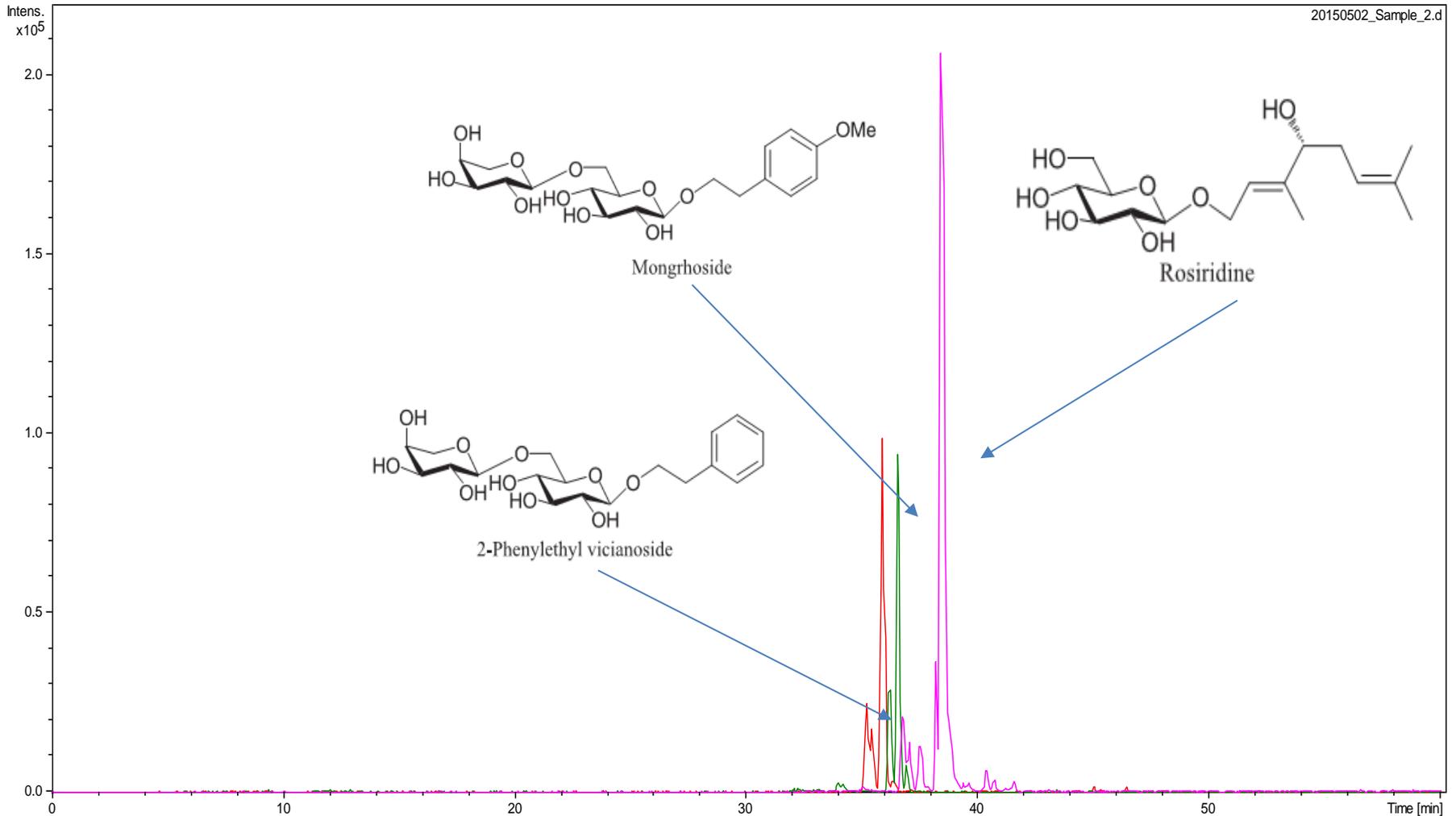
https://www.amazon.com/dp/B00F1J7QQQ/ref=sspa_dk_detail_3?pd_rd_i=B00F1J7QQQ&pf_rd_m=ATVPDKIKX0DER&pf_rd_p=f52e26da-1287-4616-824b-efc564ff75a4&pf_rd_r=5R6VCRJH652Z2DC78X9X&pd_rd_wg=EGuZN&pf_rd_s=desktop-dp-sims&pf_rd_t=40701&pd_rd_w=9AhHx&pf_rd_i=desktop-dp-sims&pd_rd_r=9c5db5f6-d6b2-11e8-b668-2fb34fec8f14&th=1

About the product

- 30 Day Supply - Adults take 1 capsule 2 times daily between meals



台灣大學協助豐山生技鑑定出庫頁紅景天的指標成分有5項指標成分
Structures of marker compounds identified from *Rodiola sachalinensis*.



東華大學協助豐山生技鑑定出庫頁紅景天的指標成分有1項指標成分
Structures of marker compounds identified from *Rodiola sachalinensis*.

依據台灣大學和東華大學的協助的分離鑑定

庫頁紅景天的6項指標成分與美國藥典的玫瑰紅景天完全符合

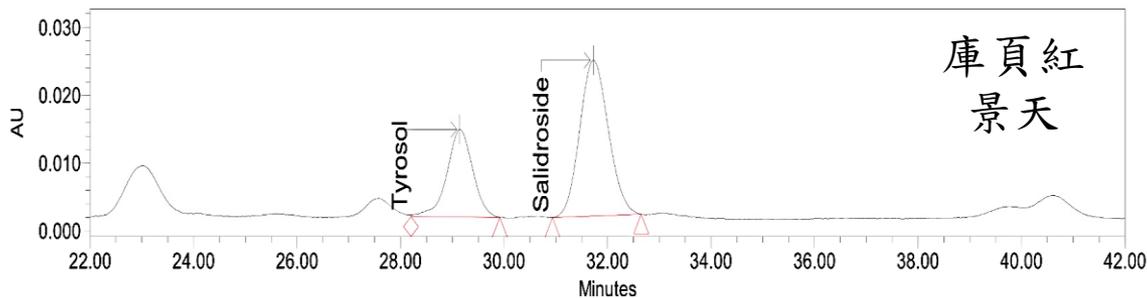
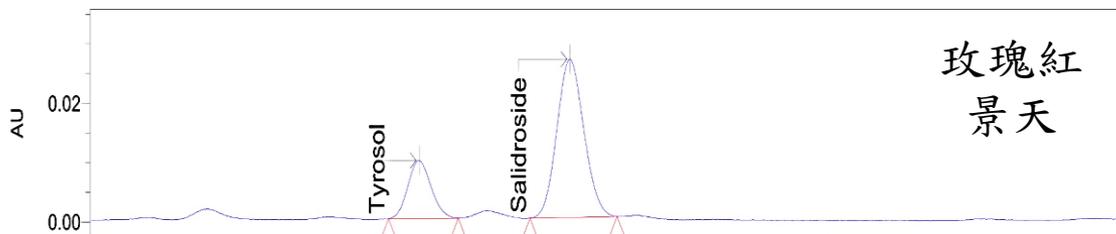
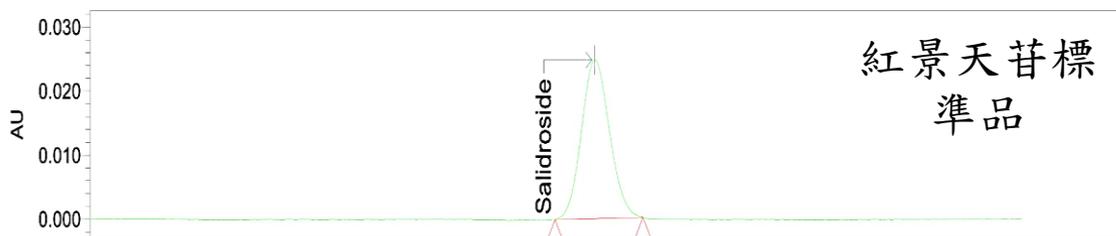
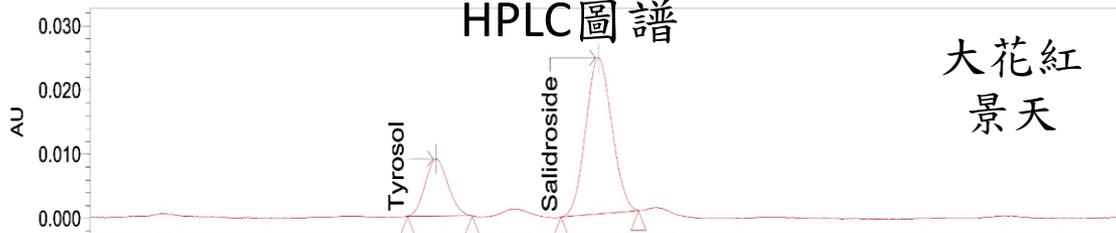
	美國藥典鑑別的成分	台大藥學院鑑定	東華大學化學所
1	Tyrosol	✓	
2	Salidroside	✓	
3	Rosarin	✓	
4	Rosavin	✓	
5	Rosin	✓	
6	Rosiridin		✓

豐山生技以HPLC分析方法
鑑定庫頁紅景天和其他不同品種紅景天的區別
(成分有5項指標成分)

Structures of marker compounds identified from
Rodiola sachalinensis.

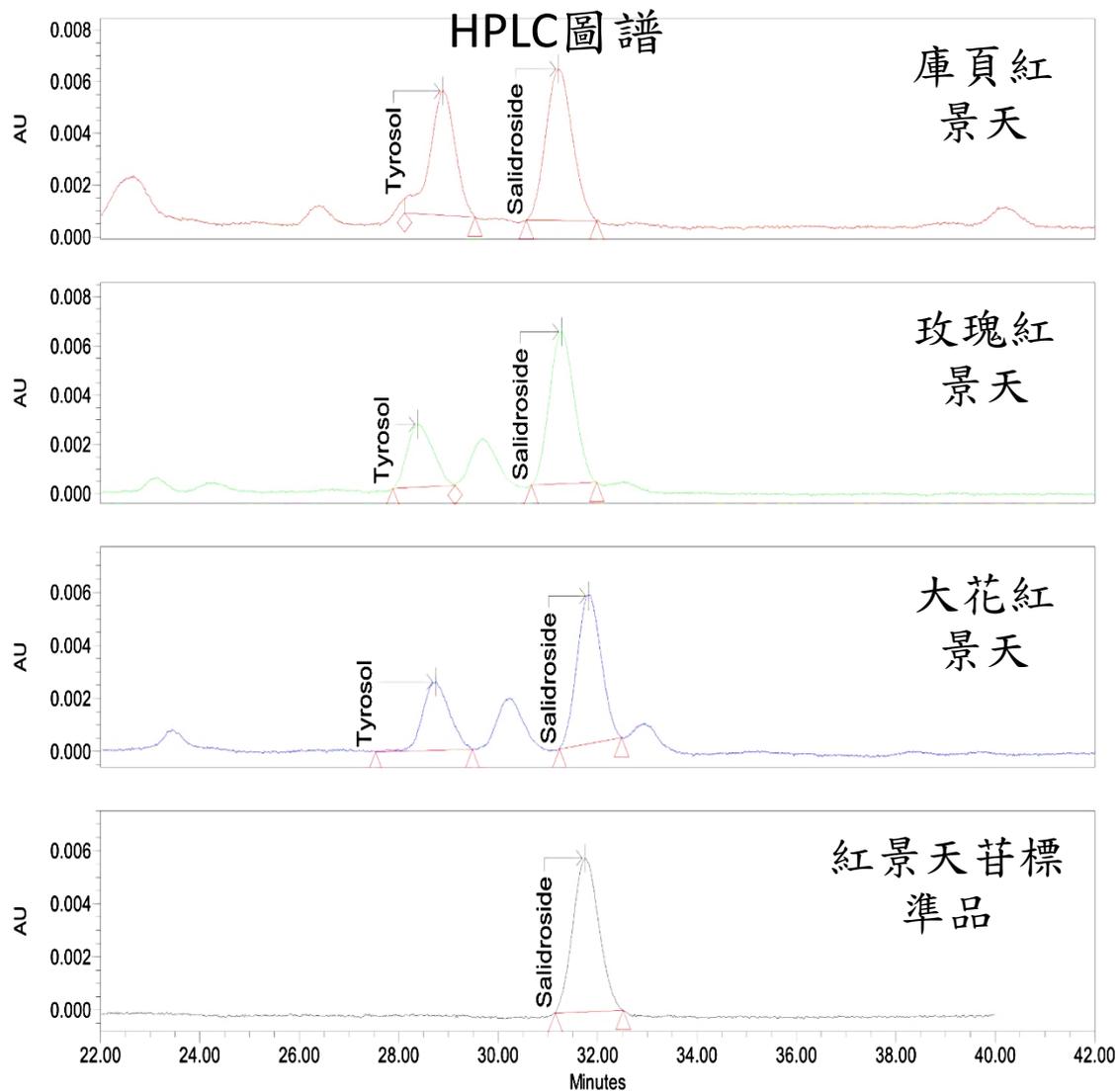
波長：223nm 紅景天苷

HPLC圖譜



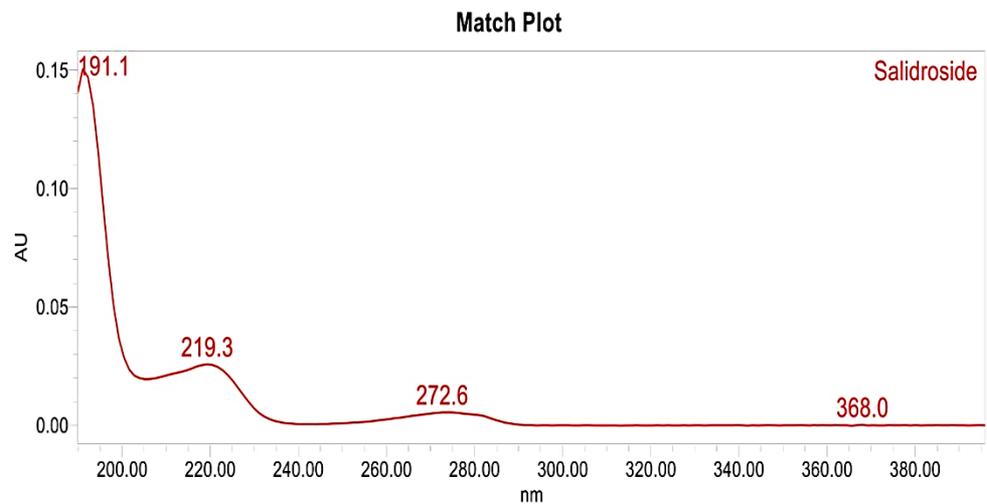
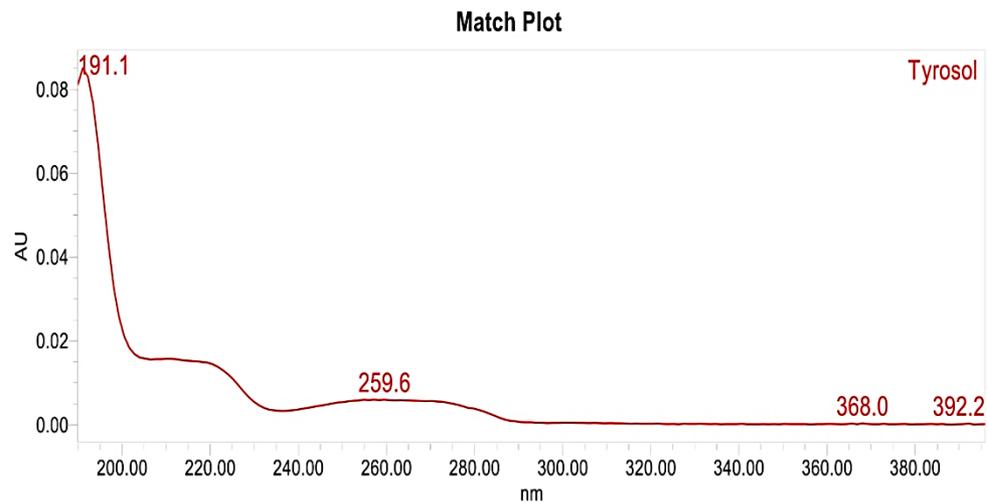
圖譜智產權：豐山生技醫藥品股份有限公司（未經許可
不得引用）

波長：274nm 紅景天苷



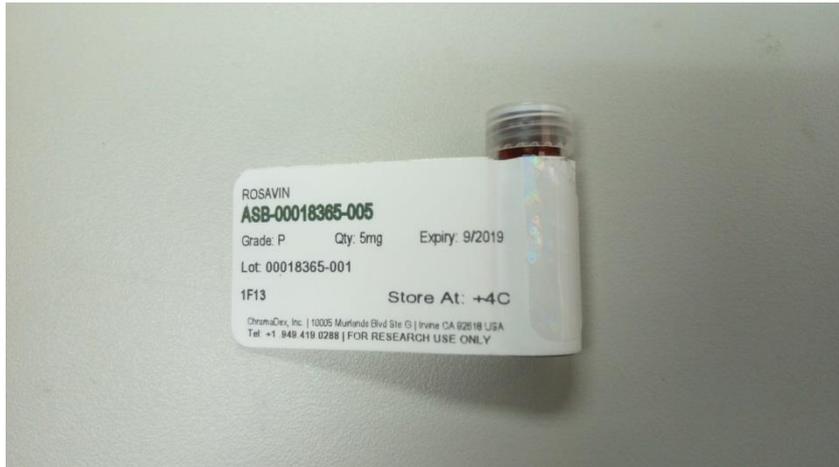
圖譜智產權：豐山生技醫藥品股份有限公司（未經許可
不得引用）

庫頁紅景天 UV 圖譜



圖譜智產權：豐山生技醫藥品股份有限公司（未經許可
不得引用）

美國 Chromadex®

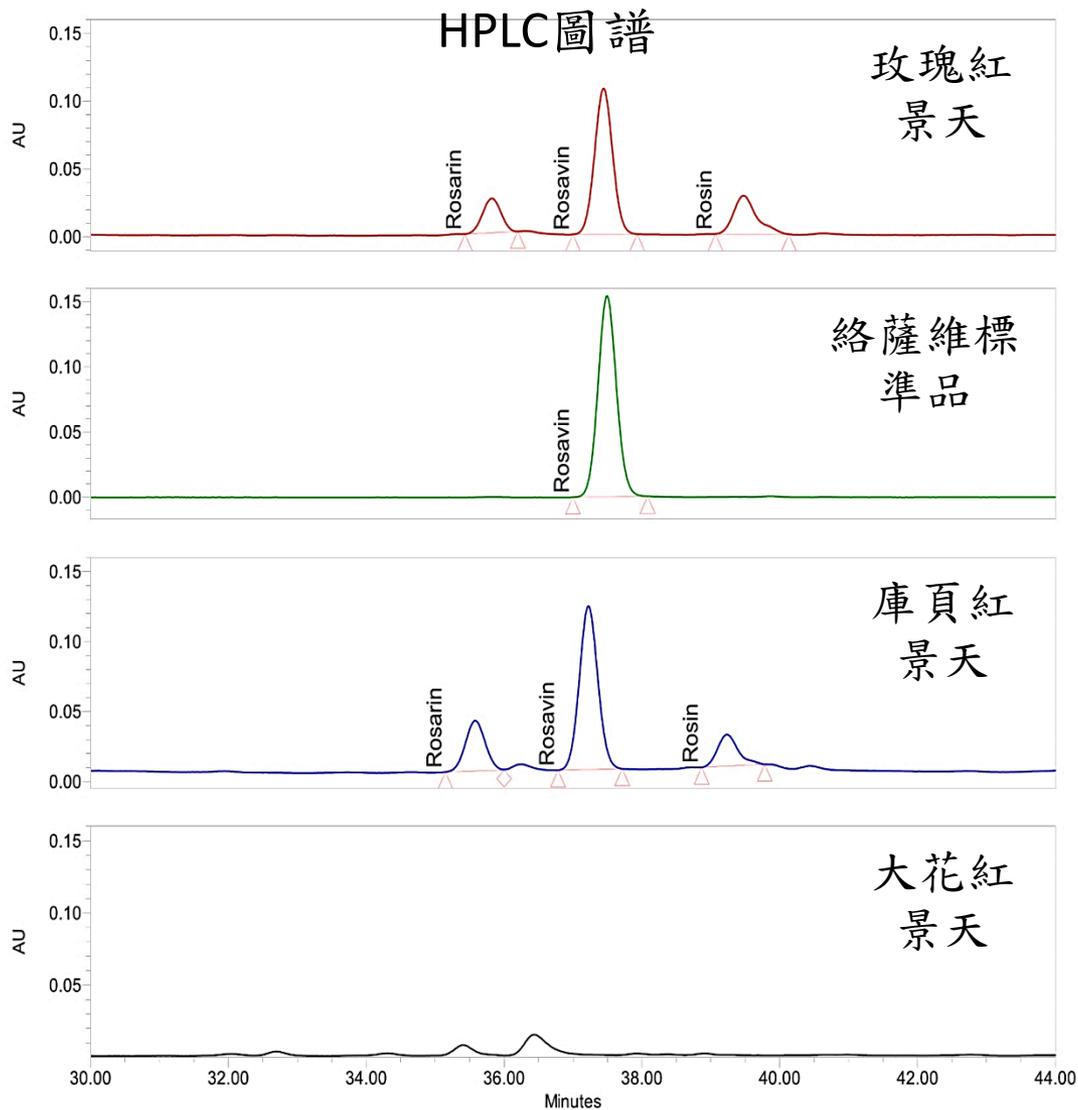


中國成都 MUST®



絡薩維 (Rosavin) 標準品

波長：250 nm 絡薩維

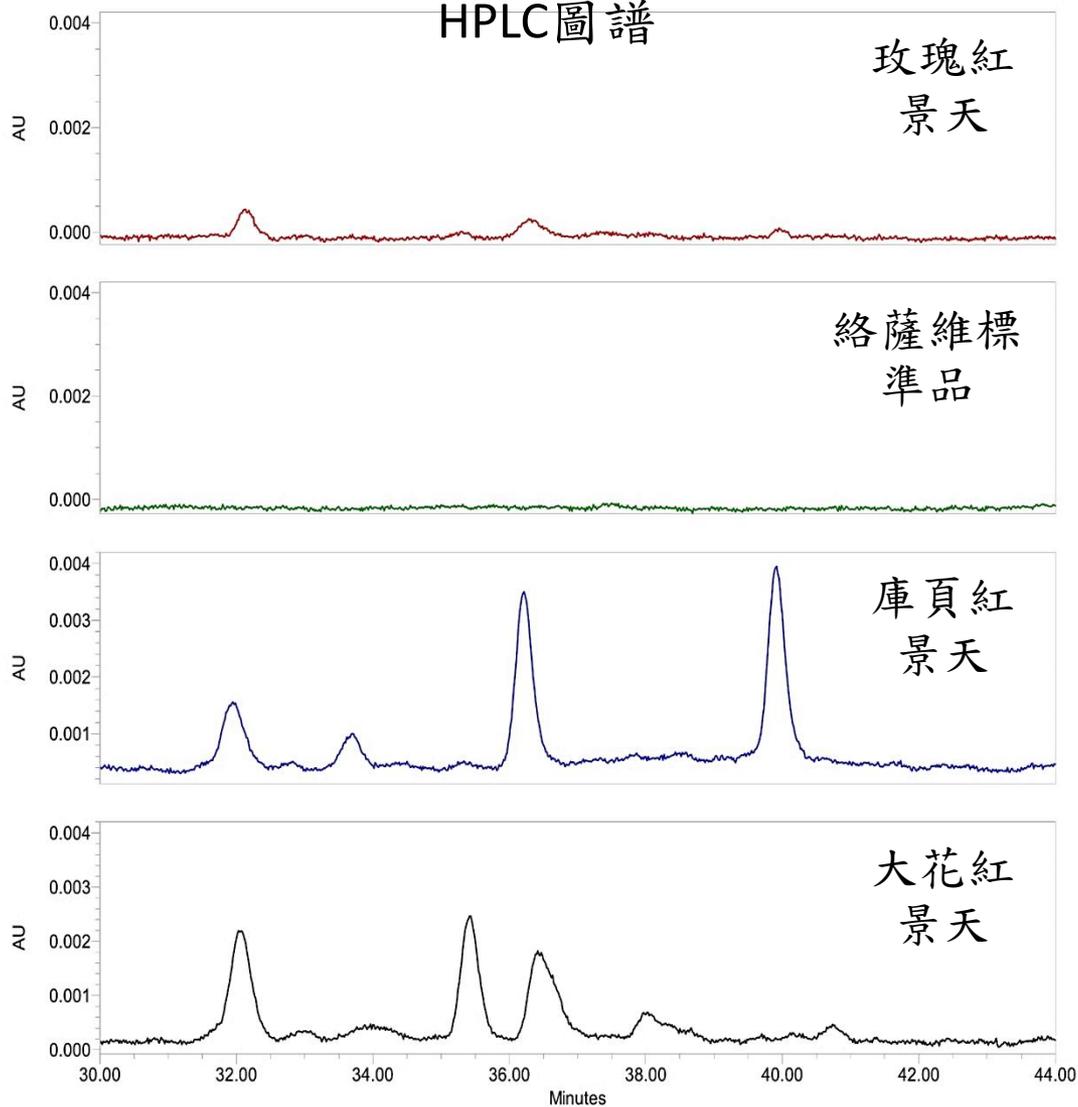


大花紅景天不含
絡薩維Rosavin

圖譜智產權：豐山生技醫藥品股份有限公司（未經許可
不得引用）

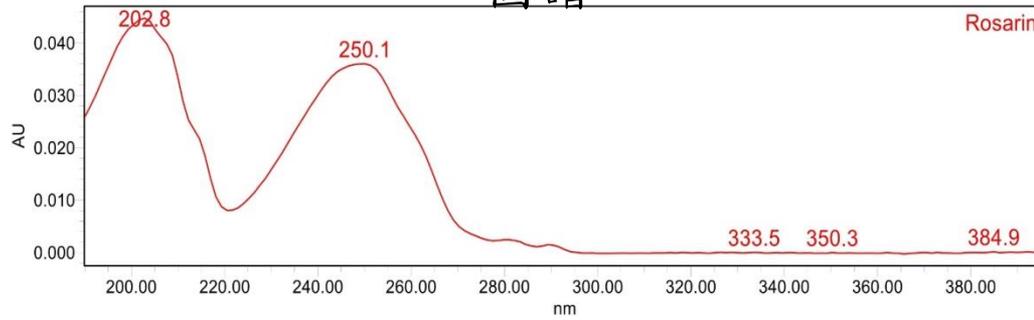
波長：340 nm 絡薩維

HPLC圖譜

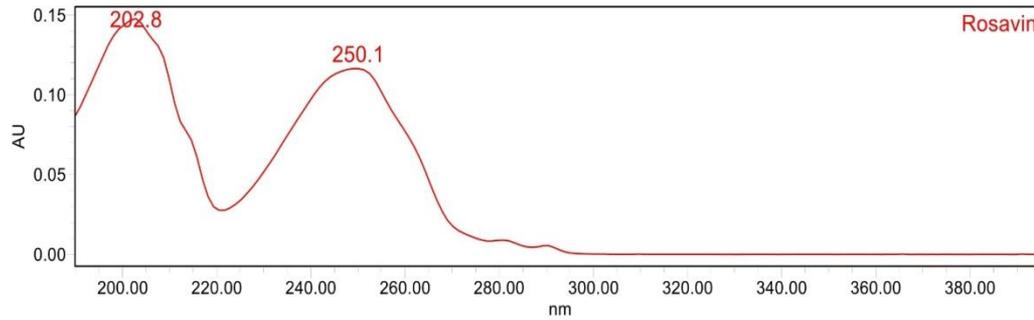


圖譜智產權：豐山生技醫藥品股份有限公司（未經許可
不得引用）

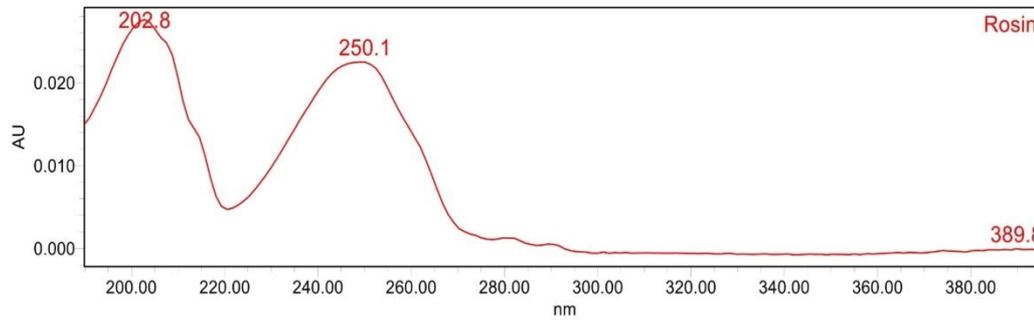
庫頁紅景天 UV 圖譜



Match Plot



Match Plot



圖譜智產權：豐山生技醫藥品股份有限公司（未經許可
不得引用）

7. 紅景天的現代藥理學研究進展

- Adaptogenic and stress- protective (neuro-cardio and hepato-protective) effects
- Cardioprotective effects
- Antioxidant effect
- Stimulating effect on the central nervous system including effects on cognitive functions such as attention, memory and learning
- Anti-fatigue effect
- Antidepressive and anxiolytic effects
- Endocrine activity normalizing
- Life-span increasing effect

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journal homepage: www.elsevier.de/phymed



Review Article

Rosenroot (*Rhodiola rosea*): Traditional use, chemical composition, pharmacology and clinical efficacy

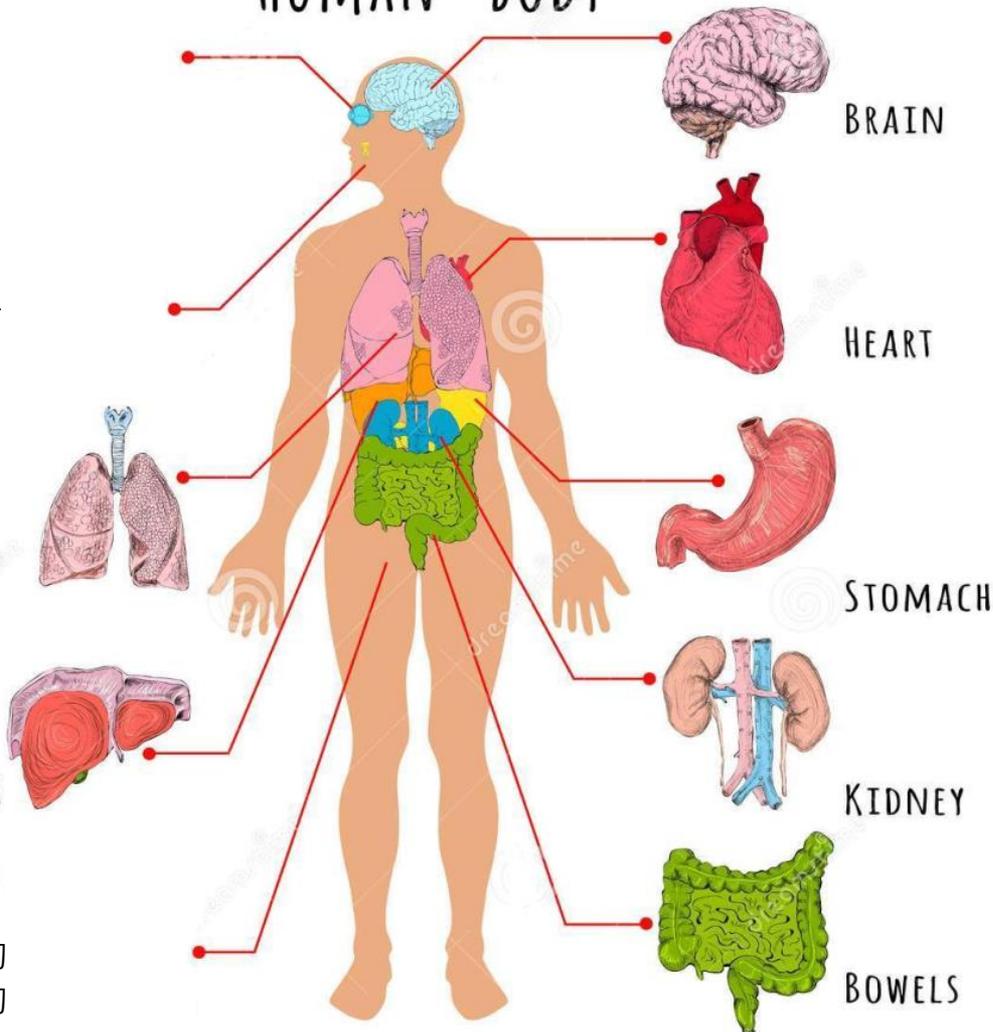
A. Panossian^{a,*}, G. Wikman^{a,*}, J. Sarris^{b,c,*}

^a Swedish Herbal Institute Research and Development, Asköster, Sweden
^b The University of Melbourne, Department of Psychiatry, Melbourne, Australia
^c Swinburne University of Technology, Brain Sciences Institute, Melbourne, Australia

近代紅景天的藥理研究

HUMAN BODY

- *抗老化、衰老
- *糖尿病
- *高血壓
- *抗氣喘
- *肺纖維化
- *猛爆性肝衰竭
- *酒精引起之急性肝損傷
- *抗生理疲勞及壓力
- *提升耐力運動能力



- *抑鬱和焦慮
- * 廣泛性焦慮症
- *心理疲勞及壓力
- *改善失眠
- *大腦皮層神經元保護作用
- *阿茲海默症

- *急性心肌缺血
- *老年性心肌衰竭
- *心臟血管狹窄

- *腎臟缺血再灌注損傷

- *小腸缺血再灌注損傷

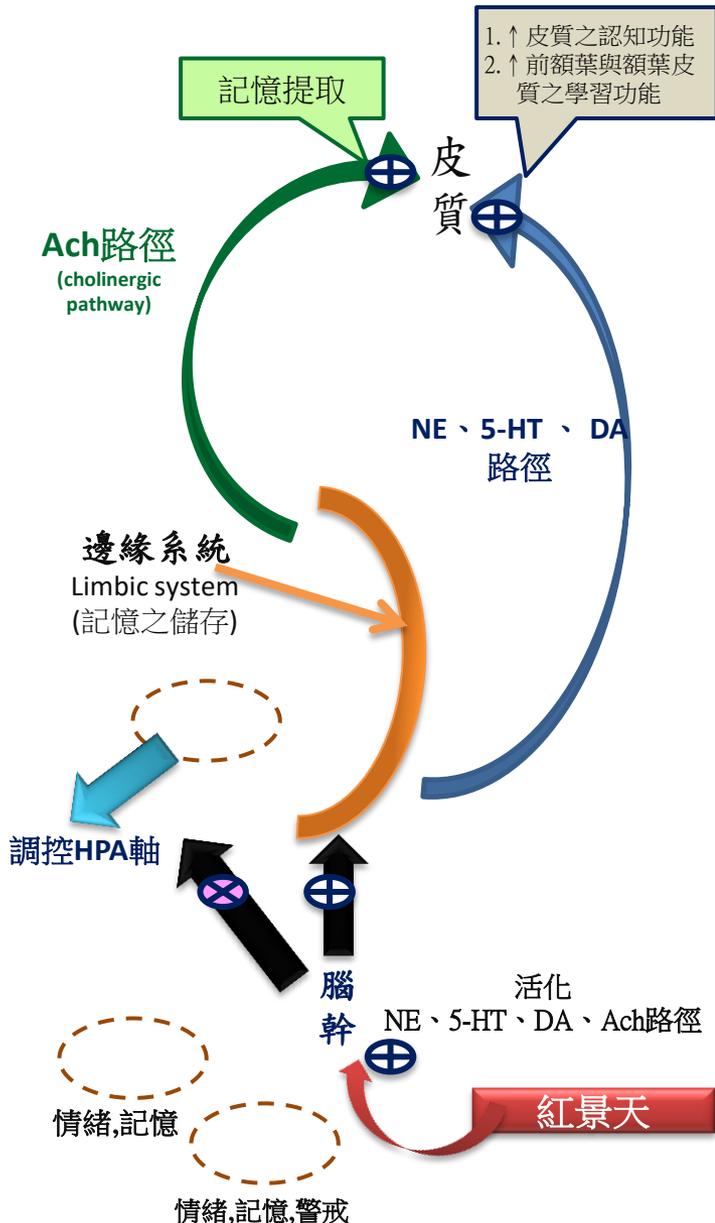
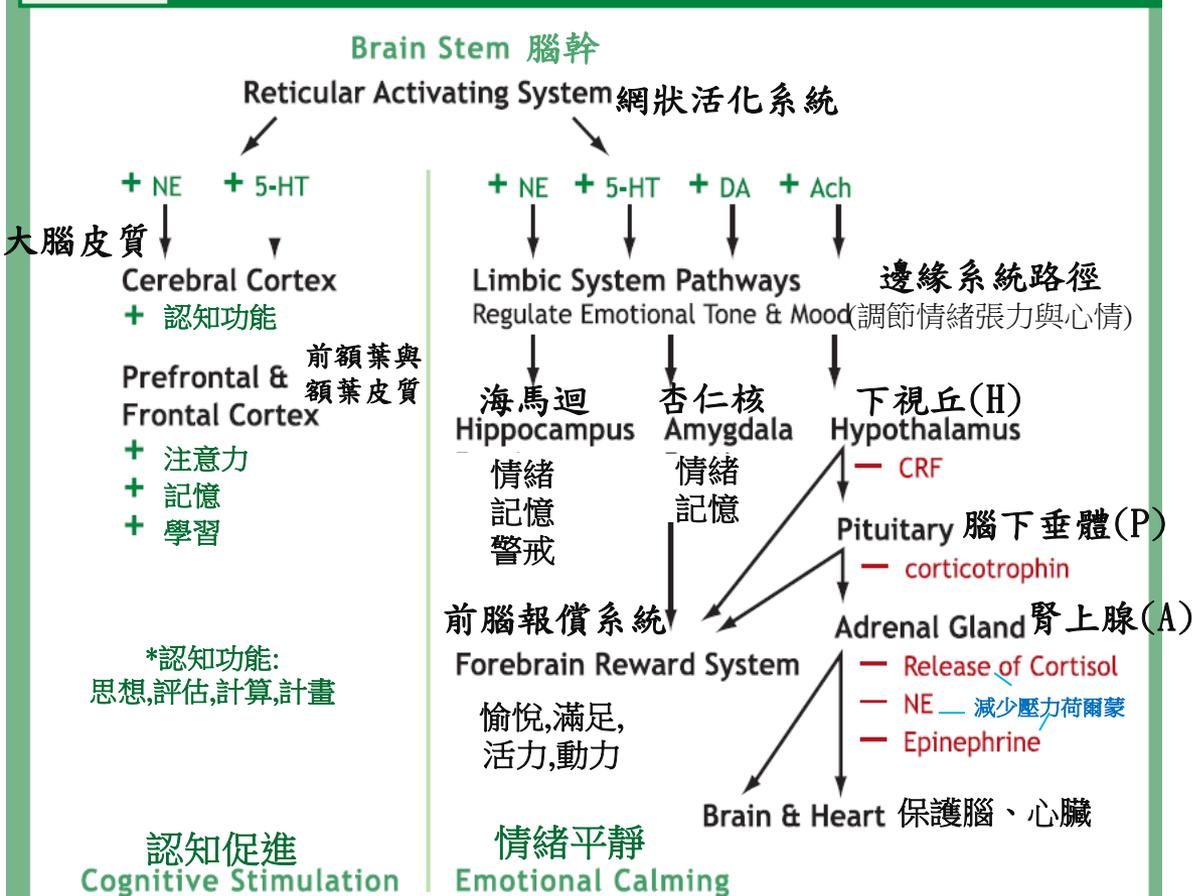
紅景天有促進認知與平靜情緒之雙重作用

對抗心理疲勞,幫助記憶、學習、抗壓、預防腦部退化



By Richard P. Brown, M.D., Patricia L. Gerbarg, M.D., and Zakir Ramazanov, Ph.D., D.S. Rhodiola rosea A Phytomedicinal Overview. HerbalGram. 2002; 56:40-52 American Botanical Council

Possible Actions of Rhodiola Rosea



KEY NE = norepinephrine, 5-HT = serotonin, DA = dopamine, Ach = acetylcholine, CRF = corticotrophin releasing factor, + = improves or increases, - = decreases

紅景天有保護心臟之效果 - 特別是在情緒與生理壓力下



Diagram 2:

Rhodiola Rosea Effects on the Heart During Emotional and Physical Stress

By Richard P. Brown, M.D., Patricia L. Gerbarg, M.D., and Zakir Ramazanov, Ph.D., D.S
Rhodiola rosea A Phytomedicinal Overview. HerbalGram. 2002; 56:40-52 American Botanical Council

• Stress Response System 壓力反應系統

- Adrenal Gland → Heart → - Risk of Tachycardia + Arrhythmia
- release of NE ↓ 心搏過速或心律不整
- release of Epinephrine

• Sympathetic/Parasympathetic System

交感/副交感系統

- Balances S/P Input → → Heart → Improves:
- + Parasympathetic
 - Sympathetic
- Heart Rate Variability
Energy Efficiency and Reserves
- 改善:
*心律變異
*增加能量之利用與保存

• Direct Effects of Rhodiola Rosea on the Heart

- Neurotransmitters: - NE, - DA
- + Cellular Energy Production: + ATP, + Creatine Phosphate, - cAMP
- 紅景天對心臟之直接效果
能量產生

KEY

NE = norepinephrine, DA = dopamine, ATP = adenosine triphosphate,
cAMP = cyclic adenosine monophosphate, + = improves or increases, - = decreases

A double-blind, placebo-controlled pilot study of the stimulating and adaptogenic effect of *Rhodiola rosea* SHR-5 extract on the fatigue of students caused by stress during an examination period with a repeated low-dose regimen.

A. A. Spasov¹, G. K. Wikman², V. B. Mandrikov¹, I. A. Mironova¹, V. V. Neumoin¹

¹Volgograd Medical Academy, Volgograd, Russia

²Swedish Herbal Institute, Göteborg, Sweden

Summary

The objective was to investigate the stimulating and normalizing effect of the adaptogen *Rhodiola rosea* extract SHR-5 in foreign students during a stressful examination period. The study was performed as a double-blind, randomized and placebo-controlled with low repeated dose regime. The study drug and the placebo were taken for 20 days by the students during an examination period. The physical and mental performance were assessed before and after the period, based on objective as well as on subjective evaluation. The most significant improvement in the SHR-5 group was seen in physical fitness, mental fatigue and neuro-motoric tests ($p < 0.01$). The self-assessment of the general well-being was also significantly ($p < 0.05$) better in the verum group. No significance was seen in the correction of text tests or a neuro-muscular tapping test. The overall conclusion is that the study drug gave significant results compared to the placebo group but that the dose level probably was suboptimal.

Key words: *Rhodiola rosea* SHR-5, mental fatigue, controlled double-blind study

玫瑰紅景天對考試壓力的研究(作者: 俄羅斯和瑞典)

紅景天改善疲勞之人體實驗~減少考試期間身體與心理之疲勞

實驗方式:1.60位(17~19歲)印度大學生在考試期間進行隨機、雙盲、安慰劑實驗

2.分為:服用薔薇紅景天根萃取物(SHR-5)100mg/天、安慰劑兩組(SHR-5:3%rosarvins+0.8%salidroside)

3.開始前與20天後進行以下檢測:

*PWC-170(power of work capacity/心跳170下時所能做之工作量:units kg/min)

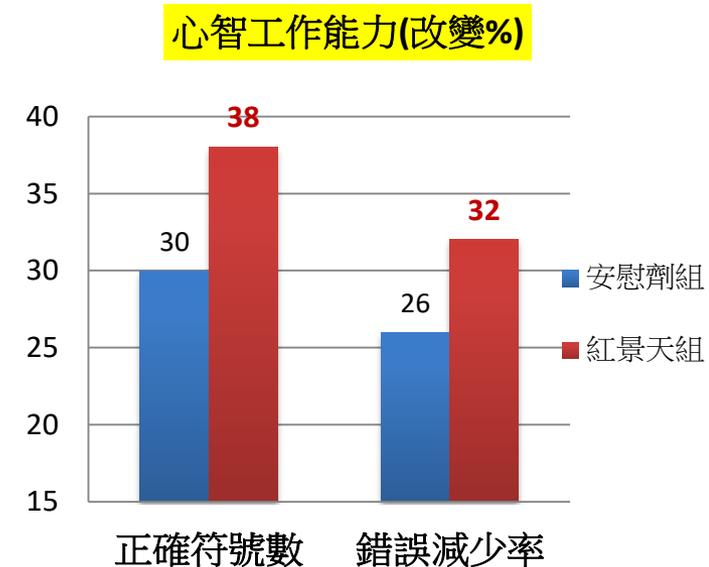
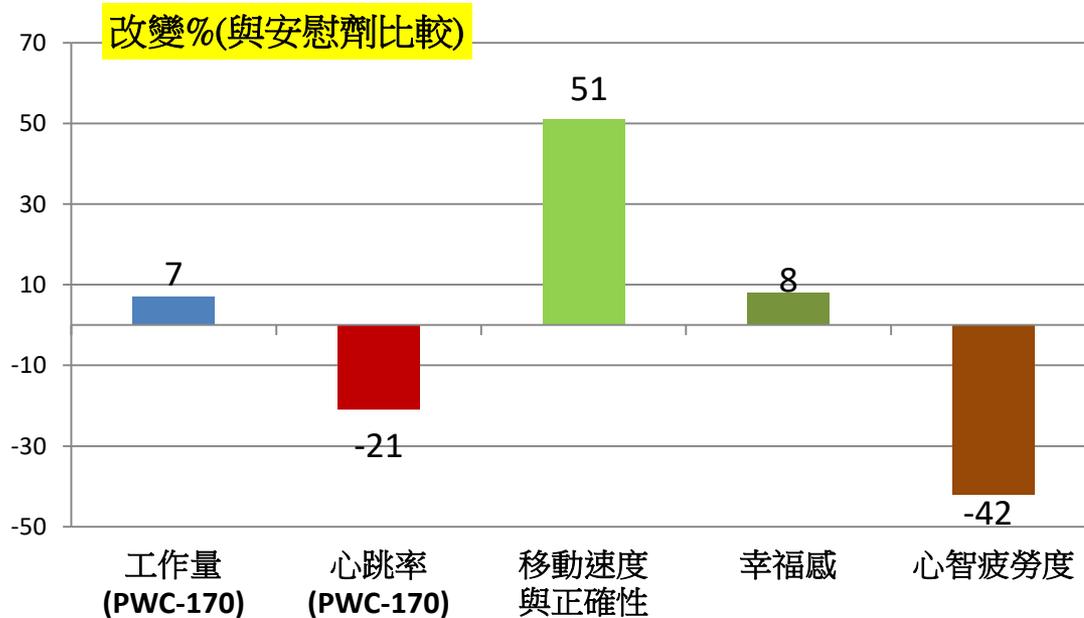
*PWC-170時之心跳率

*移動速度與正確性(迷宮測試)

*幸福感(General well-being test:SAM問卷-評估情緒狀態與工作動機)

*心智疲勞度(Mental fatigue:以心理測量問卷自我評估各種疲倦、睡眠型態、睡眠需求、心境)

*心智工作能力(Mental work capacity:以校閱符號之方式,檢測正確符號數、錯誤減少率)



結論:1.紅景天服用20天後,對有考試壓力下之學生,可有效增加工作能力,減少心跳上升,促進運動能力,增進幸福感
2.並且由於改善心智之疲勞(如改善睡眠與心智上之疲倦感),進而促進心智工作能力
3.因此紅景天可改善壓力下之身體與心理之疲勞

A Randomised, Double-Blind, Placebo-Controlled, Parallel-Group Study of the Standardised Extract SHR-5 of the Roots of *Rhodiola rosea* in the Treatment of Subjects with Stress-Related Fatigue

Author

Erik M. G. Olsson^{1,2}, Bo von Schöelle^{2,3}, Alexander G. Panossian⁴

Affiliation

¹ Department of Psychology, Uppsala University, Uppsala, Sweden

² PBM Stress Medicine AB, Stockholm, Sweden

³ School of Innovation, Design and Engineering, Mälardalen University, Västerås, Sweden

⁴ Swedish Herbal Institute Research and Development, Askö, Sweden

Key words

- *Rhodiola rosea* L.
- Crassulaceae
- stress
- fatigue
- clinical trial

Abstract



The aim of the study was to assess the efficacy of the standardised extract SHR-5 of roots of *Rhodiola rosea* L. in the treatment of individuals suffering from stress-related fatigue. The phase III clinical trial took the form of a randomised, double-blind, placebo-controlled study with parallel groups. Participants, males and females aged between 20 and 55 years, were selected according to the Swedish National Board of Health and Welfare diagnostic criteria for fatigue syndrome. A total of 60 individuals were randomised into two groups, one ($n=30$) of which received four tablets daily of SHR-5 extract (576 mg extract/day), while a second ($n=30$) received four placebo tablets daily. The effects of the extract with respect to quality of life (SF-36 questionnaire), symptoms of fatigue (Pines' burnout scale), depression (Montgomery-Asberg depression rating scale – MADRS), attention (Conners' computerised continuous performance test II – CCPT II), and saliva cortisol response to awakening were assessed on day 1 and after 28 days of medication. Data were analysed by between-within analyses of variance. No serious side effects that could be attributed to the extract were reported. Significant post-treatment improvements were observed for both groups (placebo

effect) in Pines' burnout scale, mental health (SF-36), and MADRS and in several CCPT II indices of attention, namely, omissions, commissions, and Hit RT SE. When the two groups were compared, however, significant effects of the SHR-5 extract in comparison with the placebo were observed in Pines' burnout scale and the CCPT II indices omissions, Hit RT SE, and variability. Pre- versus post-treatment cortisol responses to awakening stress were significantly different in the treatment group compared with the control group. It is concluded that repeated administration of *R. rosea* extract SHR-5 exerts an anti-fatigue effect that increases mental performance, particularly the ability to concentrate, and decreases cortisol response to awakening stress in burnout patients with fatigue syndrome.

Abbreviations



- CCCPT II: Conners' computerised continuous performance test II
HPA: hypothalamic-pituitary-adrenal
ICD: International Classification of Diseases
MADRS: Montgomery-Asberg depression rating scale
QoL: quality of life

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revised September 23, 2008
accepted September 29, 2008

Bibliography

DOI 10.1055/s-0028-1088346
Planta Med 2009; 75: 105–112

紅景天改善疲勞之人體實驗~減少壓力產生之疲勞、壓力荷爾蒙

實驗方式:1.以60位(20~55歲)有壓力產生之疲勞症狀者進行隨機、雙盲、安慰劑實驗

2.分為:服用薔薇紅景天根萃取物(SHR-5)576mg/天、安慰劑兩組(SHR-5:3%rosarvins+0.8%salidroside)

3.開始前與28天後進行以下檢測:

*疲勞症狀(Pines burn scale):為檢測疲勞症狀之問卷

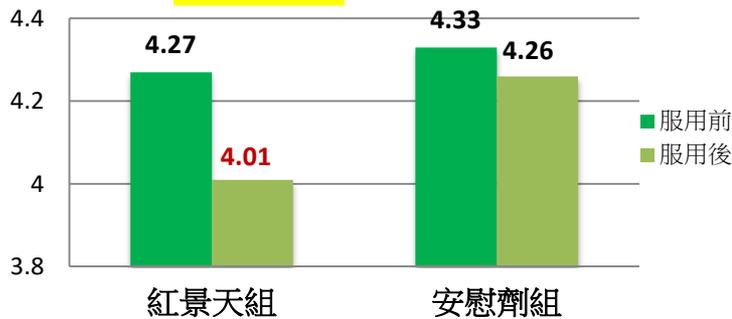
*注意力測試評估(CCPT II):包括~

a.粗心程度評分 b.反應時間之變異 c.反應過程之變異 (b與c之降低表示工作步調變穩定,有更好之注意力)

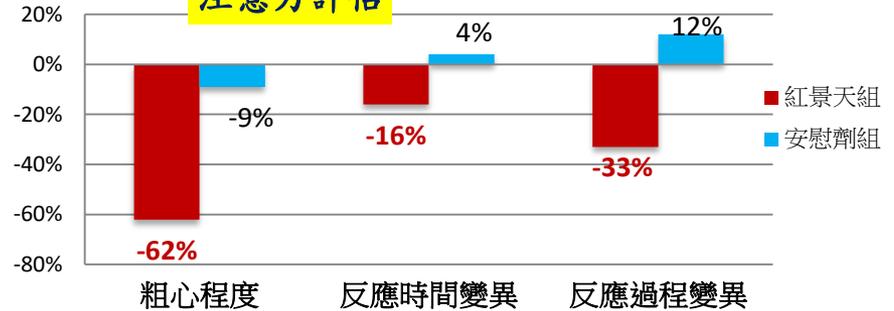
*檢測壓力荷爾蒙可體松(cortisol)之變化:

~於早上醒來產生之壓力下,在剛醒、醒後15、30、60分鐘以棉棒取唾液檢測血中可體松濃度

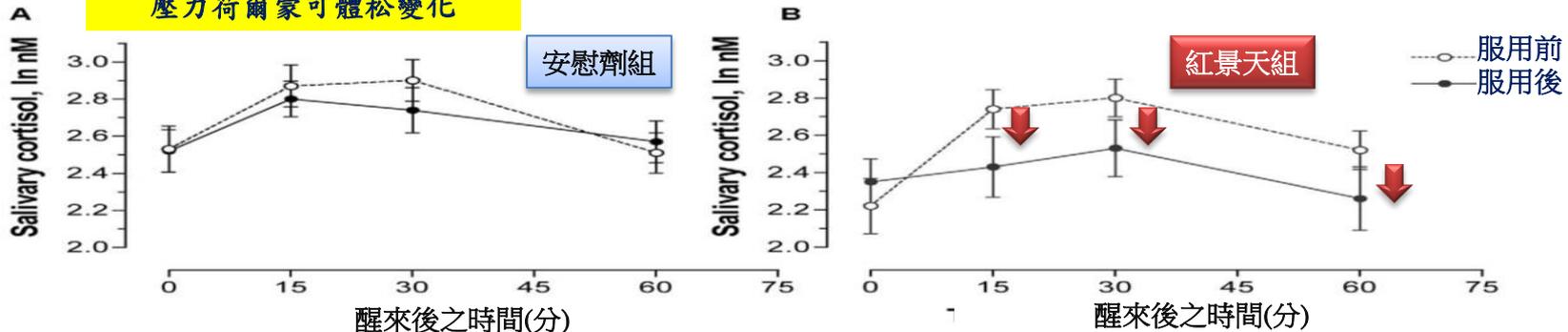
疲勞症狀



注意力評估



壓力荷爾蒙可體松變化



結論:1.紅景天服用28天後,可有效降低壓力荷爾蒙可體松之分泌

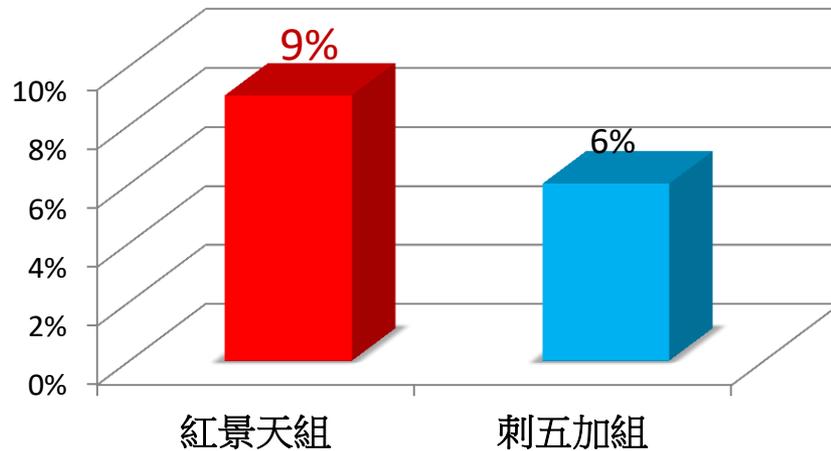
2.因此對因壓力造成疲勞症狀者,可有效改善疲勞症狀,並促進注意力(改善粗心、避免過大之反應)

紅景天增加身體之體力

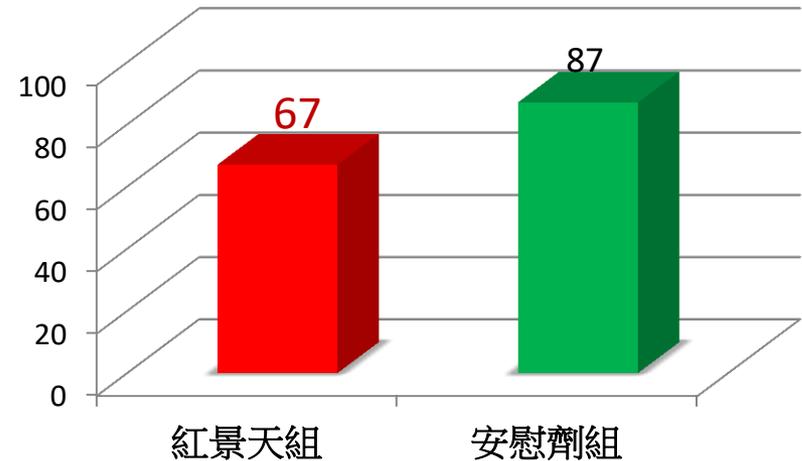
實驗方式:人體實驗

- 1.52位18~24歲男性分3組:紅景天組(15滴玫瑰紅景天萃取液/相當於150mg含3%rosavins and 1%salidroside)、刺五加組(2ml)、安慰劑組
- 2.30分鐘後,騎電力腳踏車肌力計來產生因工作誘導之基礎疲勞正確量→休息5分鐘→在特殊強度下再騎一次,以決定他們所能達到之最大之工作能力(work capacity/代表爆發力)
- 3.結束後休息10分鐘,測心跳數(代表恢復能力)

運動爆發力(與安慰劑比較)



心跳數(下/分)



結論:

1. 單次口服紅景天即可有效增加運動爆發力9%, 效果優於刺五加
2. 運動後, 紅景天也能迅速恢復心跳, 表示紅景天有有助運動後體力之快速恢復

紅景天改善憂鬱之人體實驗~改善輕度~中度憂鬱、失眠(一)

實驗方式:1.以89位(18~70歲)經DSM-IV(精神疾病診斷準則手冊)診斷為輕度~中度憂鬱症之患者,進行隨機、雙盲、安慰劑實驗

2.分為3組:組A(group A)服用薔薇紅景天根萃取物(SHR-5)340mg/天(SHR-5:3%rosarvins+0.8%salidroside)

組B(group B)服用薔薇紅景天根萃取物(SHR-5)680mg/天

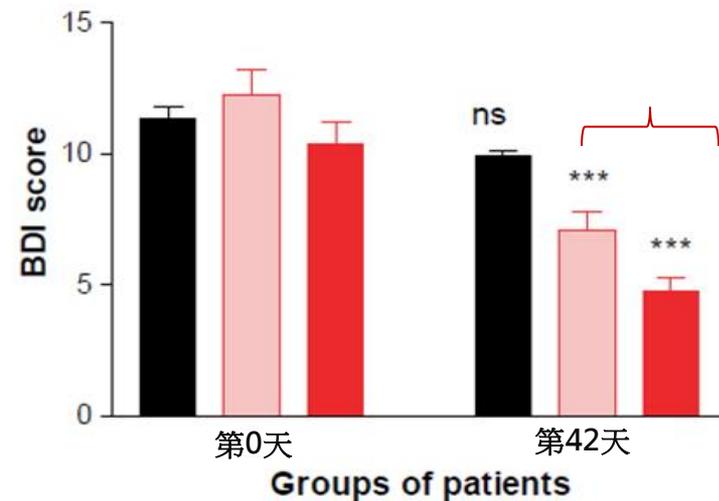
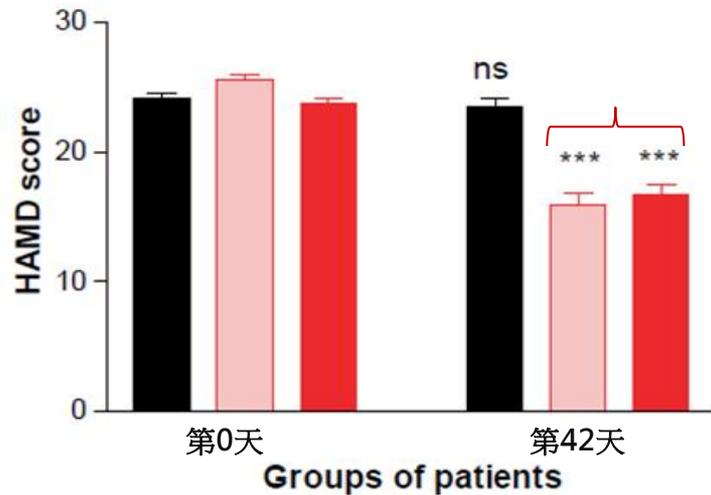
組C(group C)服用安慰劑

3.開始前與42天後進行以下兩種憂鬱症狀嚴重度評估問卷:

*BDI問卷(Beck Depression Inventory)

*HAMD問卷(Hamilton Rating Scale for Depression):

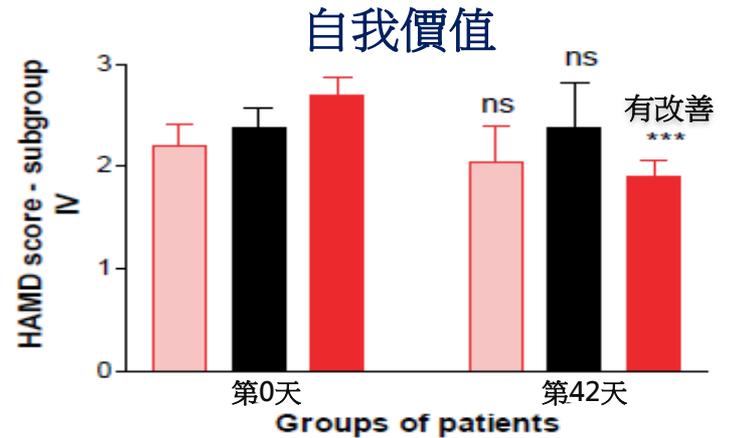
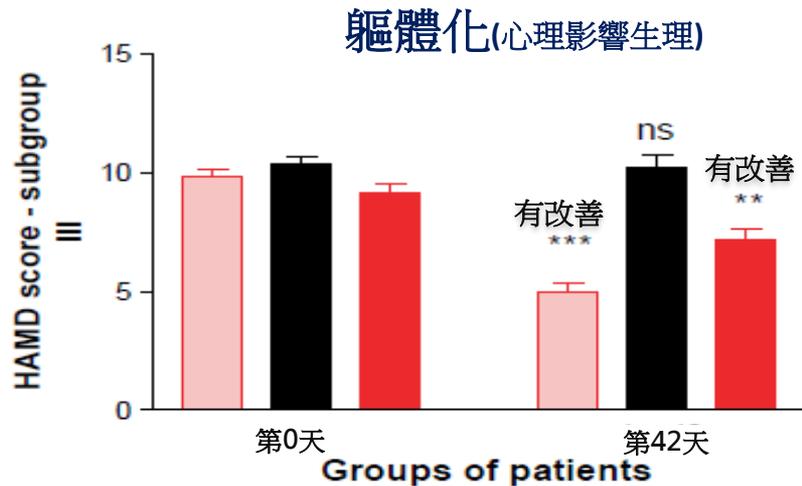
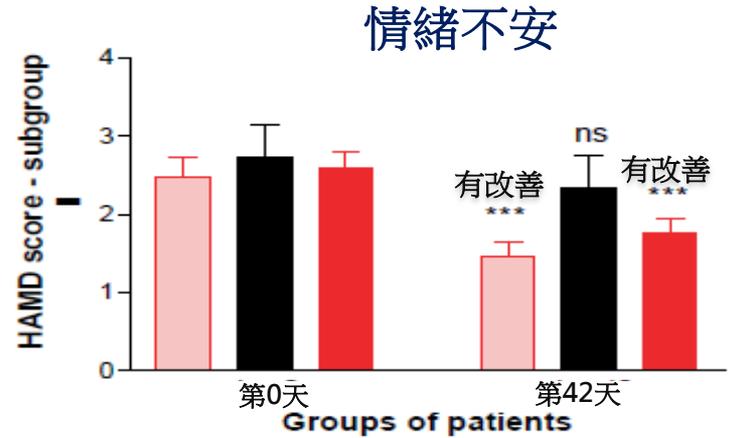
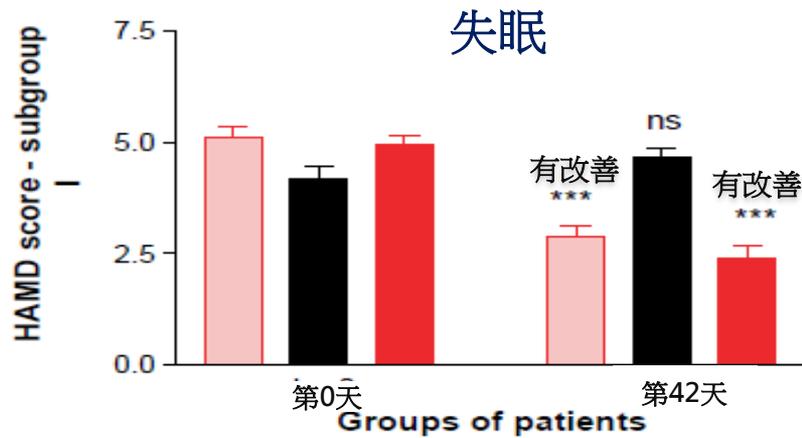
而在此問卷中除了總分外也做細項目之評分(失眠、情緒不安、軀體化/心理影響生理之狀態、自我價值)



■ Group C 安慰劑/天
■ Group A (SHR-5) 340mg/天
■ Group B (SHR-5) 680mg/天

結論:1. 紅景天服用42天後,不論服用較低或較高劑量,均可有效改善輕度~中度憂鬱症患者之症狀
2.安慰劑則沒有效果

紅景天改善憂鬱之人體實驗~改善輕度~中度憂鬱、失眠(二)



■ Group A (SHR-5)340mg/天
■ Group C 安慰劑/天
■ Group B (SHR-5)680mg/天

結論:1. 紅景天服用42天後,不論服用較低或較高劑量,均可有效改善憂鬱引起之失眠、情緒不安、生理之不適,而高劑量甚至有提升自我價值之作用
 2. 安慰劑則均沒有效果

紅景天改善腦力之人體實驗~單次投與即改善腦力、促進幸福感(一)

實驗方式:1.以161位(19~21歲)有疲勞與壓力感軍校生,進行隨機、雙盲、安慰劑實驗

2.分為4組:*控制組(甚麼都沒吃)

*安慰劑組(服用安慰劑)

*紅景天370mg/次組(服用薔薇紅景天根萃取物(SHR-5))

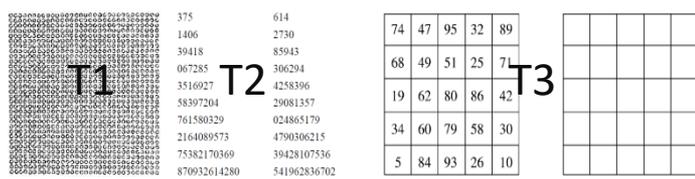
*紅景天550mg/次組

3.開始前與單次服用2小時後進行以下腦力(心智)功能評估:

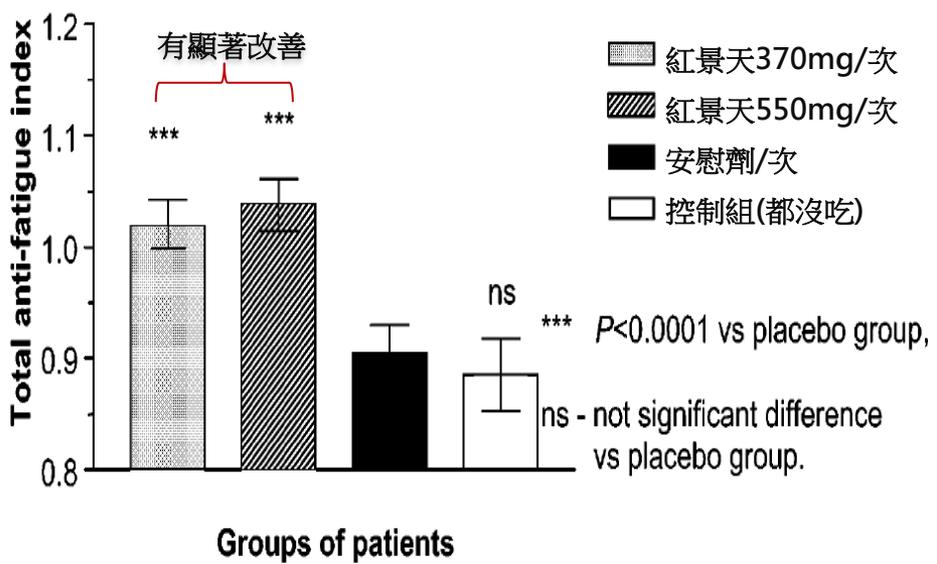
*總抗疲勞分數(AFI):包含T1s、T1e、T2、T3a之分數,由服用後與服用前之比值來計算平均值,值越大抗疲勞效果越大

*T1s分數:眼睛掃描符號之總數目~測量腦力表現之速度

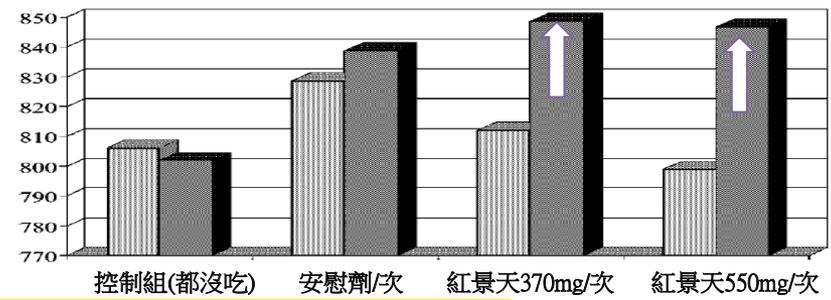
*幸福感評估(問卷)



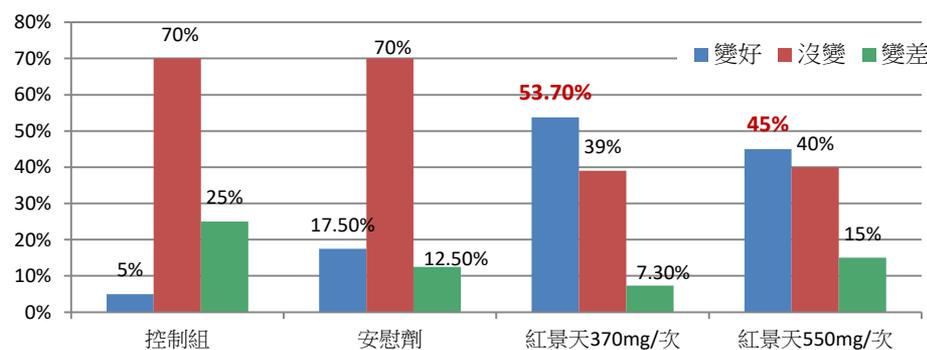
結果一:總抗疲勞分數(AFI)



結果二:T1s:測量腦力表現之速度



結果三:幸福感評估



結論:單次服用紅景天,不論服用較低或較高劑量,均可有效對抗腦力疲勞、改善腦力、促進幸福感

V. A. Shevtsov1. A randomized trial of two different doses of a SHR-5 Rhodiola rosea extract versus placebo and control of capacity for mental work
Phytomedicine 10: 95 - 105, 2003

紅景天的臨床用途

October 2007

Chem. Pharm. Bull. 55(10) 1505—1511 (2007)

1505

Bioactive Constituents from Chinese Natural Medicines. XXVI.¹⁾ Chemical Structures and Hepatoprotective Effects of Constituents from Roots of *Rhodiola sachalinensis*

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The methanolic extract from the roots of *Rhodiola sachalinensis* was found to show a protective effect on D-galactosamine-induced cytotoxicity in primary cultured mouse hepatocytes. From the methanolic extract, five new glycosides, two monoterpene glycosides, two flavonol bisdesmosides, and a cyanogenic glycoside, were isolated together with 34 known compounds. The structures of new constituents were elucidated on the basis of chemical and physicochemical evidence. In addition, the principal constituents, sachalosides III and IV, rhodiosin, and *trans*-caffeic acid, displayed hepatoprotective effects.

Key words Rhodiola Radix; *Rhodiola sachalinensis*; sachaloside; flavonol bisdesmoside; cyanogenic glycoside; hepatoprotective effect

庫頁紅景天對肝細胞的保護作用(作者: 日本)

庫頁紅景天可保護肝臟-抑制發炎與纖維化

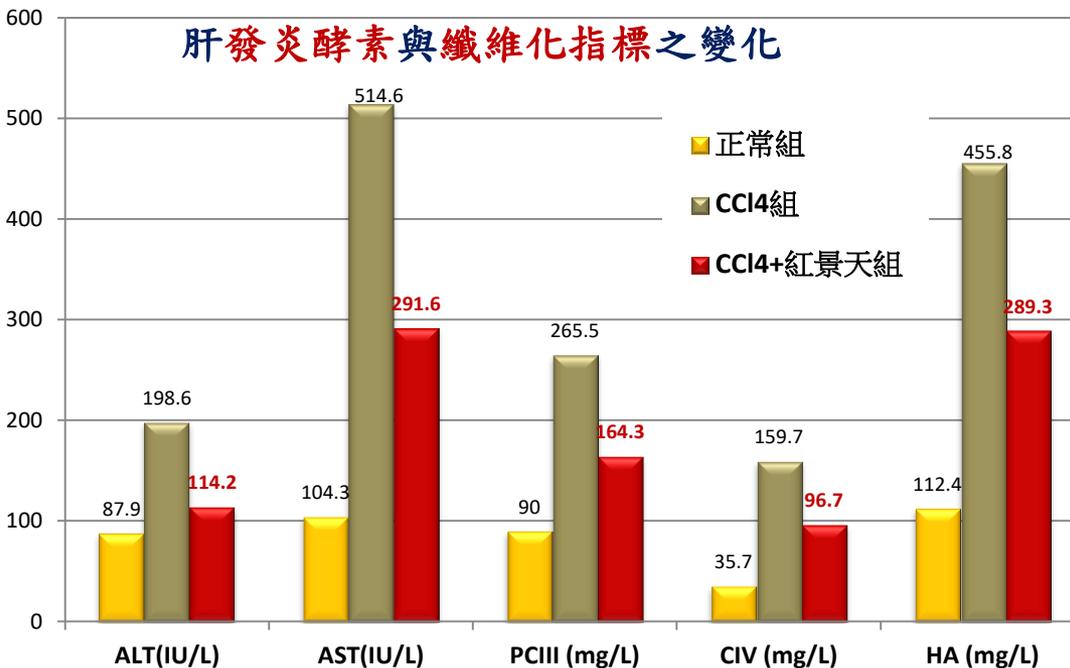
實驗方式: 1. 90隻雄性大鼠, 隨機分為3組: 正常組, CCl4組(注射CCl4誘導肝發炎與纖維化), CCl4+口服庫頁紅景天(0.5g/Kg)組

2. 進行15週後, 將大鼠犧牲:

* 自心臟取血測肝纖維化之參數(ALT、AST、procollagenIII(PCIII)、collagenIV(CIV)、hyaluronic acid(HA))

* 取肝臟做切片: a. 以VG染色看組織學變化, 並評分纖維化程度

b. 以RT-PCR *in situ*測TGF-β1mRNA之表達(此為刺激肝星狀細胞(HSC)活化之重要細胞激素)



纖維化程度分數

Group	n	0	+1	+2	+3	+4	Staging scores
正常組	10	10	0	0	0	0	0 ^a
CCl4	30	0	0	3	8	19	3.53±0.68
CCl4+紅景天	35	0	2	18	13	2	2.43±0.47 ^b

^aP<0.01, ^bP<0.05 vs model group.

TGF-β1mRNA之表達

Group	n	-	+	++	+++	Scores	Positive ratio (%)
正常組	8	3	4	1	0	0.75 ^a	62.5 ^a
CCl4	10	1	1	1	7	2.40	90.0
CCl4+紅景天	10	2	5	2	1	1.20 ^b	80.0 ^b

^aP<0.01, ^bP<0.05 vs model group.

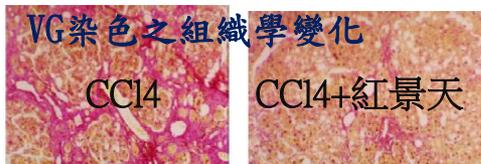


Figure 1 Liver VG staining in model rats (10×40).

Figure 2 Liver VG staining in treatment rats (10×40).

結果:

1. 庫頁紅景天可有效降低CCl4誘導之肝發炎(↓ALT、AST)
2. 也可減輕纖維化程度(↓PCIII、CIV、HA、纖維化分數)
3. 此與抑制了會刺激肝星狀細胞(HSC)活化之細胞激素TGF-β1mRNA之表達有關

Table 2 Liver fibrosis-associated enzymes and fibrosis markers in serum ($\bar{x}\pm s$)

Group	ALT (IU/L)	AST (IU/L)	β -NAG ($\mu\text{mol/L}$)	PCIII ($\mu\text{g/L}$)	CIV ($\mu\text{g/L}$)	HA ($\mu\text{g/L}$)
Normal	87.93 \pm 18.61 ^a	104.3 \pm 32.40 ^a	189.00 \pm 26.70 ^a	89.99 \pm 10.85 ^a	35.69 \pm 9.68 ^a	112.41 \pm 45.62 ^a
Model	198.64 \pm 71.02	514.59 \pm 180.22	415.77 \pm 133.37	265.54 \pm 98.21	159.67 \pm 29.64	455.79 \pm 113.55
Treatment	114.17 \pm 47.89 ^a	291.62 \pm 141.75 ^a	244.67 \pm 46.8 ^a	164.25 \pm 45.68 ^a	96.73 \pm 16.48 ^a	289.35 \pm 75.68 ^a

^a $P < 0.01$ vs model group.

Table 3 Histopathological semiquantitative scores in the liver

Group	<i>n</i>	0	+1	+2	+3	+4	Staging scores
Normal	10	10	0	0	0	0	0 ^a
Model	30	0	0	3	8	19	3.53 \pm 0.68
Treatment	35	0	2	18	13	2	2.43 \pm 0.47 ^b

^a $P < 0.01$, ^b $P < 0.05$ vs model group.

Table 5 Expression of TGF- β 1mRNA (semiquantitative scores and positive ratio)

Group	<i>n</i>	-	+	++	+++	Scores	Positive ratio (%)
Normal	8	3	4	1	0	0.75 ^a	62.5 ^a
Model	10	1	1	1	7	2.40	90.0
Treatment	10	2	5	2	1	1.20 ^b	80.0 ^b

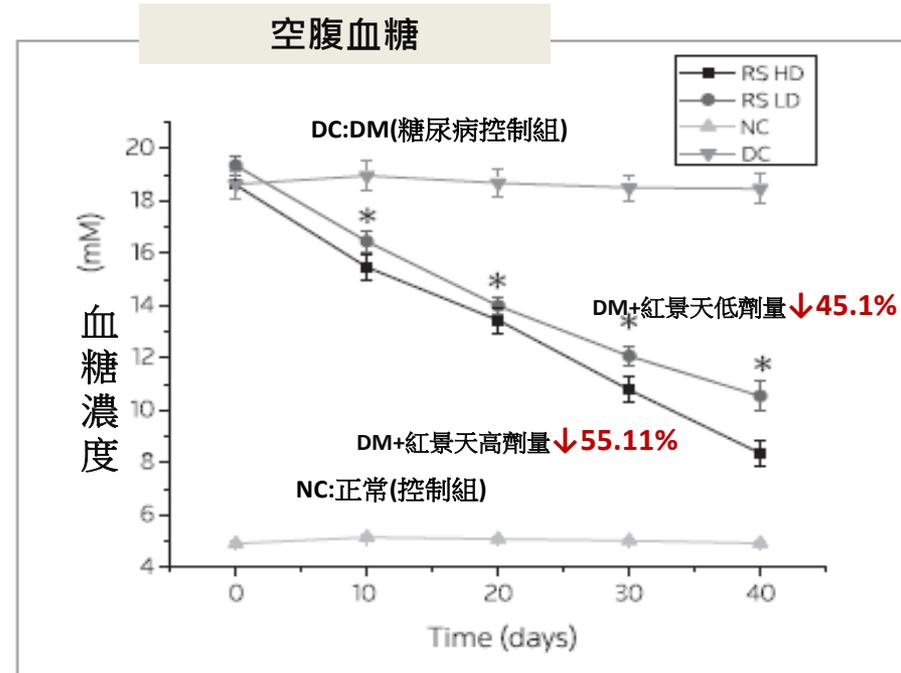
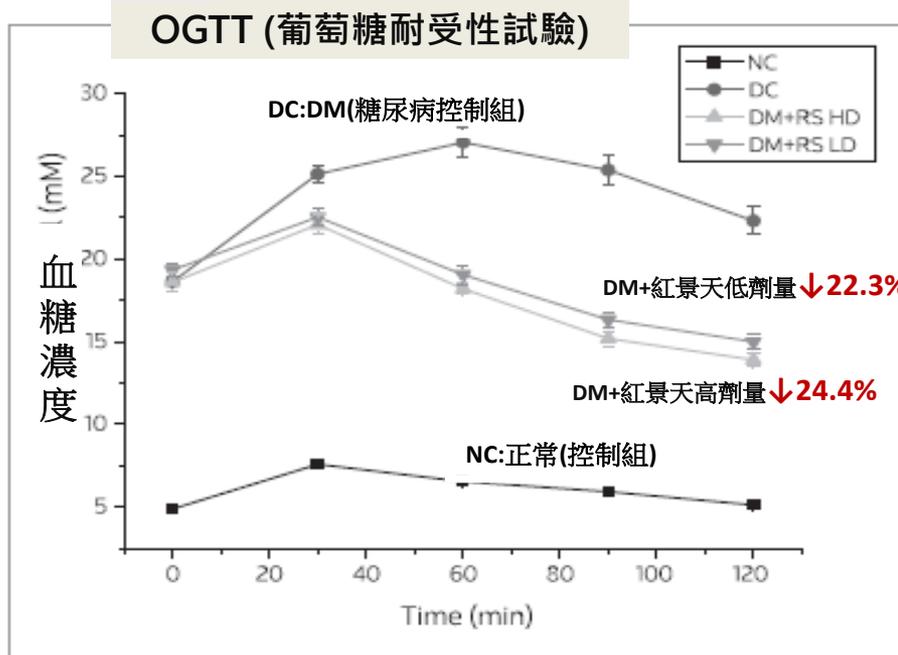
^a $P < 0.01$, ^b $P < 0.05$ vs model group.

庫頁紅景天有降血糖之效果-糖尿病老鼠之實驗(一)

~降低飯後與空腹血糖

- 實驗方式: 1. 32隻雄性大鼠, 隨機分為4組: 正常組, 控制組(DM糖尿病組), DM+紅景天根萃取物(RS)低劑量組(200mg/kg), DM+紅景天萃取物(RS)高劑量(400mg/kg) (糖尿病是以注射streptozotocin誘導)
- 第0天於投與試劑後30分鐘後, 即進行OGTT(葡萄糖耐受性試驗), 測紅景天之急性效果(降飯後血糖)
 - 進行40天後, 各組均抽血測血脂質、血中胰島素與內生性抗氧化物質濃度
 - 空腹血糖每10天檢測一次(測紅景天之慢性效果)

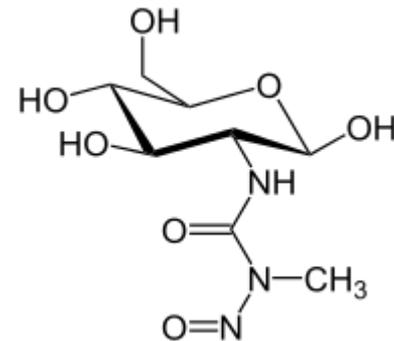
結果一: 血糖

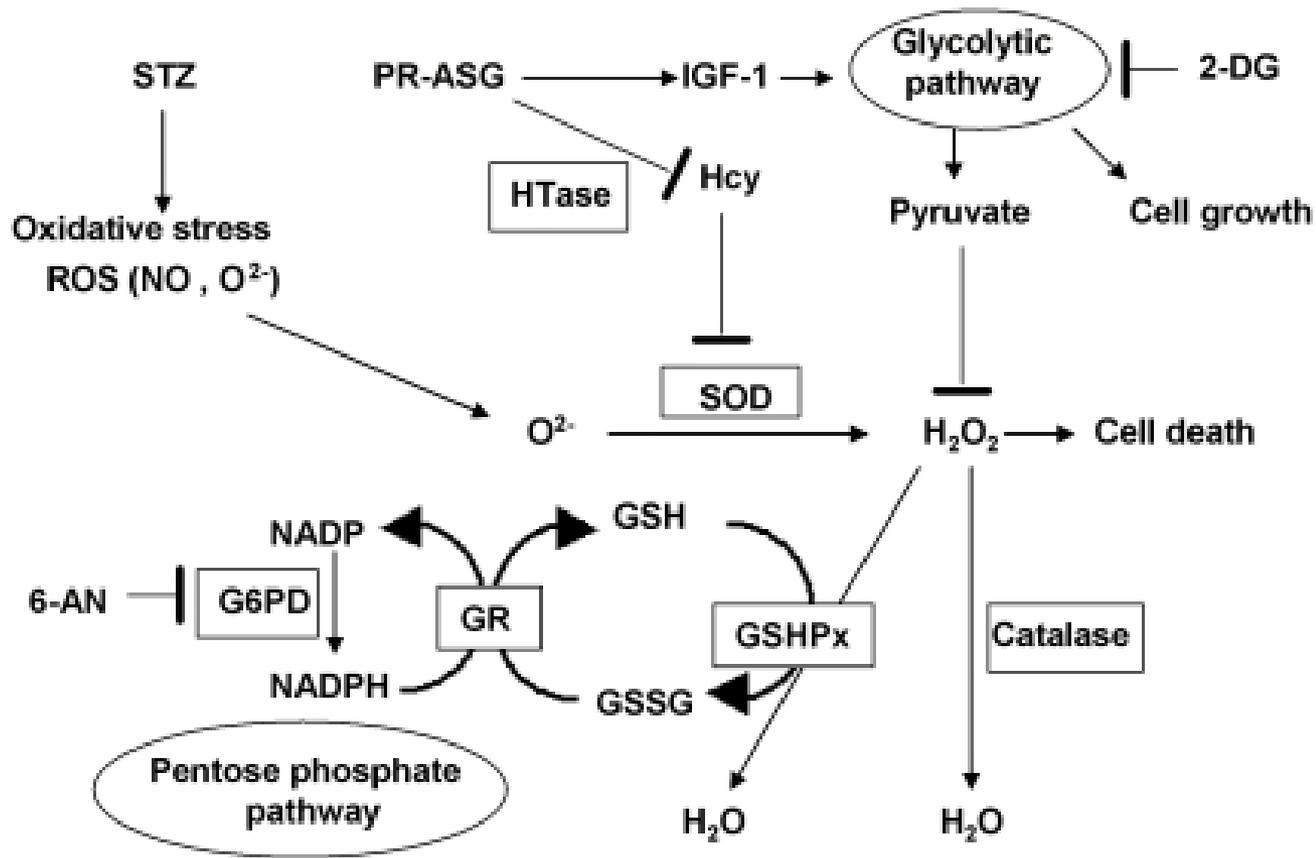


- 結果: 1. 庫頁紅景天根萃取物會降低空腹血糖(第10天即有差異, 40天後更加顯著)與OGTT之血糖
2. 可見庫頁紅景天有降低飯後與空腹血糖之作用

何謂Streptozotocin

- **Streptozotocin (Streptozocin, STZ, Zanosar)**為自然產生之化學物,與葡萄糖結構類似,會被胰臟β細胞之GLUT2辨識並運送至β細胞內,此為對胰臟β細胞有選擇性毒性之原因
- 對產生insulin之β細胞有特別之毒性,醫學可用來治療蘭氏細胞癌
- 也可用來產生**第一型**與**第二型**糖尿病之實驗動物
- 誘導糖尿病之原理:Streptozotocin 為一種glucosamine-nitrosourea 化合物.如同其他之nitrosourea種類之alkylating製劑,它會引起**DNA傷害**→誘導poly ADP-ribosylation →**誘導糖尿病**之產生.



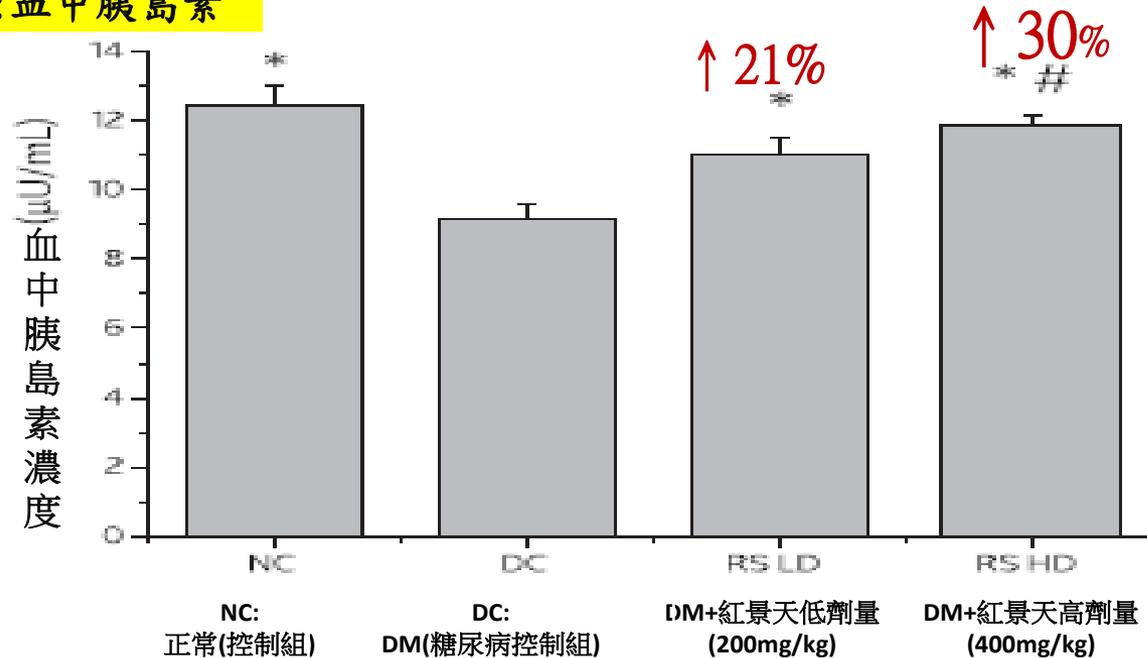


Streptozotocin (Streptozocin, STZ, Zanosar) 與葡萄糖結構類似，會被胰臟β細胞之GLUT2辨識並運送至β細胞內，對胰臟β細胞有選擇性毒性，人為造症糖尿病

庫頁紅景天可增加胰島素分泌-糖尿病老鼠之實驗(二)

庫頁紅景天對糖尿病老鼠產生之效果-
刺激胰島素分泌

結果二:血中胰島素

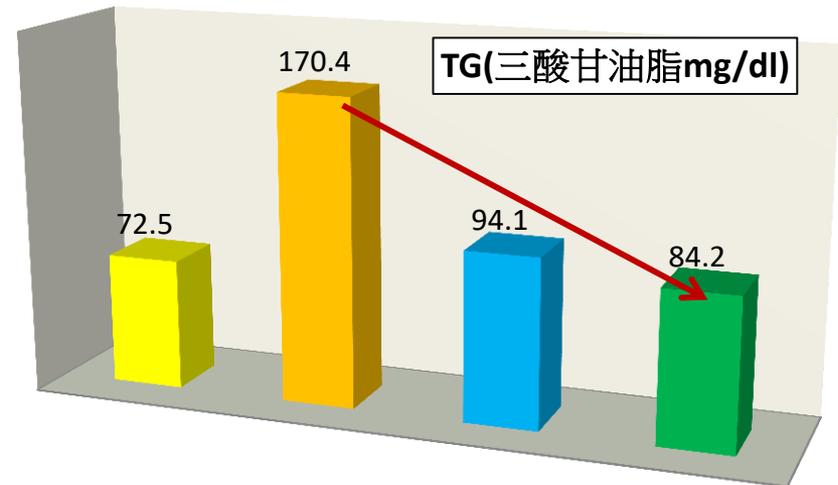
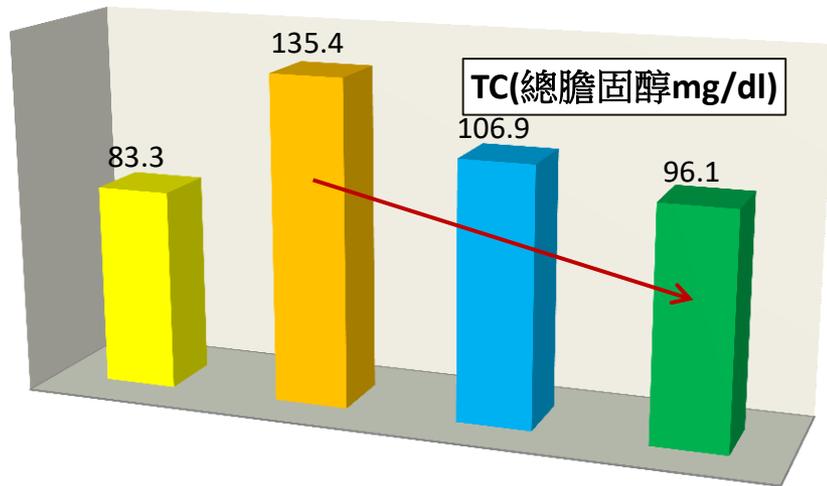


結果:1.庫頁紅景天根萃取物會呈現劑量依賴性之增加胰島素分泌
2.推測庫頁紅景天降低血糖之作用與增加胰島素分泌有關

庫頁紅景天降低總膽固醇與三酸甘油脂- 糖尿病老鼠之實驗(三)

結果三:血中脂質變化

- NC:正常(控制組)
- DC:DM(糖尿病控制組)
- DM+紅景天低劑量(200mg/kg)
- DM+紅景天高劑量(400mg/kg)



- 結果:1.庫頁紅景天根萃取物會呈現劑量依賴性之降低TC與TG
2.因此庫頁紅景天有降低血脂質之作用

庫頁紅景天對糖尿病老鼠產生之效果-
降低總膽固醇與三酸甘油脂

Table II. Effect of RS on total serum cholesterol (TC) and triglycerides (TG) in normal and diabetic rats.

Group	TC (mg/dL)	TG (mg/dL)
Normal controls	83.288 ± 3.084*	72.513 ± 3.169*
Diabetic control group	135.375 ± 4.203	170.438 ± 3.376
Diabetes model + RS low dose	106.913 ± 4.491*	94.075 ± 3.837*
Diabetes model + RS high dose	96.125 ± 4.591*#	84.188 ± 4.121*#

Values are means ± SD for eight rats in each group. * $P < 0.01$ vs. diabetic control group; # $P < 0.05$ vs. diabetes model + low dose.

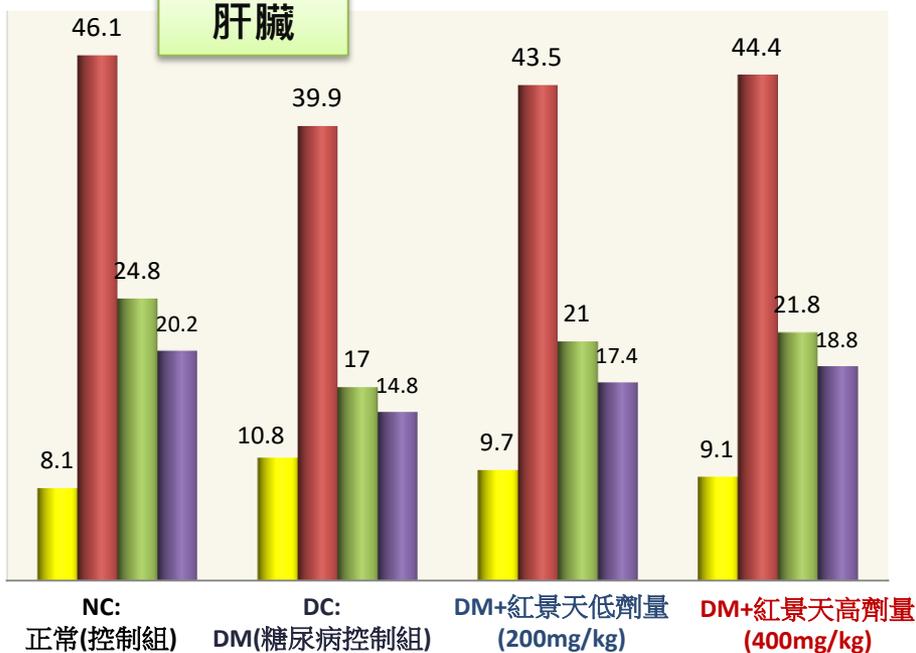
庫頁紅景天有抗氧化~保護肝臟和腎臟作用-糖尿病老鼠實驗(四)

結果四:血中抗氧化物與脂質過氧化物(MDA)之變化

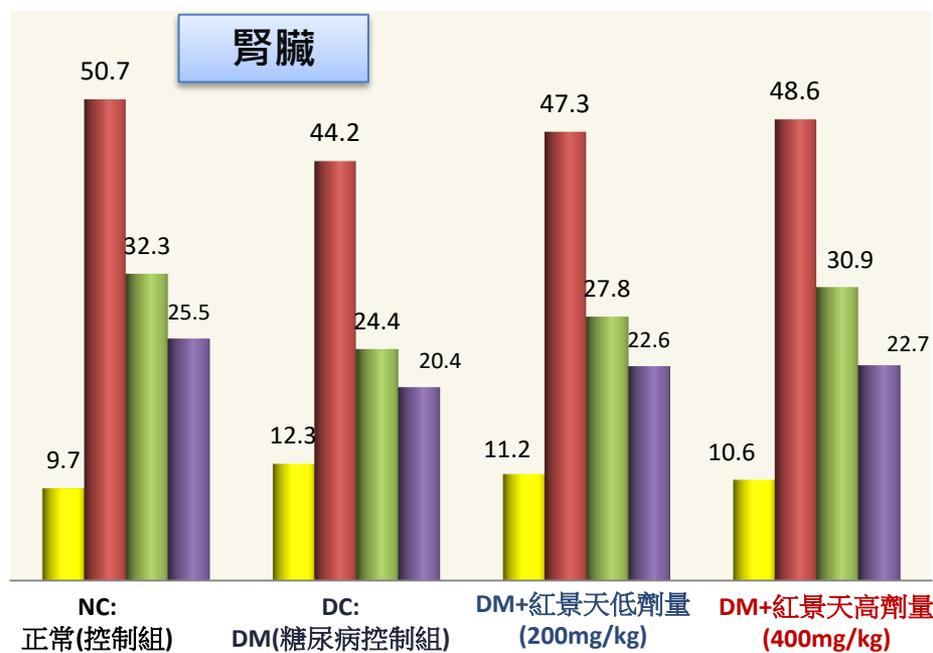
■ MDA(nmol/mg protein)
 ■ SOD(U/mg protein)
 ■ GPX(U/mg protein)
 ■ catalase(U/mg protein)

■ MDA(nmol/mg protein)
 ■ SOD(U/mg protein)
 ■ GPX(U/mg protein)
 ■ catalase(U/mg protein)

肝臟



腎臟



- 結果: 1. DM糖尿病組之內生性抗氧化物質(SOD, GPX, catalase)均比正常組低, 而脂質過氧化物 MDA則相反
 2. 庫頁紅景天根萃取物可逆轉STZ誘導糖尿病老鼠內抗氧化物質之降低與MDA之上升→避免組織之氧化性傷害與糖尿病之併發症
 3. 因此庫頁紅景天有抗氧化、保護肝臟和腎臟之作用

庫頁紅景天對糖尿病老鼠產生之效果- 在肝與腎組織產生抗氧化作用

Table III. Antioxidant effect of RS in the liver and kidney tissues of the tested rats.

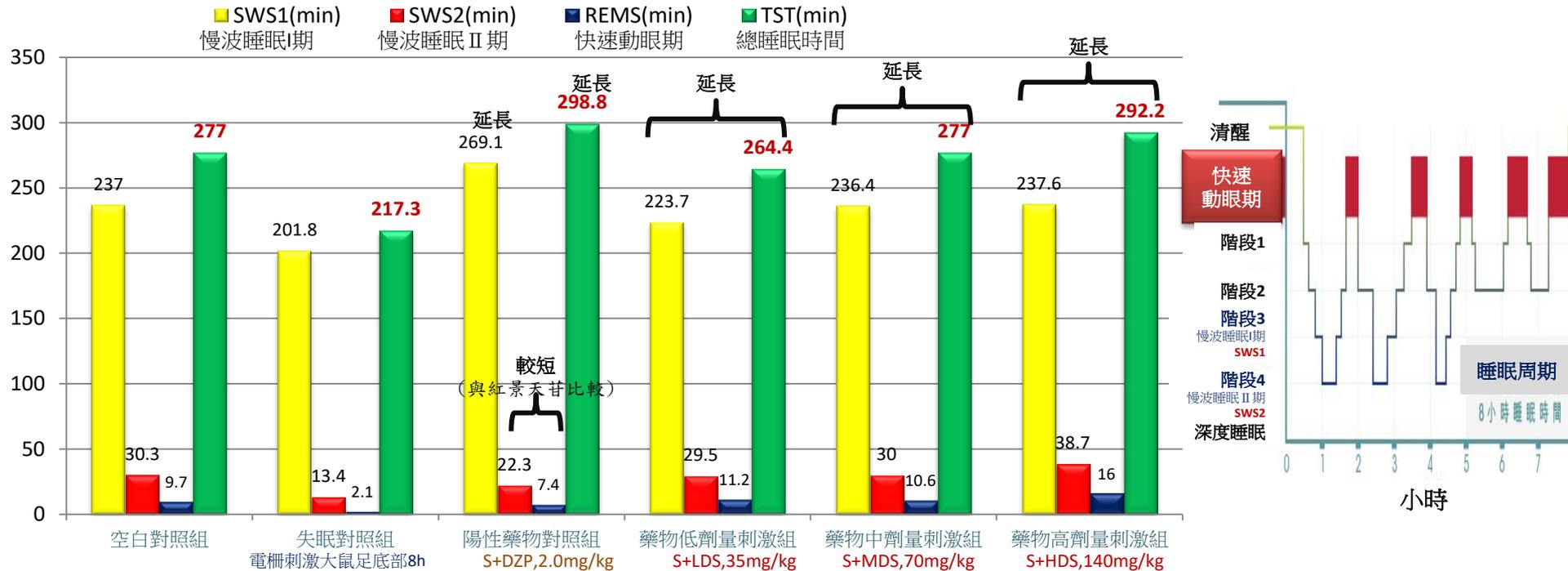
Antioxidant level in liver and kidney tissues	NC	DC	DM + RS LD	DM + RS HD
Liver malondialdehyde (nmol/mg protein)	8.105 ± 0.329**	10.848 ± 0.455	9.773 ± 0.375	9.132 ± 0.374*
Kidney malondialdehyde (nmol/mg protein)	9.701 ± 0.269**	12.315 ± 0.352	11.239 ± 0.441	10.604 ± 0.236*
Liver superoxide dismutase (U/mg protein)	46.05 ± 1.129**	39.913 ± 1.045	43.45 ± 1.018	44.375 ± 0.958*
Kidney superoxide dismutase (U/mg protein)	50.725 ± 1.184**	44.188 ± 0.834	47.263 ± 0.927	48.638 ± 0.814*
Liver glutathione peroxidase (U/mg protein)	24.849 ± 0.944**	16.959 ± 0.734	20.973 ± 0.925*	21.848 ± 1.136*
Kidney glutathione peroxidase (U/mg protein)	32.321 ± 0.795**	24.438 ± 0.600	27.779 ± 0.691*	30.853 ± 0.898**
Liver catalase (U/mL)	20.176 ± 0.551**	14.786 ± 0.390	17.398 ± 0.416*	18.776 ± 0.597**
Kidney catalase (U/mL)	25.544 ± 0.433**	20.410 ± 0.549	22.604 ± 0.539*	22.665 ± 0.491*

The values are means ± SE for eight rats per group. * $P < 0.05$ vs. diabetic control group. ** $P < 0.01$ vs. diabetic control group. See Figure 1 for abbreviations.

紅景天苷改善睡眠-改善失眠大鼠之睡眠週期

實驗方式:

- 將大鼠分6組-對照組、失眠對照組(電柵刺激大鼠足底部8h-stress)、陽性藥物對照組(stress+Diazepam, S+DZP, 2.0mg/kg)、藥物高劑量刺激組(stress+高劑量紅景天苷salidroside, S+HDS140mg/kg)、藥物中劑量刺激組(stress+中劑量 salidroside, S+MDS,70mg/kg)和藥物低劑量刺激組(stress+低劑量salidroside, S+LDS35mg/kg)
- 各組老鼠給予電柵刺激大鼠足底部8h造成失眠後,給予上述受試藥物40分鐘後,再測睡眠週期中各階段腦波與總睡眠時間



結果:

- 紅景天苷低、中、高劑量刺激組均能顯著延長失眠大鼠的總睡眠時間。主要是延長失眠大鼠睡眠時相中的SWSI、SWS2和REMS期來延長總睡眠時間, 並且調整睡眠時相各期所占的比例, 使與正常大鼠正常睡眠時的睡眠時相所占比例接近, 具有使失眠大鼠的睡眠恢復正常的功能
- BZD主要是通過不同程度地縮短睡眠時相中SWS2和REMS(與紅景天苷比較), 相對延長SWSI而達到延長總睡眠時間的作用
- 紅景天苷與BZD對延長失眠大鼠睡眠時間方面的藥理作用機制可能不同

表 1 红景天苷对失眠大鼠睡眠时相的影响($\bar{x} \pm s$)

Table 1 Effect of salidroside on sleep phase in insomnia rats ($\bar{x} \pm s$)

组 别	<i>n</i>	SWS1 (min)	SWS2 (min)	REMS (min)	TST (min)
空白对照组	8	237.0 ± 43.0	30.3 ± 9.7	9.7 ± 5.8	277.1 ± 39.6
失眠对照组	8	201.8 ± 22.9	13.4 ± 5.9 ^{##}	2.1 ± 2.5 ^{##}	217.3 ± 21.4 ^{##}
阳性药物对照组	8	269.1 ± 30.6 ^{**}	22.3 ± 7.8 [*]	7.4 ± 5.6 [*]	298.8 ± 32.3 ^{**}
药物低剂量刺激组	8	223.7 ± 37.3	29.5 ± 10.5 ^{**}	11.2 ± 5.1 ^{**}	264.4 ± 39.7 ^{**}
药物中剂量刺激组	8	236.4 ± 25.2 ^{**}	30.0 ± 11.8 ^{**}	10.6 ± 5.7 ^{**}	277.0 ± 22.5 ^{**}
药物高剂量刺激组	8	237.6 ± 37.9 [*]	38.7 ± 15.0 ^{**}	16.0 ± 7.3 ^{**}	292.2 ± 36.2 ^{**}

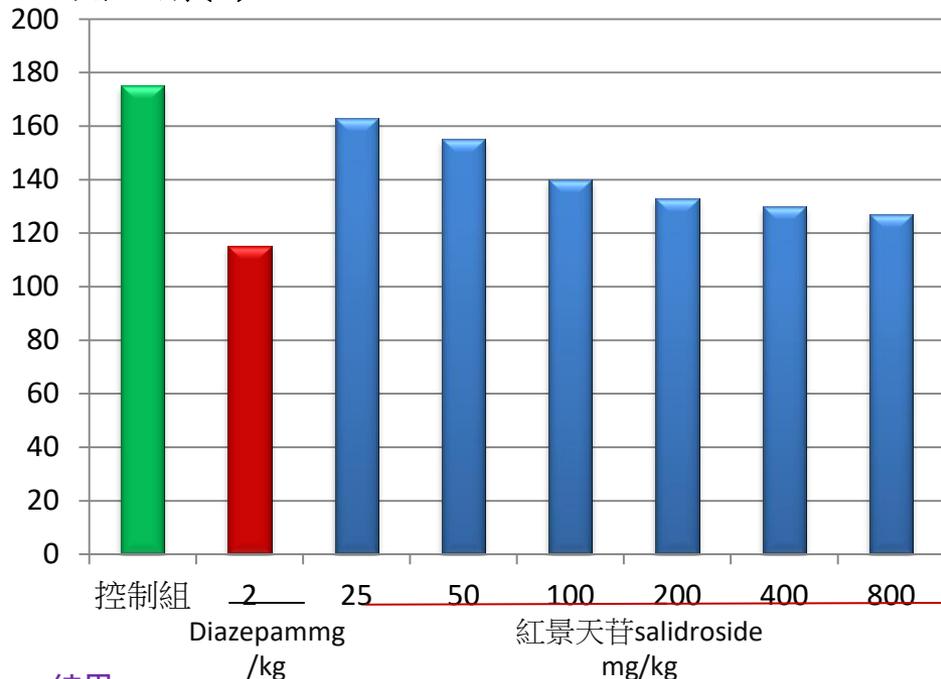
与空白对照组比较, #*P* < 0.05, ##*P* < 0.01; 与失眠对照组比较, **P* < 0.05, ***P* < 0.01

紅景天苷改善睡眠-戊巴比妥鈉誘導小鼠睡眠時減少睡眠之潛伏期,增加睡眠時間

實驗方式:

- 1.將小鼠分8組-控制組,Diazepam2mg/kg組,紅景天苷25~800mg/kg 6組
- 2.給予上述受試藥物40分鐘後,再腹腔注射戊巴比妥鈉(55mg/kg)誘導睡眠
- 3.分別計算出睡眠潛伏期(sleep latency)和睡眠持續時間(sleeping time)-從注射戊巴比妥鈉開始到翻正反射消失·這段時間為睡眠潛伏期;從翻正反射消失到翻正反射恢復·這段時間稱為睡眠持續時間

睡眠潛伏期(s)



睡眠時間(min)



結果:

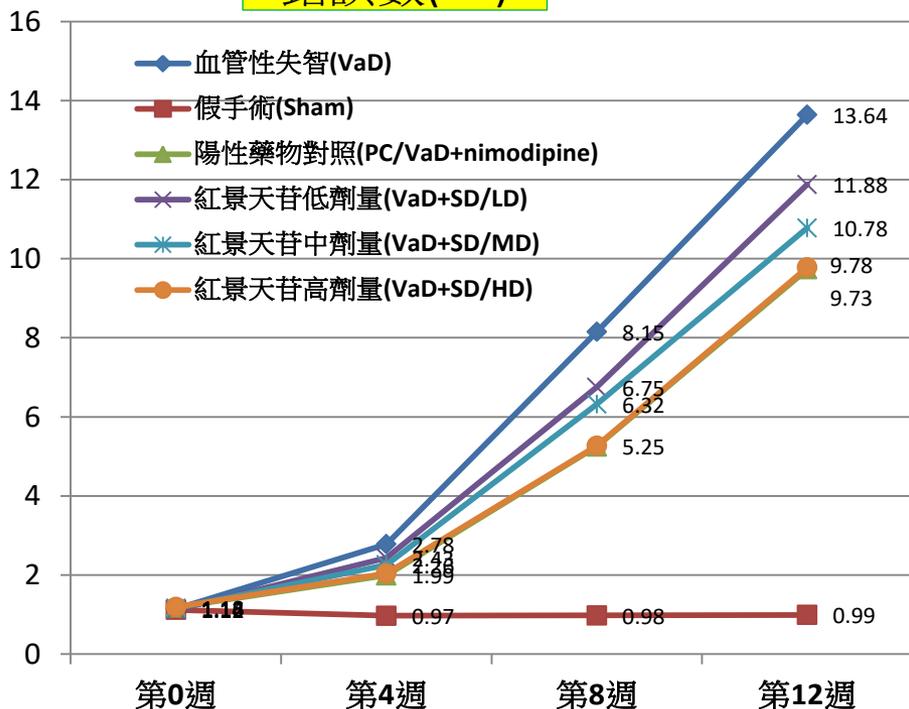
- 1.紅景天苷對戊巴比妥鈉所致小鼠睡眠具有明顯的協同作用,即明顯縮短睡眠潛伏期和顯著地增加睡眠時間。
- 2.有文獻報導·紅景天苷可能通過調節腦內5-HT系統改善睡眠·但5-HT調節睡眠的機轉還不明確
- 3.總之,紅景天苷通過縮短睡眠潛伏期和延長睡眠時間增強了實驗小鼠的睡眠效果

紅景天苷可改善血管性失智-促進血管性失智大鼠之記憶與學習

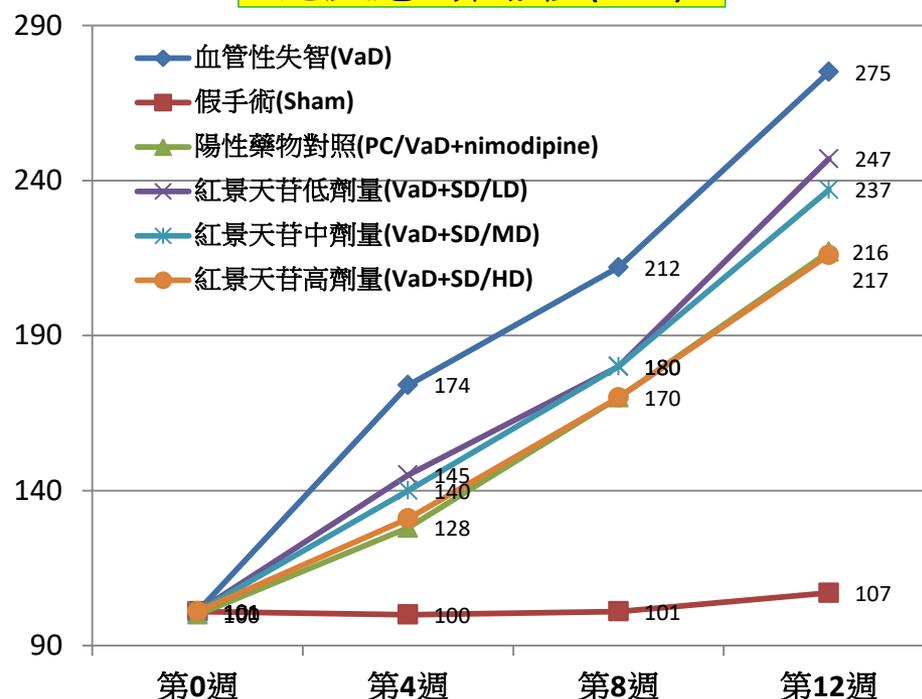
實驗方式:

- 1.將90隻大鼠分6組-血管性失智組(VaD/將兩側頸動脈結紮)、假手術組(Sham)、陽性藥物對照組(PC/VaD+nimodipine)、紅景天苷 salidroside3組:低劑量(VaD+SD/LD10mg/kg)、中劑量(VaD+SD/MD20mg/kg)、高劑量組(VaD+SD/HD30mg/kg)
- 2.在開始前與開始後第4、8、12週,均以Y-迷宮(配合電擊)測試到安全區之錯誤數(NE)、總反應時間(TRT)~可評估大鼠之記憶與學習力

錯誤數(NE)



總反應時間/秒(TRT)



結論:

紅景天苷低、中、高劑量組均能顯著減少血管性失智老鼠在迷宮實驗之錯誤數與總反應時間,高劑量組甚至與陽性藥物對照組一致,顯見紅景天苷能改善血管性失智之認知功能失常,促進記憶力與學習力

紅景天的臨床用途

**Complementary
Medicine Research**
Practice | Methods | Perspectives

Original Article · Originalarbeit

Complement Med Res 2017;24:46–52
DOI: [10.1159/000457918](https://doi.org/10.1159/000457918)

Published online: February 17, 2017

***Rhodiola rosea* in Subjects with Prolonged or Chronic Fatigue Symptoms: Results of an Open-Label Clinical Trial**

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^aState Institute of Neurology, Psychiatry and Narcology, National Academy of Medical Sciences of Ukraine, Neuroimmunology and Headache Department, Kharkiv, Ukraine;

^bNeurology Department, Tomsk Medical University, Tomsk, Russia;

^cDr. Willmar Schwabe GmbH & Co. KG, Karlsruhe, Germany

玫瑰紅景天的抗疲勞作用(作者: 俄羅斯和德國)

紅景天的臨床用途

August 2002

Notes

Biol. Pharm. Bull. **25**(8) 1101—1104 (2002)

1101

Neuroprotective Effects of Constituents of the Oriental Crude Drugs, *Rhodiola sacra*, *R. sachalinensis* and Tokaku-joki-to, against Beta-amyloid Toxicity, Oxidative Stress and Apoptosis

Inhee MOOK-JUNG,^a Hee KIM,^a Wenzhe FAN,^c Yasuhiro TEZUKA,^c Shigetoshi KADOTA,^c Hisao NISHIJO,^d and Min Whan JUNG^{*,b}

^aBrain Disease Research Center, Ajou University School of Medicine; ^bInstitute for Medical Sciences, Ajou University School of Medicine; Suwon 442-721, Korea; ^cInstitute of Natural Medicine, Toyama Medical and Pharmaceutical University; and ^dFaculty of Medicine, Toyama Medical and Pharmaceutical University; 2630 Sugitani, Toyama 930-0194, Japan. Received February 1, 2002; accepted April 12, 2002

We tested the constituents of two *Rhodiola* plants, *Rhodiola sacra* S. H. FU and *R. sachalinensis* A. BOR, and an Oriental crude drug, Tokaku-joki-to, for their neuroprotective effects. Of the 58 compounds tested, six had considerable protective effects against beta-amyloid-induced death of B103 neuronal cells *in vitro*. These six compounds also showed protective effects against staurosporine-induced cell death, and two of the six compounds protected neurons from H₂O₂-induced cell death. These results suggest that some of the tested compounds protect neurons from beta-amyloid toxicity based on antiapoptotic and antioxidative activity.

Key words beta-amyloid; apoptosis; oxidative stress; natural medicine; Alzheimer's disease; B103 cell

庫頁紅景天對阿滋海默的研究(作者: 日本)

紅景天之其他功效

韓藥作誌(Korean J. Medicinal Crop Sci.) 14(6): 317-321 (2006)

紅景天有抗癌之作用

김철희* · 김효성* · 권민철* · 배근중* · 안주희* · 이학주** · 강하영** · 이현용**

*강원대학교 바이오산업공학과

Increase Effect of Anticancer Activities on *Rhodiola sachalinensis* A. Bor by the Change of Extraction Process.

Cheol Hee Kim*, Hyo Sung Kim*, Min Chul Kwon*, Geun Jung Bae*, Ju Hee Ahn*, Hak Ju Lee**, Ha Young Kang**, and Hyeon Yong Lee**

*School of Biotechnology and Bioengineering, Kangwon National University, Chuncheon 200-701, Korea.

**Division of Wood Chemistry, Korea Forest Research Institute, Seoul 130-712, Korea.

ABSTRACT : This study was performed to compare effect of anticancer activities on *Rhodiola sachalinensis* by ultrasonification process and solvent. Compared the yield to the water extracts (WE), water extracts with ultrasonification (WEU) at 60, 100°C and ethyl alcohol extracts (EE), ethyl alcohol extracts with ultrasonification (EEU) at 60°C from *Rhodiola sachalinensis*. Experimental studies were progressed through the anticancer activities such as cell cytotoxicity, inhibition activities of cell growth. The cell cytotoxicity using human embryonic kidney cell (HEK293) was showed cytotoxicity of below 26.26% by extracts of *Rhodiola sachalinensis* in 1.0 mg/ml concentration. The anticancer activities were increased in over 70% by extracts of *Rhodiola sachalinensis* in A549, AGS, Hep3B and MCF-7 cells. From the results, the extract of *Rhodiola sachalinensis* were showed useful anticancer activities.

韓藥作誌(Korean J. Medicinal Crop Sci.) 17(3): 210-216 (2009)

紅景天有提升免疫之作用

김효성** · 배근중** · 권민철** · 이현용** · 이민용** · 김철희**
*강원대학교 BT특성화학부대학, **중구래미, ***전남대학교 생물학과, ****강원도립대학교 식품가공소재과제학과, *****강원대학교 생명공학연구소

Improvement of Immune Activities of *Rhodiola sachalinensis* A. Bor. by Serial Solvent Fractionization

Ji Hye Ha*, Cheol Hee Kim*, Hyang Suk Jeong*, Jin Ling*, Sung Ho Oh*, Seung Seop Kim*, Myoung Hoon Jeong*, Choung Je Ma*, Jong Hyun Nam**, Baik Hwang**, Geun Pyo Choi****

*College of Bioscience and Biotechnology, Kangwon National Univ., Chuncheon 200-701, Korea.

**Grami Co., Ltd., Cheonhwan, Gangwon 269-802, Korea.

***Department of Biology, Chonnam National Univ., Kwangju 520-830, Korea.

****Department of Food Processing & Bakery, Gangwon Provincial Univ., Gangneung 240-804, Korea.

*****Research Institute of Bioscience and Biotechnology, Kangwon National Univ., Chuncheon 200-701, Korea.

ABSTRACT : This study was performed to compare the effects of immuno-modulating activities of *Rhodiola sachalinensis* A. Bor. fractionized by consecutive solvent separation. The cytotoxicity of all fractionized extracts on human kidney cell (HEK293) was lower than crude extracts. Generally, the butanol and chloroform extracts showed less cytotoxicity on about 10.07% and 9.67% than the crude extracts. For human immune B and T cell growth, chloroform fraction showed the highest cell growth compared to the control. The secretion of cytokines (IL-6, TNF- α) on human B and T cells were increased by adding chloroform extract. Also, NK cell growth was significantly improved up to nearly 30% by adding the supernatant of B cell medium grown with the chloroform fraction. It was also found that chloroform fraction could yield higher nitric oxide production from macrophage than untreated control cells. Differentiation of HL-60 cells was increased up to 131.9% after treatment with chloroform fraction extracts, compared to the control. These results indicate that the chloroform fraction of *R. sachalinensis* have high immune activation activity than others fractions and the crude extracts, implying that this chloroform fractions could be used a new functional material.

Key Words : *Rhodiola sachalinensis* A. Bor., Consecutive Solvent Fraction, Immune Activation Activity, Natural Killer (NK) Cell

Asia Pac J Clin Nutr 2006;15 (3)

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Original Article

紅景天有抑制ACE之作用

Evaluation of *Rhodiola crenulata* and *Rhodiola rosea* for management of Type II diabetes and hypertension

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¹Laboratory of Food Biotechnology, Dept of Food Science, University of Massachusetts, Amherst, MA USA

²Department of Food and Nutrition, Hannam University, DaeJeon, Korea

In the current study, we investigated 2 species of the genus *Rhodiola* for the inhibition of α -amylase, α -glucosidase and angiotensin converting enzyme (ACE) inhibitory activity. Water extracts of *Rhodiola crenulata* had the highest α -amylase inhibitory activity (IC₅₀, 98.1 μ g total phenolic/ml) followed by ethanol extract of *R. crenulata* (IC₅₀, 120.9 μ g total phenolic/ml) and ethanol extract of *R. rosea* (IC₅₀, 173.4 μ g total phenolic/ml). Ethanol *R. rosea* (IC₅₀, 44.7 μ g total phenolic/ml), water extract of *R. rosea* (IC₅₀, 52.3 μ g total phenolic/ml), water extract of *R. crenulata* (IC₅₀, 60.5 μ g total phenolic/ml) and ethanol extract of *R. crenulata* (IC₅₀, 60.2 μ g total phenolic/ml) also showed significant α -glucosidase inhibitory activity. The α -glucosidase inhibitory activity of the extracts was compared to standard tyrosol, which was significantly detected in the extracts using HPLC. Tyrosol had strong α -glucosidase inhibitory activity (IC₅₀, 70.8 μ g total phenolic/ml) but did not have any inhibitory effect on the α -amylase activity. Results suggested that α -glucosidase inhibitory activities of both *Rhodiola* extracts correlated to the phenolic content, antioxidant activity and phenolic profile of the extracts. The ability of the above *Rhodiola* extracts against angiotensin I-converting enzyme (ACE) was investigated. The ethanol extracts of *R. rosea* had the highest ACE inhibitory activity (38.5 %) followed by water extract of *R. rosea* (36.2 %) and *R. crenulata* (15.4 %).

Key Words: *Rhodiola*, tyrosol, salidroside, antioxidants, amylase, glucosidase, angiotensin converting enzyme, enzyme inhibitors, type 2 diabetes, hypertension.

紅景天有抗憂鬱之效果

« Previous

Volume 15, Issue 1, Pages 84-91, 25 January 2008

Next »

Comparative study of *Rhodiola* preparations on behavioral despair of rats

A. Panossian, N. Nikovyan, N. Ohanyan, A. Hovhannisyanyan, H. Abrahamyan, E. Gabrielyan, G. Wikman

Abstract

Full Text

PDF

Images

References

Abstract

The antidepressant-like activity of an extract of the roots of *Rhodiola rosea* (RR), its combination with piperine containing extract (RPE), pure substances isolated from *Rhodiola*, such as rhodiolide, rosavin, rosin, rosarin, tyrosol, cinnamic alcohol, cinnamaldehyde, despair assay. *Salidroside, rosavin 為玫瑰紅景天之抗憂鬱與抗焦慮成分 *但Salidroside 活性更甚rosavin

at 20 mg/kg, extract of *R. rosea* (RR) and *R. rosea* extract with piperine (RPE) were identified as active principles of the extract, whereas rosavin, rosin, rosin, cinnamic alcohol, cinnamaldehyde, cinnamic acid were inactive. A fixed combination of rhodiolide, rosavin, rosin, rosin and rosin was more active than any of the individual components alone, indicating a synergistic effect of the ingredients in RR extract. Piperine in combination with *Rhodiola* (RPE) distorts pharmacological effect of *Rhodiola* most probably due to changes of pharmacokinetic profile of rhodiolide and rosin. RPE cannot provide predictable therapeutic effect due to herb-herb interaction. Moreover, concomitant treatment of RPE with other drugs should also be excluded due to drug-piperine interaction.

紅景天有促進性功能之作用

Rhodiola Rosea

<http://www.webmd.com/erectile-dysfunction/news/20040505/natural-sex-boosters-gaining-ground>

- A perennial plant that grows in arctic regions of the world, *Rhodiola* can boost sexual desire in both men and women, Brown says. "It's also possible, although more study is needed, that it may help premature ejaculation," he says.
- While no one knows exactly how the plant improves sexuality, Brown says "it probably works on the dopamine system in the brain which is very important to sexual functioning and libido." But there may be other effects, too, he adds.
- Philip R. Muskin, MD, professor of clinical psychiatry also at Columbia University, and chair of the APA scientific program committee, agrees.
- "*Rhodiola* appears to have a beneficial effect in enhancing sexual function," he tells WebMD. "It improves satisfaction, pleasure, erections, response to orgasms."
- In fact, he says, *Rhodiola* appears to help the body adapt to a variety of life stresses.
- Muskin says that he has given the supplement to some of his own patients, many of whom reported a new sense of sexual energy.
- "There was less fatigue," he says. "Menopausal women say the cobwebs are gone."



Natural Sex Boosters Gaining Ground

紅景天藥理作用整理

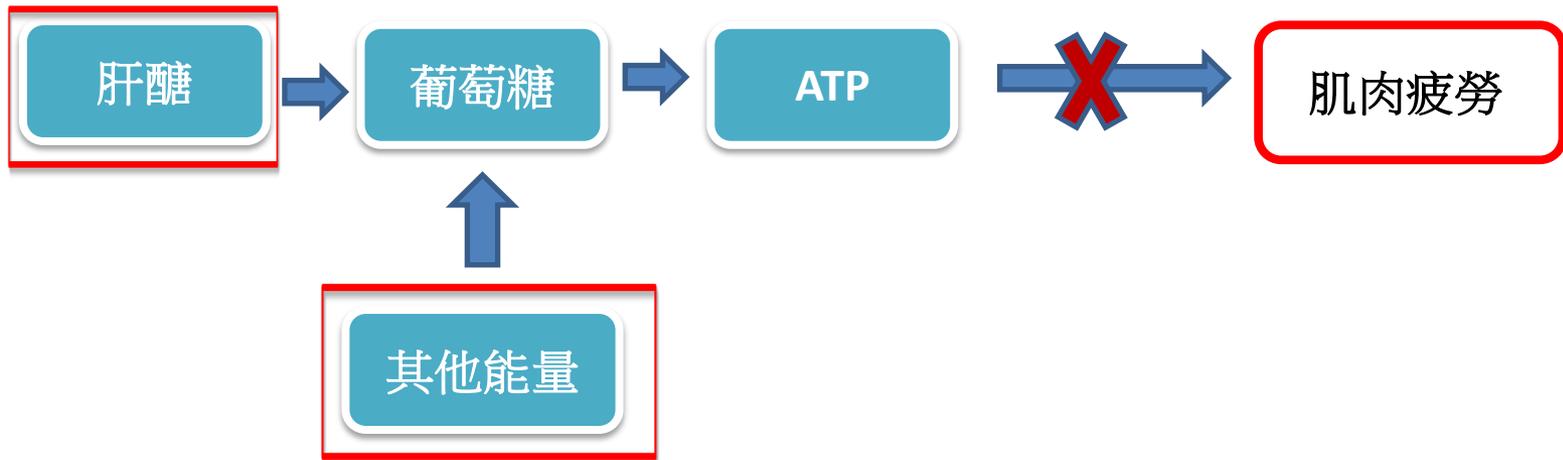
影響中樞神經系統 (減少心理疲勞)	增加生理做工能力 (減少身體疲勞)	適應原(抗壓)與 神經內分泌效果	臟器保護效果	抗氧化與抗癌效果
<ul style="list-style-type: none">● 刺激NE、DA、5-HT產生● 增加DA、5-HT前驅物穿透BBB● 促進記憶與學習● 促進認知(注意、思考、分析、評估、計算、計畫)● 保護神經,避免自由基之傷害● 改善疲勞、工作力、睡眠、食慾、躁動、頭痛● 增進工作量和品質● 降低壓力下之疲勞● 改善幸福感、生理適應、心智疲勞、考試成績、協調度● 減少心理疲勞與焦慮	<ul style="list-style-type: none">● 增加工作能力● 縮短高強度運動間之恢復期● 改善生理強度、耐力、協調度● 增加心、肌肉、腦部粒線體ATP、CP● 增加脂肪代謝● 改善肌肉能量利用	<ul style="list-style-type: none">● 增加耐壓之時間● 降低壓力源之傷害● 改善處理壓力之神經機制● 促進甲狀腺功能(但不引起功能亢進)● 恢復正常月經週期● 改善男性性功能	<ul style="list-style-type: none">● 保護心臟:<ul style="list-style-type: none">① 防止壓力所誘導之心肌損傷② 減少腎上腺髓質釋放兒茶酚胺③ 防止心律不整(μ受體有關)④ 增加心臟肌肉之收縮力-增加生理工作力⑤ 增加心血管之能量儲存⑥ 平衡交感/副交感神經● 保護肝臟:<ul style="list-style-type: none">① 抑制肝臟發炎② 減少肝纖維化(抑制HSC)③ 抗氧化,減少過氧化脂質● 保護腎臟:抗氧化,減少過氧化脂質● 保護肺臟:對抗肺炎及哮喘	<ul style="list-style-type: none">● 抗氧化:<ul style="list-style-type: none">① 增加內生性抗氧化物質 SOD、catalase、GPX 製造② 紅景天本身有兩種抗氧化物歧化酶:Cu-Zn-SOD與Mn-SOD● 抗癌:<ul style="list-style-type: none">① 降低抗癌藥物之毒性(如 cyclophosphamide, adriamycin)② 促進化療藥物之效果③ 抑制腫瘤生長、轉移

8. 紅景天在抗疲勞功效研究成果

疲勞的成因

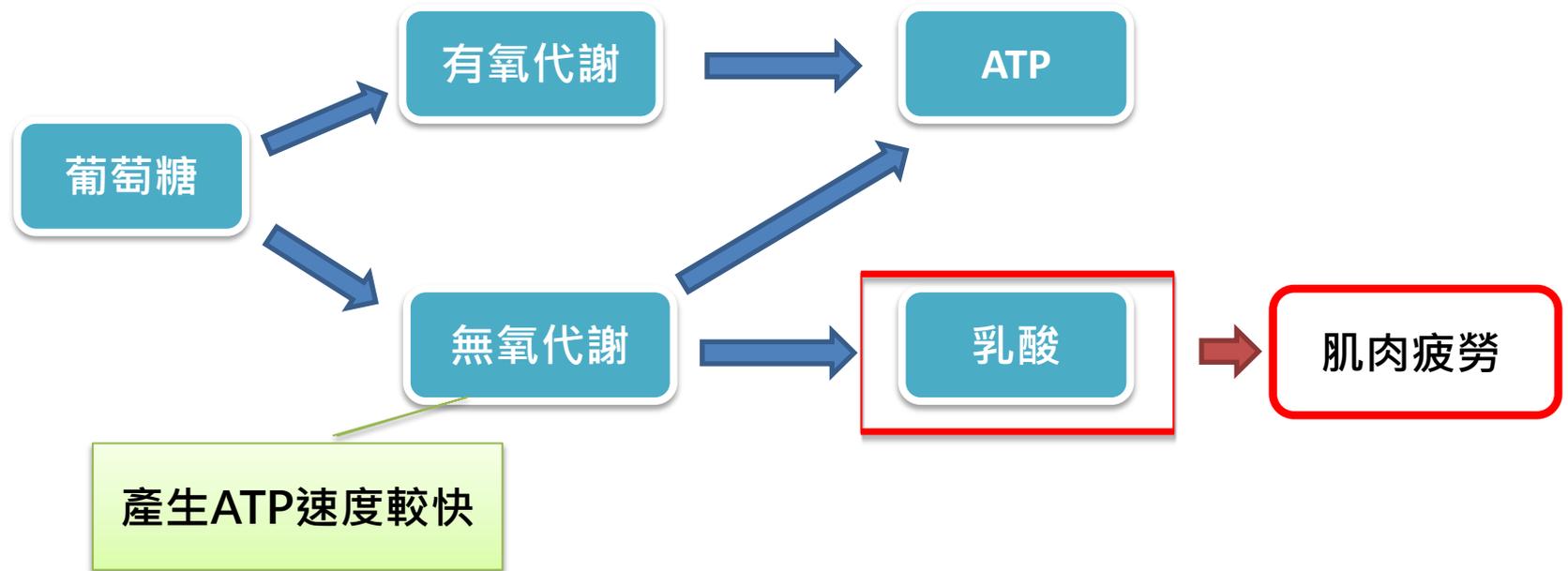
1. 【能量耗竭理論】：

人體肌肉使用之能量為ATP，而ATP是經由肝醣分解代謝成葡萄糖進而所產生的，當沒有足夠肝醣可產生ATP且無法及時補充能量時，最終產生疲勞現象(王與張，2010)。



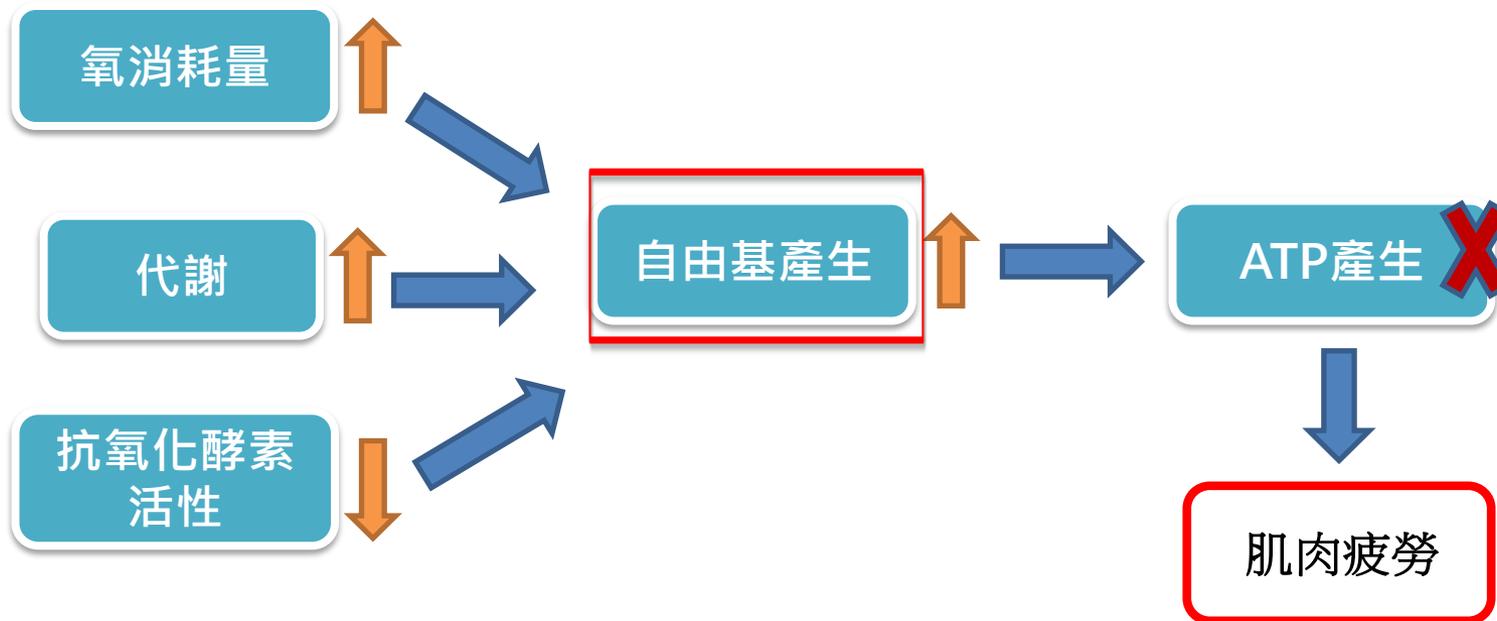
疲勞的成因

2. 【代謝產物堆積理論】：運動過程中，身體會進行葡萄糖代謝以產生ATP給肌肉，而葡萄糖代謝可分為有氧和無氧，當激烈運動大量消耗ATP時，葡萄糖就會進行無氧代謝以提供身體大量ATP，但因此也會產生副產物乳酸，如果體內乳酸大量堆積又不能及時清除時，則會導致疲勞(王與張，2010)。



疲勞的成因

3.【自由基損傷理論】：運動過程中，氧消耗量增加、代謝上升與抗氧化酵素活性下降，會引起人體內自由基增多，而自由基會對細胞膜通透性產生影響，阻礙體內產生ATP，最終導致疲勞(王與張，2010)，另外也有研究指出，餵食大鼠抗氧化物可提高其游泳負重耐力疲勞試驗中之游泳時間，表示增加體內抗氧化物物質可達到抗疲勞效果(劉等，2004)。



何謂疲勞

- 持久或過度勞累後造成的身體不適及工作效率減退的現象稱為疲勞
- 又分為體力疲勞、腦力疲勞與精神疲勞(腦力疲勞與精神疲勞統稱為心理疲勞)

體力疲勞	腦力疲勞	精神疲勞
<ul style="list-style-type: none">● 又稱運動性疲勞● 當血液循環變差，葡萄糖的運送量不足、血液中涵氧量也變少，粒線體無法有效作功產生能量給身體使用指由身體運動所引起的身體生理機能不能保持在正常水平上或不能維持其原有的運動強度而表現出身體運動能力下降的現象	<ul style="list-style-type: none">● 長時間用腦，引起腦的血液和氧氣供應不足，產生自由基和氧化壓力，導致神經細胞功能降低，神經傳導物質分泌降少，例如血清素，而出現大腦疲勞感● 其主要表現為頭昏腦脹，食慾不振，記憶力下降，注意力不集中、緊張、思維遲鈍、反應遲緩等	<ul style="list-style-type: none">● 這是現代社會疲勞症中最複雜的一種疲勞● 最主要是長期超負荷運行形成慢性疲勞，精神壓力過大也是重要原因● 精神疲勞最明顯的表現莫過於失眠，其他表現為厭倦、心情煩躁、憂鬱、焦慮等
<ul style="list-style-type: none">➤ 抗疲勞的作用就是要延緩疲勞的產生和加速疲勞的消除➤ 紅景天是一種安全有效、無毒與副作用的抗疲勞良方		

你是疲勞一族嗎？

疲勞徵候

1. 持續性身體虛弱
2. 心情沮喪、憂鬱、容易焦慮、煩躁、情緒起伏不定
3. 缺乏行動力、容易感覺疲倦
4. 注意力無法集中、記憶力下降
5. 沒有精神、無精打采、記憶力衰退
6. 性欲低下，性能力減退
7. 睡眠障礙、睡眠時間越來越短、醒來還是覺得疲倦
8. 經常頭痛、耳鳴、目眩

1 National Board of Health and Welfare. Utmattningsyndrom – Stressrelaterad psykisk ohälsa. 2003 – 123 – 18. Stockholm: National Board of Health and Welfare; 2003



給我紅景天!



你是缺氧一族嗎？

缺氧的表徵

1. 易喘，稍運動就呼吸困難或急促，心跳加快。
2. 常打哈欠。
3. 胸口鬱悶、疼痛。
4. 盜汗或手足冒冷汗。
5. 容易疲勞，且無法自然消除疲勞。
6. 虛弱，四肢無力，眩暈。
7. 指甲、嘴唇發白或呈紫色。
8. 臉色蒼白。

1 National Board of Health and Welfare. Utmattningsyndrom – Stressrelaterad psykisk ohälsa. 2003 – 123 – 18. Stockholm: National Board of Health and Welfare; 2003



給我紅景天!



抗疲勞功效作用？

中國大陸

根據中國大陸1996年頒佈之-保健食品功能學評價程序和檢驗方法:

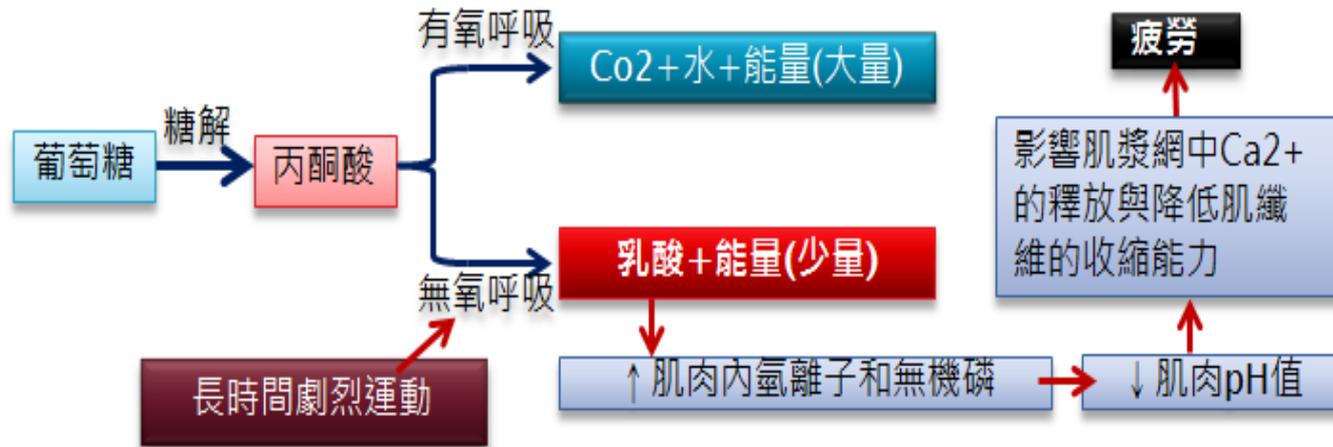
若一項或一項以上之耐力運動實驗(負重游泳和爬竿)及兩項或兩項以上之生化指標(血乳酸,血清尿素氮,肌/肝糖原)為陽性,即可判斷受試物有抗疲勞活性

台灣

台灣之健康食品之抗疲勞功能評估方法:

運動能力測試至少有一項(持續游泳及跑步時間)、及生化值(血尿素氮、肝醣、血乳酸值)測定至少有二項試驗指標達統計上之正面顯著差異 ($p < 0.05$) , 則可認定攝入的食品具抗疲勞的功效

葡萄糖代謝與血乳酸對疲勞的影響



*乳酸水平是反映身體**有氧代謝能力**和**疲勞程度**之重要指標

*長時間劇烈運動→身體**相對缺氧**與**糖酵解作用**增加→產生大量

乳酸→使肌肉內**氫離子**和**無機磷**堆積→**降低肌肉之pH值**→影響肌

漿網中Ca²⁺的釋放與降低肌纖維的收縮能力→**導致疲勞**

(肌肉之pH值降低為**導致疲勞**之**主要因素**之一)

檢測尿素氮之意義

1. 身體運動時體內平衡遭到破壞, 血糖降低, 肌/肝糖原消耗, 迫使蛋白質與胺基酸之分解代謝加強以作為能量來源, 並產生尿素氮(BUN)
2. BUN與人之身體機能, 疲勞程度及負荷量之大小呈正相關, 亦即BUN隨運動負荷增加而升高
3. 而身體負荷適應程度越差→BUN會產生越多
4. 而身體負荷適應程度越好→BUN會產生越少

因此: BUN越**少** → 耐久力越高, 不易疲勞

檢測肝(肌)糖原之意義

1.糖是肌肉組織之重要能量來源

2.體內之糖儲存: 包括肌糖原,肝糖原和血糖三處,總量約300-400g

3.大於1小時之運動如長跑,長距離游泳等,會使體內之糖儲備耗竭→影響運動能力
(耐久力)

4.隨著肌糖原之消耗增加,身體為維持血糖水平, 將動用肝糖原而導致肝糖原減少

5.因此,肝糖原和肌糖原之含量為反映疲勞程度 之敏感指標

因此: 肝糖原和肌糖原越**高**→耐久力越高,不易疲勞

紅景天可增肌肉粒線體中ATP之量

IMMUNOLOGY AND MICROBIOLOGY

Effect of Extracts from *Rhodiola Rosea* and *Rhodiola Crenulata* (Crassulaceae) Roots on ATP Content in Mitochondria of Skeletal Muscles

M. Abidov, F. Crendal*, S. Grachev*, R. Seifulla**, and T. Ziegenfuss***

Translated from *Byulleten' Eksperimental'noi Biologii i Meditsiny*, Vol. 136, No. 12, pp. 664-666, December, 2003
Original article submitted September 16, 2003

We studied the effects of oral treatment with extracts from *Rhodiola rosea* (50 mg/kg) and *Rhodiola crenulata* (50 mg/kg) roots on the duration of exhaustive swimming and ATP content in mitochondria of skeletal muscles in rats. Treatment with *R. rosea* extract significantly (by 24.6%) prolonged the duration of exhaustive swimming in comparison with control rats and rats treated with *R. crenulata*. *R. rosea* extract activated the synthesis or resynthesis of ATP in mitochondria and stimulated reparative energy processes after intense exercise. Experiments proved different pharmacological characteristics of *R. rosea* and *R. crenulata*: *R. rosea* is most effective for improving physical working capacity.

*實驗方式:

- 1.將大鼠隨機分成3組:安慰劑組、大花紅景天根萃取物(50mg/kg)組、玫瑰紅景天根萃取物(50mg/kg)組
- 2.服用前、後進行小鼠力竭游泳測試,並檢測骨骼肌粒線體中ATP之量

*實驗結果(相較於安慰劑與大花紅景天):

- 1.玫瑰紅景天延長力竭游泳時間**24.6%**
- 2.玫瑰紅景天有效增加肌肉中粒線體中**ATP之合成**(或再合成),並促進劇烈運動後能量之恢復
- 3.所以玫瑰紅景天不論是增加ATP合成與增加運動耐力與恢復力,均優於大花紅景天

紅景天苷(Salidroside)之抗疲勞機轉實驗-運動後之小鼠

Zhongguo Ying Yong Sheng Li Xue Za Zhi. 2012 Jan;28(1):53-6.

[Influence of salidroside from *Rhodiola Sachalinensis* A. Bor on some related indexes of free radical and energy metabolism after exercise in mice].

[Article in Chinese]

Li MH¹, Tang CF, Ouyang JQ.

庫頁紅景天

⊕ Author information

Abstract

OBJECTIVE: To study the anti-fatigue mechanism of salidroside from *Rhodiola Sachalinensis* A. Bor (SRS) in anti-oxidation and energy metabolic systems in mice, some related indexes of free radical and energy metabolism after exercise were measured.

METHODS: Forty male mice were divided into four groups (n = 10): SRS sport group (SS), SRS quiet group (SQ), sport control group (SC), quiet control group (QC). The mice of SS and SQ groups received SRS solution of 150 ml/kg body weight per day for two weeks, while the mice of SC and QC groups received the same volume of distilled water. 30 min after the last treatment, the mice of SS and SC groups were forced to swim for 120 min without loads. then the biochemical parameters related to fatigue were determined.

RESULT: SRS could increase liver superoxide dismutase (SOD), glutathione peroxidase (GSH-Px) activity of antioxidant enzymes and reduce the malondialdehyde (MDA) content, which might increase the body activity of antioxidant enzymes to play the role of anti-oxidation; SRS had some effect of stabilizing blood sugar, increasing liver glycogen and muscle glycogen reserves, preventing blood sugar, liver glycogen and muscle glycogen levels from reducing in long time exercise on mice; SRS could increase plasma total cholesterol (TC), triglyceride (TG) and free fatty acid (FFA) levels in exercise mice, and it had some effect on metabolism of fat under different conditions, and promoted the use of the role of fat.

CONCLUSION: Influence of SRS on some related indexes of free radical and energy metabolism is one of the mechanisms of anti-exercise-induced fatigue of SRS.

- **實驗方法:** 40隻小鼠分成4組(紅景天苷+運動組,紅景天苷組,運動組,沒運動組),餵食紅景天苷之量為150ml/kg/d,控制組為服等量之蒸餾水,於14天後進行無負重游泳120分鐘之實驗,之後檢測與抗氧化、疲勞有關之數值
- **結果:** 1.紅景天苷增加肝superoxide dismutase (SOD), glutathione peroxidase (GSH-Px) 活性,並減少脂質過氧化物malondialdehyde (MDA)含量,因此增加抗氧化之作用
- 2.紅景天苷有穩定血糖之作用,增加肝與肌肉之糖原保存,減少長時間運動下血糖與糖原之耗損
- 3.紅景天苷也會增加運動中小鼠血中之TC,TG和FFA之量,幫助脂肪之代謝與利用
- **結論:** 紅景天苷之抗疲勞機轉與增加抗氧化作用、脂肪之利用、肝臟與肌肉之糖原保存有關→因此延緩運動疲勞產生



***延緩疲勞發生:**

- ◎↑肝醣儲存
- ◎↑粒線體合成ATP
- ◎↑身體負荷力(↓BUN)
- ◎清除自由基與增加脂質之利用

增加記憶力、學習力

認知促進
抗腦力疲勞

安神、鎮靜、抗焦慮、
抗憂鬱、助眠

平靜情緒

抗精神疲勞

抗心理疲勞

抗身體疲勞

***消除疲勞:**
↑身體有氧代謝→↓乳酸堆積、↑乳酸清除



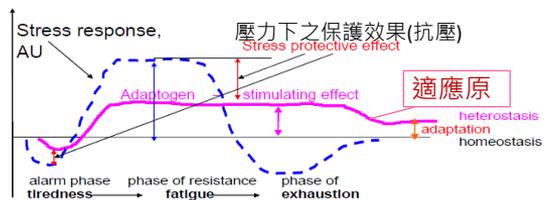
適應原:有改善個人對抗壓力能力之物質.使人在壓力增加下,使生理功能正常化,並使身體適應改變

適應原樣作用~雙向調節生理機能

↑血氧飽和度、氧利用率
↑血液流量與流速

抗高山症、提神
(抗身心疲勞)

保護心、肝、腎、肺等器官,尤其是心臟(抗心律不整、減少心律、增加心收縮力)



一.運動疲勞之表現

1.運動耐力之下降

2.肌肉出現僵硬、腫脹和疼痛，動作慢、不協調

二.運動導致疲勞之因素

1.肝與肌肉糖原耗竭
(總是與體力衰竭同時發生)

2.缺氧和糖酵解作用增加
之下所產生之大量乳酸

3.身體負荷度下降,尿素氮之上升
(會隨運動量之增加而上升)

4.自由基之產生

三.紅景天可增加運動耐力、延緩疲勞產生、促進疲勞之消除

維持糖原之水平

減少乳酸量

增加身體負荷程度

清除自由基

增加ATP與脂質利用

如何選擇可靠的紅景天

1. 紅景天的來源一定要可靠，不要買到女貞子的混充品
2. 紅景天的品種標示清楚
3. 紅景天的成分標示一定要有絡薩維(Rosavin)
4. 功能成分的劑量一定要標示清楚
5. 要有安全性和功效性試驗報告 (不能引用別人的)
6. 誠實可靠的生技公司出品



豐山生技公司之紅景天原材來源地理分布圖
集中於吉林省延邊自治州、白山市和通化市。



感恩 您的聆聽



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