Standardization of the Fruits of *Lycium chinense* (Lycii Fructus) in Miaoli

Yu-Hsuan Lin (林愉瑄) [a], Yuan-Chu Chen (陳月珠) [a], Ying-Chi Du (杜英齊) [a], Chih-Sheng Hung (洪志昇) [a], Jui-Ching Chen (陳瑞青) [a], Chao-Jan Ho (何超然) [b, *], and Yu-Shan Lin (林妤姍) [b, *]

[a] Department of Botanicals, Medical and Pharmaceutical Industry Technology and Development Center, New Taipei City 248, Taiwan
[b] Section of Crop Improvement, Miaoli District Agricultural Research and Extension Station, Miaoli 36347, Taiwan

1. Introduction

Lycii Fructus (Wolfberry Fruit), the fruits of *Lycium barbarum* or *L. chinese* are renowned Yin strengthening agents and are officinal in the Pharmacopoeia of Taiwan. It is well known in Chinese herbal medicine for its restorative functions including liver and kidney protection, immunity enhancement, vital essence replenishment, and eyesight improvment.

2. Cultivation of *L. chinense* in Miaoli

To better use the Taiwanese traditional herbal medicine, *L. chinense* was cultivated as a treasured crop by Miaoli District Agricultural Research and Extension Station (MDARES) since 2001.

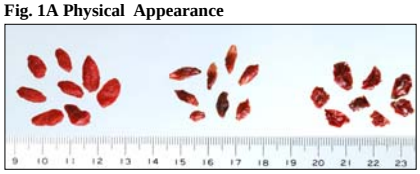
3. Standardization of Taiwanese *L. chinense* Fruit

Two different local cultivars of *L. chinense* fruits, LC-1 and LC-2, in Miaoli were prepared and investigated with Histological anatomy, TLC, and HPLC. LC-1 were the dried ripe fruits collected from yuanyin farm, Faburary, 2014, and LC-2 were those collected from MDARES, Faburary, 2014.

3.1 Histological Anatomy

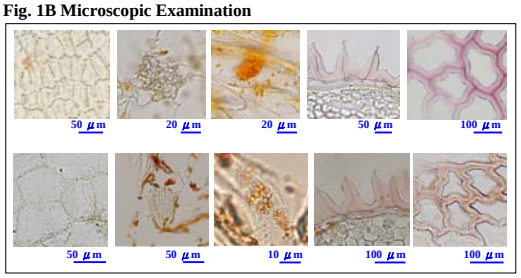
The dried ripe fruits of LC-1 and LC-2 appearance subfusiform or ellipsoid, apex gradually acute, and leathery, whereas those of genuine regional materia medica (GRMM), *L. barbarum*, are ellipsoid, and non-leathery. The characteristics of histological anatomy are similar to those in the Pharmacopoeia of Taiwan.

Fig. 1A Physical Appearance



GRMM LC-1 LC-2

Fig. 1B Microscopic Examination



Epidermal cell | Vascular bundle | Spherotical granules | Stone cell (vertical view) | Stone cell (surface view)

3.2 TLC Analyses

When used the method described in Pharmacopoeia of Taiwan, fruits of LC-1and LC-2 showed the same TLC results with those of GRMM (Fig. 2A). Furthermore, the fruits of LC-1and LC-2 showed different metabolomic profiles by other TLC methods. (Fig. 2B and 2C).

Fig. 2A UV 366 nm

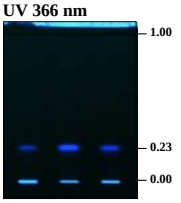


Fig. 2B Nihydrin

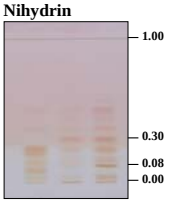
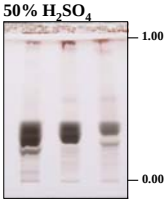


Fig. 2C 50% H_2SO_4



3.3 HPLC and UV Analyses

When compared HPLC profiles in UV wavelength 203 nm 260 nm and 340 nm, HPLC fingerprint profiles of LC-1 and LC-2 were similar, but were different to that of GRMM.

Fig. 3A UV 203 nm **Fig. 3B UV 260 nm**

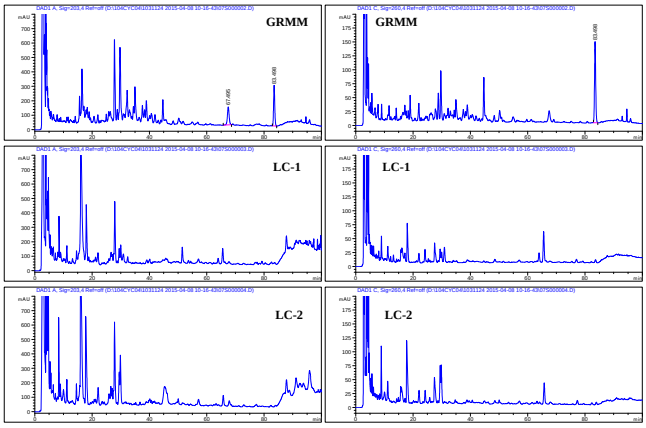
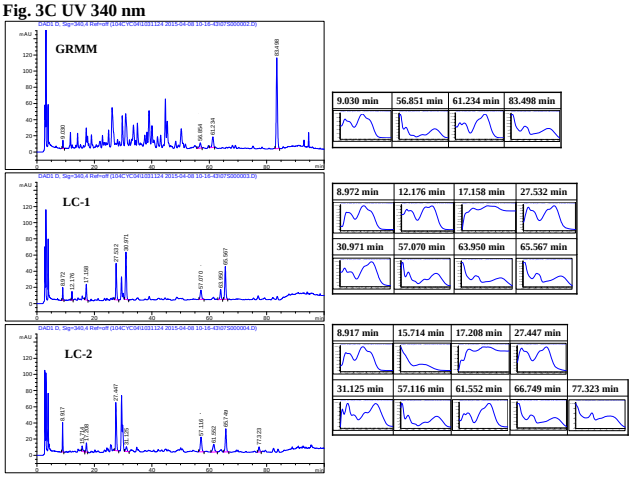
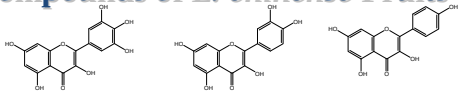


Fig. 3C UV 340 nm



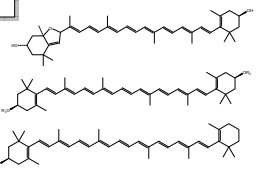
4. Active Compounds of *L. chinense* Fruits

Flavonoids



Myricetin | Quercetin | Kaempferol

Carotenoids



Mutatoxanthin

Zeaxanthin dipalmitate: R1=R2=palmitoyl
Zeaxanthin monopalmitate: R1=palmitoyl, R2=H
Zeaxanthin: R1=R2=H

β-cryptoxanthin palmitate: R=Opalmitoyl
β-carotene: R=H
β-cryptoxanthin: R=OH

5. Results and Conclusion

The data showed that *L. chinense* fruits had similar histological characteristics but different TLC and HPLC metabolomic profiles when compared with those of *L. barbarum*.