Fitoterapia 125 (2018) 221–226

Contents lists available at ScienceDirect

Fitoterapia

journal homepage: www.elsevier.com/locate/fitote

Structural identification and biological activity of six new Shellolic esters from Lac

Jin Lu[a,b], Lei Shang[c], Huimin Wen[d], Jian Huang[a,*], Guoyu Li[e], Jinhui Wang[a,f,**]

[a] School of Traditional Chinese Materia Medica, Shenyang Pharmaceutical University, Shenyang 110016, China
[b] Shenzhen Neptunus Bioengineering Co., Ltd., Shenzhen 518075, China
[c] College of Basic Medical Sciences, Shenyang Medical College, Shenyang 110034, China
[d] Institution of Life Science and Biology Pharmacopedia, Shenyang Pharmaceutical University, Shenyang 110016,China
[e] School of Pharmacy, Shihezi University, Shihezi 832002, China
[f] School of Pharmacy, Xinjiang Medical University, Urumuqi 830054, China

ARTICLE INFO

Keywords:
Lac
Sesquiterpenoid
Shellolic ester A–F
Lac dyes
Anti-bacterial activity

ABSTRACT

Six new sesquiterpenoid esters, named Shellolic ester A–F (**1–6**), along with four known Lac dyes (**7–10**) were isolated from methanol extract of the secretions of *Laccifer lacca*. Their structures were established on the basis of spectroscopic analyses (IR, HR-ESI-MS, 1D and 2D NMR) and by comparison with published data. Biological activities evaluation of the isolates showed that they were inactive against human cancer cell lines (HepG2, MCF-7, Hela and C6) and LPS-treated RAW264.7, which is well consistent with that Lac resin used as nontoxic material in agriculture applications, pharmaceutical formulations, and food additives. However, compound **2**, **4**, **7**, **9**, **10** were found to be considerable active against *B. subtilis*, *E. coli*, and *S. aureus* microorganisms. The results complements the current knowledge about Lac produced from China. Meanwhile, Our present study further reveals that Lac resin are edible with no toxicity and physiologically harmless at the level employed as an excipient.

1. Introduction

Lac, a versatile natural resin, secreted by a tiny insect, *Laccifer lacca* Kerr (Family: *Lacciferidae* Cockerell) is the only resin of animal in India, Thailand and China [1]. It is widely used as thermoplastics, adhesives, sealants, insulants, coloring matter and coating materials in various fields like agriculture applications, pharmaceutical formulations, and food ingredients [2,3]. In traditional Chinese medicine, it has been documented for the treatment of measles, macula, scabies and swollen poison [4]. Modern chemical investigations disclosed that the backbone of shellac is a complex mixture of polyesters consisting of a number of closely related sesquiterpenic acids of the cedrene skeleton, mainly Shellolic acid, jalaric acid and laccijalaric acid, and hydroxy fatty acids, mainly aleuritic acid, butolic acid and threoaleuritic acid, which can be separated into about 30% soft resin (single ester), and about 70% hard resin (polyesters consisting of several resin acid components). The main single shellac ester components are laccijalaric ester-I, jalaric ester-I, laccijalaric ester-II and jalaric ester-II. Hard resin is also called “pure lac resin”, it has been found that the pure lac resin is based on four sesquiterpenic acids (essentially jalaric acid) and four aleuritic acid units by the gas-liquid chromatography [5–13]. Chemical studies of lac-dye have been carried out for the past century and six colored components, laccaic acid A–F, have been isolated and their structures were determined. Since all of these chemical studies are related solely to the Indian or Thailand sticklac [14–16], we started our chemical study on Lac which produced from China. This investigation led to the isolation and identification of six new sesquiterpenoid esters, named Shellolic ester A–F (**1–6**), along with four known Lac dyes (**7–10**) from China-produced Lac (Fig. 1). Their structures were elucidated on the basis of spectroscopic data analyses (IR, HR-ESI-MS, 1D and 2D NMR). This paper herein describes their structure elucidation and biological activation.

2. Experimental section

2.1. Chemicals

Column chromatography was performed on silica gel (200–300 μm, Qingdao Marine Chemical Company, Qingdao, China), and RP C-18 (40–60 μm, Merck, Germany). Methanol, chloroform, ethyl acetate,

* Corresponding author.
** Corresponding to: J. Wang, School of Traditional Chinese Materia Medica, Shenyang Pharmaceutical University, Shenyang 110016, China.
E-mail addresses: 15999290001@163.com (J. Huang), wangjh_716@163.com (J. Wang).

https://doi.org/10.1016/j.fitote.2017.11.021
Received 16 October 2017; Received in revised form 27 November 2017; Accepted 28 November 2017
Available online 06 December 2017
0367-326X/

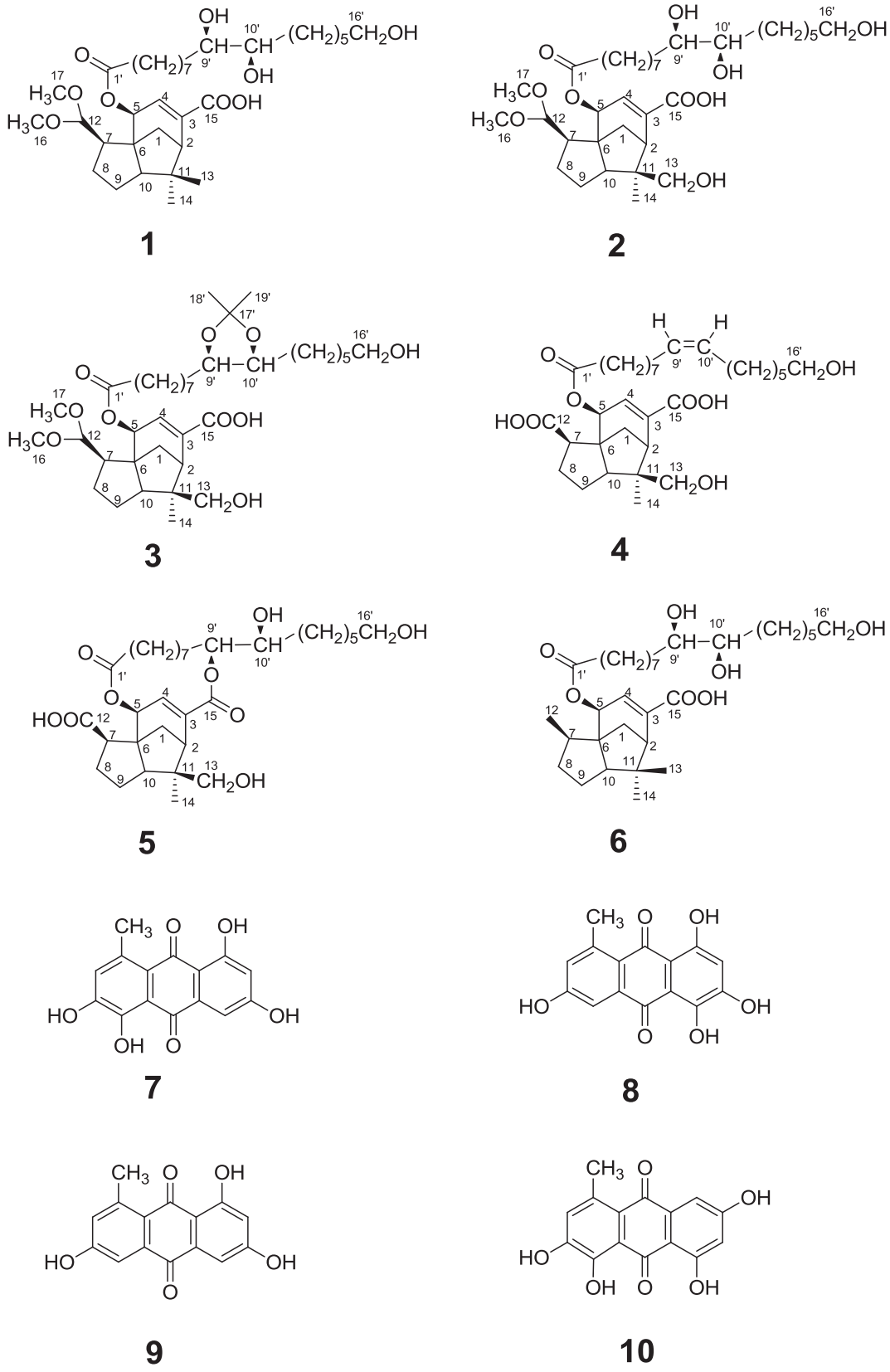

Fig. 1. Structures of compounds **1–10**.

acetone (Tianjin Chemical Reagents Co., Tianjin, China), and water (Wahaha Co., Zhejiang, China) were used for eluent. TLC was performed on precoated TLC plates (200–250 μm thickness, F_{254} Si gel 60, Qingdao Marine Chemical, Inc., Qingdao, China) with compounds visualized by spraying the dried plates with 10% aqueous H_2SO_4 followed by heating until dryness.