Steroids 78 (2013) 79–90

Contents lists available at SciVerse ScienceDirect

Steroids

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

Nine new steroidal glycosides from the roots of *Cynanchum stauntonii*

Jin-Qian Yu, An-Jun Deng, Hai-Lin Qin *

State Key Laboratory of Bioactive Substance and Function of Natural Medicines, Institute of Materia Medica, Chinese Academy of Medical Sciences and Peking Union Medical College, Beijing 100050, PR China

ARTICLE INFO

Article history:
Received 17 May 2012
Received in revised form 7 October 2012
Accepted 10 October 2012
Available online 2 November 2012

Keywords:
Cynanchum stauntonii
Asclepiadaceae
Structure determination
Steroidal glycosides
Stauntosides C, D, E, F, G, H, I, J, and K

ABSTRACT

Nine new steroidal glycosides, named as stauntosides C–K (**2**, **5**, **7**–**10**, **13**, **14**, and **16**), along with seven known compounds (**1**, **3**, **4**, **6**, **11**, **12**, and **15**) were isolated from the 95% ethanol extract of the roots of *Cynanchum stauntonii*. The structures of these new compounds were elucidated on the basis of extensive spectroscopic analyses, mainly 1D and 2D NMR, and HRESI-MS, and qualitative chemical methods. Their significance in terms of the chemotaxonomy of *C. stauntonii* is discussed.

1. Introduction

Cynanchum stauntonii (Decne.) Schltr. ex Levl., a perennial medicinal herb from the family of Asclepiadaceae, is widely distributed in south-central region of China. Along with another species of the same genus, *Cynanchum glaucescens* (Decne.) Hand.-Mazz., it has been used as antitussives and expectorants in traditional Chinese medicine (TCM). Both of them are given the Chinese name of 'Bai Qian' [1]. The main native organic compounds isolated from *Cynanchum* species are steroids, especially the steroidal saponins with aglycones assignable to either the normal four-ring C_{21} steroid skeleton or the aberrant 13,14:14,15-diseco-pregnane-type skeleton or the equally abnormal 14,15-secopregnane-type skeleton, respectively [2,3]. These steroids have been accepted, generally and chemotaxonomically, as the most important and characteristic chemical constituents in *Cynanchum* species. However, phytochemical investigation on the title plant is very rare up to now and, to the best of our knowledge, with only three papers having reported several steroids, including four by our group 8 years ago [4]. The ongoing research aims at confirming the phytotaxonomical basis from this plant through isolating and elucidating more compounds, especially new ones. In this paper, we describe nine new steroidal glycosides, compounds **2**, **5**, **7**–**10**, **13**, **14**, and **16**, and seven known compounds (**1**, **3**, **4**, **6**, **11**, **12** and **15**) (Fig. 1), from the roots of *C. stauntonii*, and the evaluation of their cytotoxic activities. The new steroidal glycosides contained steroid aglycones with either the 13,14:14,15-disecopregnane-type skeleton or the 14,15-secopregnane-type skeleton and were given the trivial names stauntosides C–K, respectively, according to the priority order of isolation and their structural characteristics. Also, this is the first isolation and characterization of the known compounds **1**, **4**, **11**, **12**, and **15** from *C. stauntonii*. From a phytochemical point of view, these new steroidal glycosides isolated as major compounds from the title plant provided additional evidence for the botanical classification of this genus in Asclepiadaceae.

2. Experimental

2.1. General

Optical rotations were measured on a Perkin–Elmer 241 digital polarimeter at 20 °C. IR spectra were recorded on a Nicolet 5700 spectrometer. 1D and 2D NMR spectra were taken on either a Varian INOVA-500 spectrometer or a Varian NMR System-600 NMR spectrometer with tetramethylsilane as internal standard. ESI-MS and HRESI-MS were obtained using an Agilent 1100 series LC/MSD Trap SL mass spectrometer. Preparative HPLC was performed on a Shimadzu LC-6AD system equipped with a SPD-10A detector, and a reversed-phase C_{18} column (YMC-Pack ODS-A U 20 × 250 mm, 10 μm) was employed. GC analyses were conducted on an Agilent 7890A instrument. Column chromatography (CC) was undertaken over silica gel (200–300 mesh). TLC was carried out with glass plate precoated silica gel G. Spots were visualized under UV light and by spraying with 10% H_2SO_4 in 95% EtOH, followed by heating. Acetonitrile used in preparative HPLC procedure was in HPLC grade, and other solvents were of analytical grade.

* Corresponding author. Tel.: +86 010 83172503; fax: +86 010 63017757.
E-mail addresses: fish@imm.ac.cn (J.-Q. Yu), denganjun@imm.ac.cn (A.-J. Deng), qinhailin@imm.ac.cn (H.-L. Qin).

0039-128X/$ - see front matter © 2012 Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.steroids.2012.10.007

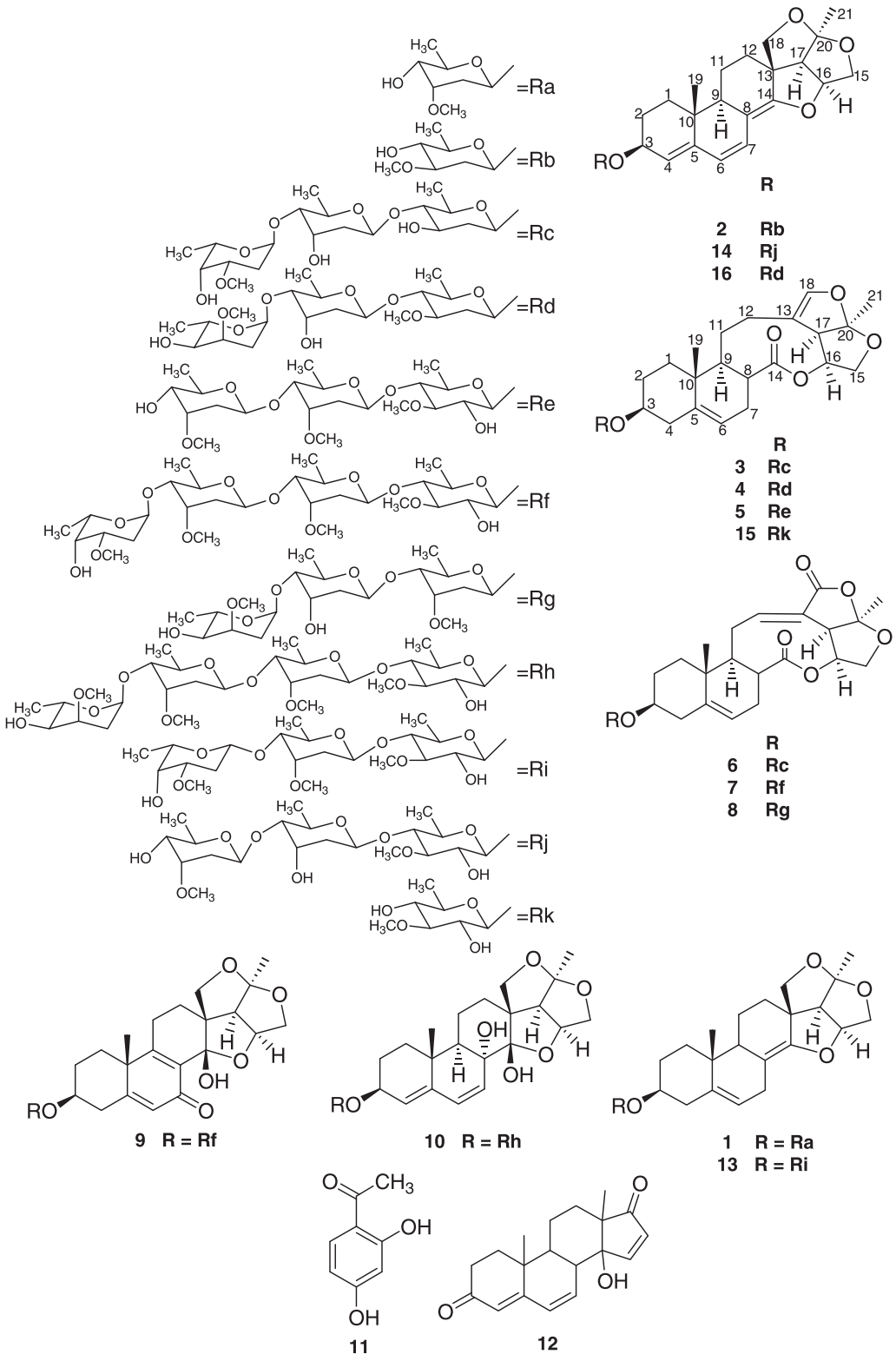

Fig. 1. The structures of compounds **1**-**16**.

2.2. Plant material

The roots of *C. stauntonii* were collected from Tongbai County, Henan Province of central China, in August, 2011. It was identified by Associate Prof. Lin Ma (a savant in plant systematics from Institute of Materia Medica, Chinese Academy of Medical Sciences and Peking Union Medical College) according to the morphological features. A voucher specimen (ID-S-2426) was deposited in the Herbarium of Institute of Materia Medica, Chinese Academy of Medical Sciences, Beijing, PR China.