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Review

Dioscorea zingiberensis C. H. Wright: An overview on its traditional use, phytochemistry, pharmacology, clinical applications, quality control, and toxicity

Xinxin Zhang[a,b], Ming Jin[a], Nigatu Tadesse[c], Jun Dang[d], Tao Zhou[a], Hui Zhang[a], Sicen Wang[a], Zengjun Guo[a,*], Yoichiro Ito[e,*]

[a] College of Pharmacy, Xi'an Jiaotong University, No. 76 Yanta Road, Xi'an 710061, China
[b] Department of Medicine, Imperial College London, London, England
[c] School of International Education, Xi'an Jiaotong University, Xi'an 710061, China
[d] Key Laboratory of Tibetan Medicine Research, Northwest Institute of Plateau Biology, Chinese Academy of Sciences, Xining, Qinghai, China
[e] Laboratory of Bio-separation Technologies, Biochemistry and Biophysics Center, National Heart, Lung, and Blood Institute, National Institutes of Health, Bethesda, MD, USA

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ABSTRACT

Ethnopharmacological relevance: Dioscorea zingiberensis C. H. Wright (*D. zingiberensis*), Dioscoreaceae, is used extensively in traditional Chinese medicines. The aim of the current review paper is to give a comprehensive overview of the traditional usage and phytochemistry of the plant. Clinical studies performed and products prepared from the plant and active principles will be mentioned. In addition a review of the taxonomy of the genus *Dioscorea* is given.

Materials and methods: A systematic search on literature has been performed in databases like Google Scholar, Science Direct, Scifinder, Web of Science, and in Chinese databases (China Knowledge Resource Integrated, *i.e.,* CNKI and Wanfang) including Ph.D. and M.Sc. dissertations. These from the period 1983–2016 have been searched.

Results: D. zingiberensis is an endemic plant in China widely distributed in some provinces, especially Hubei and Shaanxi. The rhizomes are the medicinal part in *Dun-Ye-Guan-Xin-Ning* tablets and are used for isolation of diosgenin. Steroidal saponins are believed to be the active principles. More than 70 compounds have been identified. Several of these have been tested in preclinical assays and clinical trials. A wide spectrum of biological effects including cardiovascular, anti-thrombosis, hyperlipidemia, neuroprotection, anti-inflammatory, and anthelmintic effect has been verified.

Conclusions: Because of the promising results from the investigations on the plant material of *D. zingiberensis*, further in depth analyses ought to be performed to evaluate its potential as either a traditional drug or a source of bioactive principle. The presently performed studies do not explain mechanism of action, pharmacokinetics (ADME properties), or toxicity. All of these topics need more elaborate investigations.

1. Introduction

Dioscorea zingiberensis C. H. Wright (*D. zingiberensis*) is a perennial vine exclusively cultivated in China. Chinese people call this plant as "yellow ginger" (Chinese name黄姜), and it is also named as *Huo-Tou-Gen* (Chinese name火头根) and *Zhen-Tou-Gen* (Chinese name枕头根).

Abbreviations: ALT, alanine aminotransferase; AST, aspartate aminotransferase; CK, creatine kinase; CNKI, China Knowledge Resource Integrated; CT, clotting time; CVD, cardiovascular disease; *D. zingiberensis*, *Dioscorea zingiberensis* C. H. Wright; ELSD, evaporative light scattering detector; GLU, glucose; HDL-C, high-density lipoprotein cholesterol; HPLC, high performance liquid chromatograph; HPLC-ESI-MS/MS, high performance liquid chromatograph-electron spray ionization-mass spectrometry-mass spectrometry; IHD, ischemic heart disease; IL-6, interleukin-6; IL-1β, interleukin-1β; I/R, cerebral ischemic reperfusion; LD_{50}, median lethal dose; LDH, lactate dehydrogenase; LDL-C, low-density lipoprotein cholesterol; MDA, malondialdehyde; MS, mass spectrometry; NF-κB, nuclear factor-kappa binding; NMR, nuclear magnetic resonance; NO, nitric oxide; *P. notoginseng*, *Panax notoginseng* (Burkill) F. H. Chen; PT, prothrombin time; SOD, superoxide dismutase; $t_{1/2}$, the elimination half-life; TBIL, total bilirubin; TC, total cholesterol; TCM, Traditional Chinese Medicine; TG, triglyceride; T_{max}, the time to reach the peak concentration; TNF-α, tumor necrosis factor; TSSN, total steroidal saponin; TT, thrombin time; UPLC-/Q-TOF-MS/MS, ultra performance liquid chromatography-quadrupole-time of flight-mass spectrometry-mass spectrometry; UV, ultraviolet; VLDL-C, very low density lipoprotein cholesterol; WBC, white blood cell

* Corresponding authors.
E-mail addresses: guozj@mail.xjtu.edu.cn (Z. Guo), itoy@nhlbi.nih.gov (Y. Ito).

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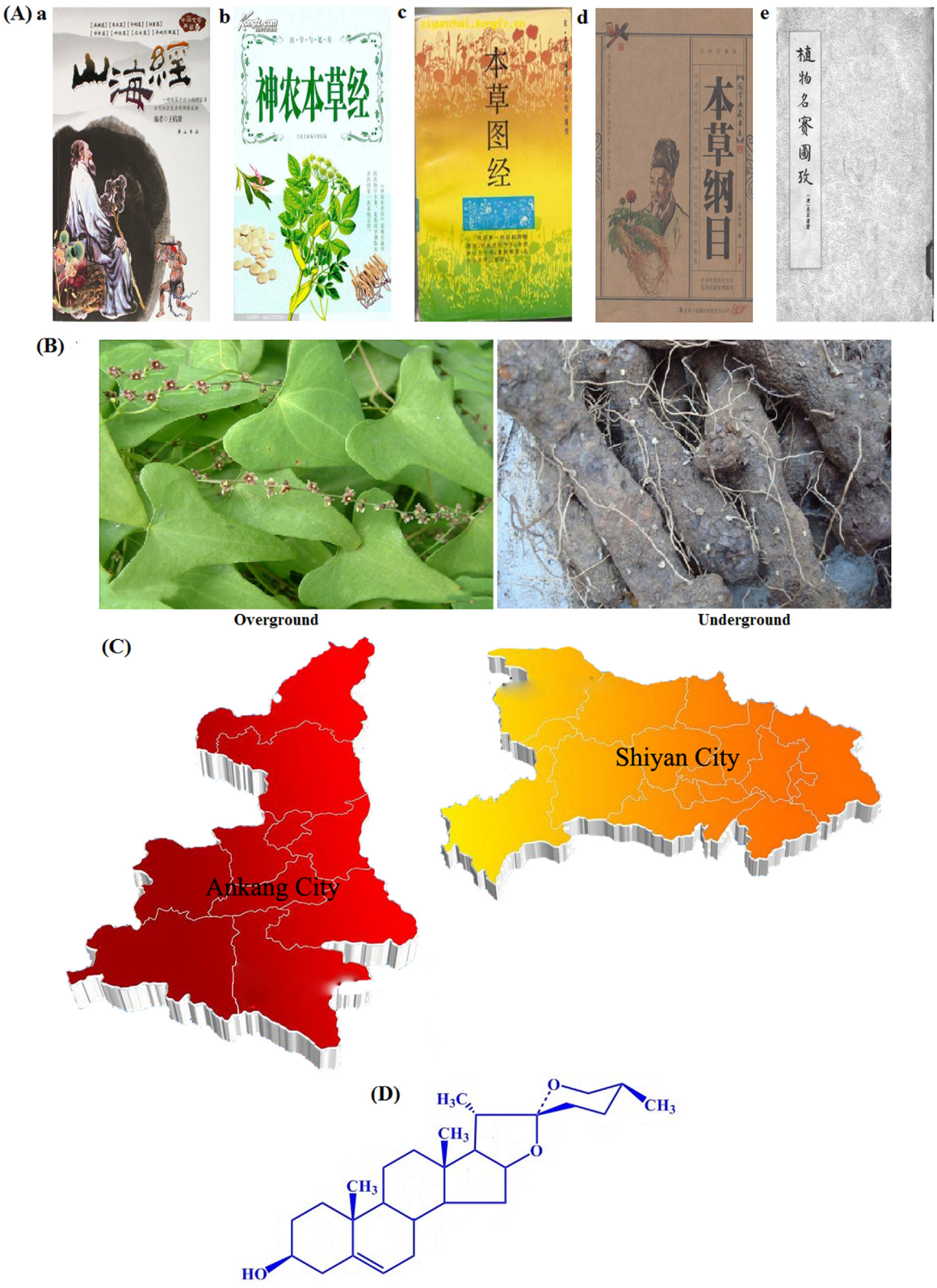

Fig. 1. A: The cover pages of the Traditional Chinese Medicine books. (a) Treatise on Cold Pathogenic Diseases (Shan Hai Jing); (b) Shen Nong's Herbal Classic (Shen Nong Ben Cao Jing); (c) Plans as herbal medicine (Tu Jing Ben Cao); (d) Compendium of Materia Medica (Ben Cao Gang Mu); (e) *An Illustrated Book on Plants* (Zhi Wu Ming Shi Tu Kao). B: The overground and underground parts of *Dioscorea zingiberensis* C. H. Wright. C: The main distribution areas of *Dioscorea zingiberensis* C. H. Wright in China. D: The chemical structure of diosgenin.