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Chinese Journal of Natural Medicines 2012, **10**(1): 0001–0012
Chinese Journal of Natural Medicines
·*Review*·

Natural products chemistry research 2010's progress in China

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Available online 20 Jan. 2012

[ABSTRACT] This article reviews the progresses made by Chinese scientists in the field of natural products chemistry in 2010. Selected compounds with unique structural features and/or promising bioactivities were described herein on the basis of structural types.

[KEY WORDS] Natural products chemistry; Natural compounds; Research progress

[CLC Number] R284; R965 **[Document code]** A **[Article ID]** 1672-3651(2012)01-0001-12

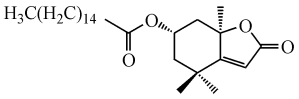
In 2010, Chinese scientists were continually active in the field of natural products chemistry research. For instance, the RSC journal *Nat Prod Report* published the review about the chemical structures and biosynthesis of new diterpenoid alkaloids (1998-2008) by Prof. WANG Feng-Peng of West China School of Pharmacy, Sichuan University. Prof. GUO Yue-Wei of Shanghai Institute of Materia Medica, Chinese Academy of Sciences was awarded the Paul Scheuer prize, set up and issued by Akademie Gemeinnützliger Wissenschaften zu Erfurt, for his distinguished achievements in marine natural products chemistry. On the other hand, the year of 2011 is an adjustive year for most Chinese scientists from the perspective of research papers. Compared with 2009, papers published in international journals such as *Org Lett*, *J Nat Prod*, *Tetrahedron*, and *Planta Med* had an obvious decline in 2010. For example, the total number of papers published in *J Nat Prod* dropped from 83 in 2009 to 57 in 2010. Additionally, Chinese scientists reported a series of novel structures/skeletons from the Meliaceae family in the past two years, prompting a research hot point around the highly oxygenated limonoids. In 2010, these papers went down both on quantity and quality.

Following the convention of the past years, we summarize here the achievements and progresses Chinese scientists have made in 2009 based on the classified novel structures/skeletons with interesting bioactivities from published articles.

1 Terpenes

1.1 *Monoterpenes*

One monoterpene, 3-*O*-palmitoylloliolide (**1**), was isolated from the aerial parts of *Parasenecio deltophylla*, with inhibitory activity on Hela cell proliferation[1].



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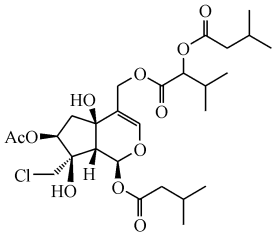
Irioids, a special kind of monoterpenes, are prevalent in plants, but they are not common to have Cl or S atoms substituting on the skeleton. A chlorinated iridoid, volvaltrate B (**2**), was isolated from *Valeriana jatamansi*[2]. Two thio-substituted irioids, epipaederoside and epipaederosidic acid (**3**), were isolated from *Saprosma ternatum* [3].



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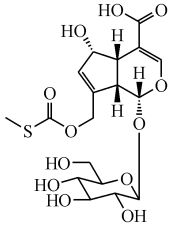

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1.2 *Sesquiterpenes*

[Received on] 02-Nov.-2011
[Research funding] This project was supported by the National Natural Science Funds for Distinguished Young Scholar (No. 30925043).
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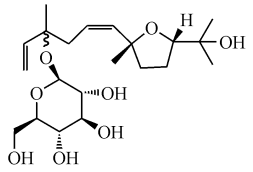
These authors have no any conflict of interest to declare.

A sesquiterpenoid with chain structure, (5*Z*)-6-[5-(2-hydroxypropan-2-yl)-2-methyl-tetrahydrofuran-2-yl]-3-methyl-hexa-1, 5-dien-3-*O*-beta-glucopyranoside (**4**), was isolated from *Breynia fruticosa* and *Breynia rostrata* (Euphorbiaceae)[4]. Anhuienol (**5**), a 6-eremophilene derivative with an unusual pendant, was produced as phytoalexin in the fresh leaves of *Chloranthus anhuiensis* K.F. Wu in response to abiotic stress elicitation by $CuCl_2$[5]. Scorzoaustriacin (**6**) was identified as a guaianolide derivative possessing an unusual aminomethyl-γ-butyrolactone structural unit from the roots of *Scorzonera austriaca*[6]. By bioassay guided isolation, five sesquiterpene lactones, including henrylactone A (**7**) with a dilactone moiety, were obtained from *Illicium henryi*, with moderate activities against HBsAg and HBeAg secretion in the HBV transfected Hep G 2.2.15 cell lines[7].



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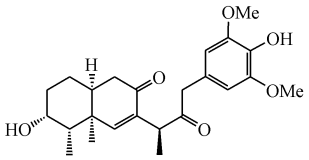

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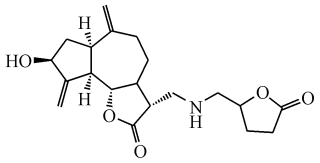

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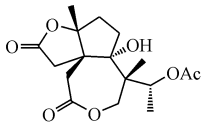

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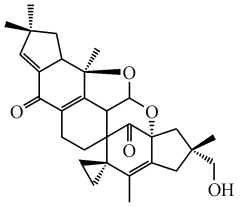

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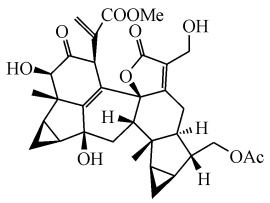

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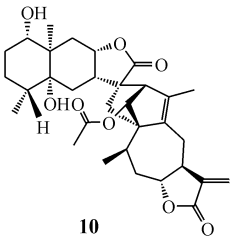
An illudane-illudane bis-sesquiterpene, agrocybone (**8**), was isolated from the basidiomycete *Agrocybe salicacola*. Compound **8** represents a structure with eight rings (including two spiro rings) and seven stereogenic carbon atoms[8]. Two sesquiterpenoid dimers, multistalides A (**9**) and B, were isolated from the whole plant of *Chloranthus multistachys*[9]. A series of dimeric sesquiterpene lactones including japonicone F (**10**) were isolated from the aerial part of *Inula japonica* Thunb. Compound **10** showed strong inhibitory effects against LPS-induced NO production in RAW264.7 macrophages with IC_{50} of 4.1 μg·mL^{-1}[10]. Two asymmetric eremophilane-type sesquiterpene dimers, ligulamulienins A and B (**11**), were separated from the rhizomes of *Ligularia muliensis*, and compound **11** exhibited moderate cytotoxic activity against MGC-803 and HEPG2 cell lines[11].



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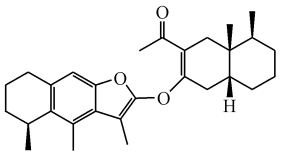

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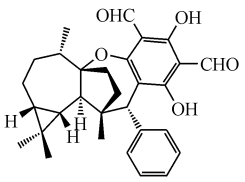
From the leaves of *Psidium guajava*, psiguadials A (**12**) and B (**13**)[12], and psidials B and C (**14**)[13], were isolated as unusual sesquiterpenoid-diphenylmethane meroterpenoids. Two 3-nor-methyl-chamigrane sesquiterpene peroxides, steperoxides A (**15**) and B, were isolated from basidiomycete *Steccherinum ochraceum*. This is the first report on the isolation of chamigrane sesquiterpene from higher fungi[14]. Volvalerenone A (**16**) was identified as a mononorsesquiterpenoid with an unprecedented 5/6/6 tricyclic ring system from the roots of *Valeriana officinalis*[15].



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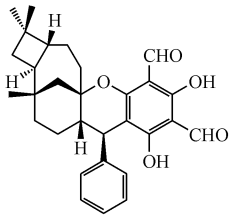

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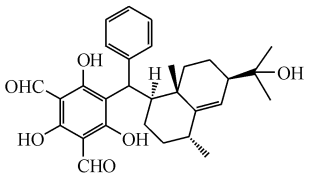

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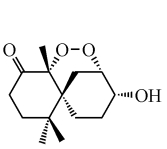

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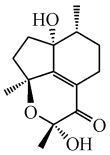

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1.3 *Diterpenes*

Four highly acylated diterpenoids with a 3, 4-secograyanane skeleton were isolated from the flower buds of *Rhododendron molle*, of which secorhodomollolide D (**17**) exhibited significant analgesic and sedative effects at a dose of 5 mg·kg^{-1}[16]. Three highly functionalized daphnane diterpenoids, which featured an oxygen-bridged four-member-ring system and a linkage mode of 12, 13, 14-orthoester, were isolated from the stems of *Trigonostemon thyrsoideum*. Among them, trigonothyrin C (**18**) was observed to inhibit HIV-1 induced cytopathic effects with the EC_{50} of 2.19 μg·mL^{-1} and the therapeutic index (TI) more than 90[17]. From *Trigonostemon chinensis*, trigochinins A-C were isolated as three highly oxygenated diterpenes, and trigochinin C (**19**) showed significant inhibition against MET tyrosine kinase activity with IC_{50} of 1.95 μmol·L^{-1}[18].

Scaparvin A (**20**), a caged *cis*-clerodane diterpenoid possessing an unprecedented C-6/C-11 bond and a ketal ring, was characterized from the Chinese liverwort *Scapania parva* [19]. Castanolide and *epi*-castanolide (**21**), two diterpenoids possessing a unique *seco*-norabietane skeleton, were isolated from *Salvia castanea* Diels f. *pubescens* Stib. Their structures featured a six-membered *α*, *β*-unsaturated lactone ring and a five-membered *α*-methyl-*α*, *β*-unsaturated γ-spirolactone