Available online at SciVarse ScienceDirect

Chinese Herbal Medicines (CHM)

ISSN 1674-6384

Journal homepage: www.tiprpress.com E-mail: chm@tiprpress.com

Review

Chemical Constituents in Plants of Genus *Kadsura* Kaempf. ex Juss.

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ARTICLE INFO

Article history

Received: February 24, 2014

Revised: May 23, 2014

Accepted: May 28, 2014

Available online: July 15, 2014

DOI: 10.1016/S1674-6384(14)60028-9

ABSTRACT

Genus *Kadsura* Kaempf. ex Juss. includes important medicinal plants widely used in the south and southwest of China. The stems and roots are effective in activating blood and resolving stasis, promoting *qi* circulation to relieve pain, dispelling wind and eliminating dampness, in which lignans and triterpenoids are the major bioactive constituents. Here we summarized the chemical constituents isolated from genus *Kadsura* Kaempf. ex Juss., which would provide a primary and strategic platform for further exploiting the medicinal value and resources of genus *Kadsura* Kaempf. ex Juss.

Key words

lignan; *Kadsura* Kaempf. ex Juss; Schisandraceae; triterpenoid

1. Introduction

Genus *Kadsura* Kaempf. ex Juss. (family Schisandraceae) comprises 16 species, mainly distributed in Asia, and eight of them existed in the south and southeast of China (Wu et al, 2008; Saunders, 1998). The plants of the genus have been used as folk medicines for a long time to activate blood and resolve stasis, promote *qi* circulation to relieve pain, dispell wind and eliminate dampness (Liu et al, 2012). Some species such as *K. interior*, *K. coccinea*, *K. longipedunculata*, and *K. heteroclita*, have been recorded in *Chinese Pharmacopoeia 2010* (Pharmacopoeia Committee of P. R. China, 2010) and *Provincial Chinese Materia Medica Standards* (Fujian Food and Drug Administration, 2006; Guangdong Food and Drug Administration, 2004). (Figure 1)

In recent years, genus *Kadsura* Kaempf. ex Juss. has been extensively studied in chemical constituents including lignans, triterpenoids, flavonoids, sesquiterpenoids, and so on. Among them, lignans and triterpenoids were the main characteristic constituents with various biological activities. Since the pharmacological studies have been reviewed in our previous paper (Liu et al, 2014), we summarized the chemical constituents including bioactive compounds isolated from the plants of genus *Kadsura* Kaempf. ex Juss. over the past 20 years, and provided a primary and strategic platform for the further development and utilization of the medicinal value and resources in the plants of genus *Kadsura* Kaempf. ex Juss.

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Fund: National Natural Sciences Foundation of China (81001609, 81373913); Fundamental Research Funds for the Central Scientific Research Institutes for Public Welfare

Whole plant of *K. heteroclite* Blades of *K. coccinea* Fruits of *K. oblongifolia*

Figure 1 Some morphological characters in plants of genus *Kadsura* Kaempf. ex Juss.

2. Chemical constituents

More than 450 compounds had been isolated and identified from the plants of genus *Kadsura* Kaempf. ex Juss., which could enrich the abundant constituents in the natural products in Schisandraceae plants. They were lignans, triterpenoids, flavonoids, sesquiterpenoids, etc. Among them, lignans and triterpenoids were the main chemical constituents, which were the research hotspots for their bioactivities in anti-HIV, antitumor, antihepatitis treatment and so on. Their names, structures, and corresponding plant sources were collected as follows.

2.1 Lignans

Lignans were the major constituents in the plants of genus *Kadsura* Kaempf. ex Juss. Two hundred and eighty-five lignans had been identified and divided into five categories, dibenzocyclooctadienes (A), spirobenzofuranoid dibenzocyclooctadienes (B), aryltetralins (C), diarylbutanes (D), and tetrahydrofurans (E).

2.1.1 Dibenzocyclooctadienes (A)

Abundant dibenzocyclooctadienes were isolated from the plants of genus *Kadsura* Kaempf. ex Juss., occupying above half of total lignans (Table 1). According to their different configurations and conformations, dibenzocyclooctadienes could be further classified into three categories: S-twist boat chair (S-TBC), R-TBC, and S-TB, more than half of which were S-TBC. In addition, a special type of dibenzocyclooctadienes isolated from the plants of genus *Kadsura* Kaempf. ex Juss. had an oxygen-bridged eight-membered ring. (Figure 2)

2.1.2 Spirobenzofuranoid dibenzocyclooctadienes (B)

Fifty-three spirobenzofuranoid dibenzocyclooctadienes were isolated from the plants of genus *Kadsura* Kaempf. ex Juss. Most of them were only found in this genus, considered as the characteristic chemical constituents in genus *Kadsura* Kaempf. ex Juss., and demonstrated important taxonomic significance (Xu et al, 2008b). (Table 2, Figure 3)

2.1.3 Aryltetralins (C)

This category contained eight compounds with the same nuclear structure. Kadsuralignans H (**255**) and C (**257**) were isolated from *K. coccinea*. Kadsurindutin C (**256**) was isolated from *K. induta*. Other five compounds, namely otobaphenol (**258**) and arisantetralone A−D (**259−262**) were isolated from *K. longipedunculata*. (Table 3, Figure 4)

2.1.4 Diarylbutanes (D)

There were seventeen diarylbutane-type lignans isolated from *Kadsura* plants. Extensive phytochemical studies on the roots and stems of *K. longipedunculata* collected from different places resulted in the isolation of (+)-anwulignan (**263**), dihydroguaiaretic acid (**264**), monomethyl dihydroguaiaretic acid (**265**), saururenin (**266**), mesodihydroguaiaretic acid (**267**), isoanwulignan (**269**), 4-[4-(3,4-dime-thoxyphenyl)-2,3-dimethyl-butyl]-2-methoxy-phenol (**270**), and 3-methoxy-3′,4′-(methylenedioxy)-9,9′-epoxylignan-4,7′-diol (**271**). Other diarylbutane-type lignans were also obtained from other species, including lengfantuanjing I (**268**), kadcoccilignan (**272**) (from *K. coccinea*), kadangustins J and K (**273** and **274**), H (**276**), I (**277**), heteroclitin R (**275**) (from *K. heteroclita*), meso-dihyroguaiaretic acid (**278**) (from *K. angustifolia*), and kadsuphilin J (**279**) (from *K. philippinensis*). (Table 4, Figure 5)

2.1.5 Tetrahydrofurans (E)

Only six terahydrofuran-type lignans had been obtained from *Kadsura* plants, namely grandisin (**281**), kadlongirins A and B (**282** and **283**), fragransin B (**284**), and zuihonin A (**285**) isolated from *K. longipedunculata*, and veraguensin (**280**) isolated from an unidentified species of genus *Kadsura* Kaempf. ex Juss. (Liu and Huang, 1988; Pu et al, 2008a; Zaugg et al, 2011). (Figure 6)

2.2 Triterpenoids

Triterpenoid was another kind of major chemical constituent in the plants of genus *Kadsura* Kaempf. ex Juss. Up to now, 160 triterpenoids had been isolated and identified. According to their different structural skeleton, they could be classified into four categories: lanostane-type, cycloartane-type, nortriterpenoids, and others triterpenoids, which could be further divided into several sub-types because of the different oxygenated patterns and structure characteristics.

Table 1 Dibenzocyclooctadienes (A) isolated from genus *Kadsura* Kaempf. ex Juss.

No.	Compounds	Structures	Plant sources	References
1	gomisin J	$R_1=R_6=R_7=R_{10}=R_{11}=R_{12}=H$	*K. interior*	Chen et al, 1997
		$R_2=R_3=R_4=R_5=R_8=R_9=CH_3$	*K. heteroclita*	Chen et al, 2006
2	gomisin C (schisantherin A)	$R_3=R_4=R_5=R_6=R_8=R_9=CH_3$	*K. interior*	Chen et al, 2002a
		$R_1+R_2=CH_2$, R_{12}=OBz, $R_7=R_{11}=H$, R_{10}=OH		
3	schisandrin C (wuweizisu C)	$R_1+R_2=R_5+R_6=CH_2$, $R_3=R_4=R_8=R_{10}=CH_3$	*K. longipedunculata*	Chen et al, 1997
		$R_7=R_9=R_{11}=R_{12}=H$	*K. interior*	Chen et al, 2002a
			K. coccinea	Liu and Li, 1995b
4	longipedunin A	$R_1+R_2=CH_2$, $R_3=R_5=R_6=R_8=R_{10}=CH_3$	*K. longipedunculata*	Sun et al, 2006b
		$R_4=R_7=R_9=R_{12}=H$, R_{11}=OCin		
5	schizarin B	$R_1=R_2=R_3=R_7=R_9=CH_3$, $R_5+R_6=CH_2$, R_{12}=βOCin	*K. matsudai*	Kuo et al, 2001b
		$R_4=R_8=R_{10}=R_{11}=H$		
6	schizarin E	$R_1=R_2=R_3=R_7=R_9=CH_3$, $R_5+R_6=CH_2$, R_{12}=βOBz	*K. matsudai*	Kuo et al, 2001b
		$R_4=R_8=R_{10}=R_{11}=H$		
7	tigloylgomisin P	$R_1+R_2=CH_2$, $R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3$	*K. heteroclita*	Han et al, 1992
		$R_7=R_{11}=H$, R_{12}=OTig, R_9=OH		
8	angeloylgomisin P	$R_1+R_2=CH_2$, $R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3$	*K. heteroclita*	Han et al, 1992
		$R_7=R_{11}=H$, R_{12}=OAng, R_9=OH		
9	longipedunin B	$R_1+R_2=CH_2$, R_{11}=Oprop, $R_3=R_5=R_6=R_8=R_{10}=CH_3$	*K. longipedunculata*	Sun et al, 2006b
		$R_4=R_7=R_9=R_{12}=H$		
10	kadsuphilin A	$R_1+R_2=CH_2$, R_{11}=t-OCin	*K. philippinensis*	Shen et al, 2006
		$R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3$, $R_7=R_9=R_{12}=H$	*K. polysperma*	Dong et al, 2012b
11	angeloylbinankadsurin A	$R_1+R_2=CH_2$, $R_4=R_7=R_9=R_{12}=H$	*K. philippinensis*	Shen et al, 2006
		$R_3=R_5=R_6=R_8=R_{10}=CH_3$, R_{11}=OAng	*K. oblongifolia*	Huang et al, 2011
			K. japonica	Ookawa et al, 1981
			K. coccinea	Hu et al, 2012
			K. heteroclita	Lu and Chen, 2008
12	butyrylbinankadsurin A	$R_1+R_2=CH_2$, $R_4=R_7=R_9=R_{12}=H$	*K. sp.s*	Liu and Zhou, 1991
		$R_3=R_5=R_6=R_8=R_{10}=CH_3$, R_{11}=Obutanoyl		
13	acetylbinankadsurin A	$R_1+R_2=CH_2$, $R_4=R_7=R_9=R_{12}=H$	*K. sp.s*	Liu and Zhou, 1991
		$R_3=R_5=R_6=R_8=R_{10}=CH_3$, R_{11}=OAc	*K. coccinea*	Li et al, 1988
			K. japonica	Ookawa et al, 1981
14	deacetyldeangeloyl-kadsurarin	$R_1+R_2=CH_2$, $R_{10}=R_{11}=R_{12}$=OH	*K. longipedunculata*	Liu et al, 1991
		$R_3=R_4=R_5=R_6=R_8=R_9=CH_3$, R_7=H		
15	schizanrin J	$R_1+R_2=CH_2$,R_{10}=OH, $R_{11}=R_{12}$=OAng, $R_4=R_7$=H	*K. philippinensis*	Shen et al, 2006
		$R_3=R_5=R_6=R_8=R_9=CH_3$		
16	ananosin A	$R_1+R_2=CH_2$, R_{12}=Tig, R_{11}=OH, $R_7=R_9$=H	*K. ananosma*	Chen et al, 2001
		$R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3$		
17	angustifolin C	$R_1+R_2=R_5+R_6=CH_2$, $R_3=R_4=R_8=R_{10}=CH_3$	*K. angustifolia*	Chen et al, 2001
		R_{11}=OH, R_{12}=OBz, $R_7=R_9$=H		
18	angeloylbinankadsurin B	$R_1=R_2=R_3=R_5=R_6=R_8=R_{10}=CH_3$	*K. japonica*	Ookawa et al, 1995
		R_4=OH,R_{11}=OAng,$R_7=R_9=R_{12}$=H		
19	acetylbinankadsurin B	$R_1=R_2=R_3=R_5=R_6=R_8=R_{10}=CH_3$	*K. japonica*	Ookawa et al, 1995
		R_{11}=OAc, $R_4=R_7=R_9=R_{12}$=H		
20	deangeloylschisantherin F	$R_1=R_2=R_3=R_5=R_6=R_8=R_{10}=CH_3$	*K. japonica*	Ookawa et al, 1995
		R_{11}=OH, $R_4=R_7=R_9=R_{12}$=H	*K. angustifolia*	Gao et al, 2008b
21	isovaleroylbinankadsurin A	$R_1+R_2=CH_2$, $R_4=R_7=R_9=R_{12}$=H	*K. coccinea*	Ban et al, 2009
		$R_3=R_5=R_6=R_8=R_{10}=CH_3$, R_{11}=OTig		
22	isobutyroylbinankadsurin A	$R_1+R_2=CH_2$, $R_4=R_7=R_9=R_{12}$=H	*K. longipedunculata*	Li et al, 1991
		$R_3=R_5=R_6=R_8=R_{10}=CH_3$, R_{11}=O-2-methylpropanoyl		
23	kadsuralignan J	$R_1+R_2=CH_2$, R_{11}=OH, $R_7=R_9=R_{12}$=H	*K. coccinea*	Ban et al, 2009
		$R_3=R_5=R_6=R_8=R_{10}=CH_3$, R_4=Tig		
24	binankadsurin A	$R_1+R_2=CH_2$, $R_3=R_5=R_6=R_8=R_{10}=CH_3$	*K. coccinea*	Ban et al, 2009
		R_{11}=OH, $R_4=R_7=R_9=R_{12}$=H	*K. heteroclita*	Lu and Chen, 2008
			K. longipedunculata	Lu and Chen, 2008
			K. angustifolia	Gao et al, 2008b

(To be continued)

(Continued Table 1)

No.	Compounds	Structures	Plant sources	References
25	schizandrin N	R_1=R_2=R_3=R_4=R_5=R_6=R_8=R_9=CH_3, R_{12}=OBz R_{10}=OH, R_7=H, R_{11}=OAc	*K. coccinea*	Shinomiya et al, 2009
26	kadsuralignan L	R_1=R_7=R_9= R_{12}=H, R_{11}=OH, R_4=Oig R_2=R_3=R_5=R_6=R_8=R_{10}=CH_3	*K. coccinea*	Hu et al, 2012
27	polysperlignan A	R_1+R_2=CH_2, R_7=R_9=H, R_{11}=OAng, R_{12}=OAng R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3	*K. polysperma*	Dong et al, 2012b
28	polysperlignan B	R_1+R_2=CH_2, R_7=R_9=H, R_{11}=OTig, R_{12}=OAc R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3	*K. polysperma*	Dong et al, 2012b
29	polysperlignan C	R_1+R_2=CH_2, R_7=R_9=H, R_{11}=OTig, R_{12}=OBz R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3	*K. polysperma*	Dong et al, 2012b
30	polysperlignan D	R_1+R_2=CH_2, R_7=R_9=H, R_{11}=OTig, R_{12}=OAng R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3	*K. polysperma*	Dong et al, 2012b
31	polysperlignan E	R_1+R_2=CH_2, R_7=R_9=H, R_{11}=OAng, R_{12}=t-OCin R_3= R_4=R_5=R_6=R_8=R_{10}=CH_3	*K. polysperma*	Dong et al, 2012b
32	polysperlignan F	R_1+R_2=CH_2, R_7=R_9=H, R_{11}=c-OCin, R_{12}=H R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3	*K. polysperma*	Dong et al, 2012b
33	polysperlignan G	R_1+R_2=CH_2, R_7=R_9=H, R_4=Ang, R_{12}=OAng R_3=R_5=R_6=R_8=R_{10}=CH_3, R_{11}=OH	*K. polysperma*	Dong et al, 2012b
34	polysperlignan H	R_1+R_2=CH_2, R_7=R_9=H, R_{11}=OH, R_{12}=OTig R_4=Ang, R_3=R_5=R_6=R_8=R_{10}=CH_3	*K. polysperma*	Dong et al, 2012b
35	polysperlignan I	R_7=R_9=H, R_4=Ang, R_{11}=OH, R_{12}=OAng R_1=R_2=R_3=R_5=R_6=R_8=R_{10}=CH_3	*K. polysperma*	Dong et al, 2012b
36	polysperlignan J	R_7=R_9=H, R_4=Ang, R_{11}=OH, R_{12}= OTig R_1=R_2=R_3=R_5=R_6=R_8=R_{10}=CH_3	*K. polysperma*	Dong et al, 2012b
37	methylschisantherin F	R_7=R_9=R_{12}=H, R_{11}=OH, R_4=Ang R_1=R_2=R_3=R_5=R_6=R_8=R_{10}=CH_3	*K. polysperma*	Dong et al, 2012b
38	interiotherin C	R_1+R_2=CH_2, R_7=R_9=H, R_{11}=OAc R_{12}=OAng R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3	*K. polysperma* *K. heteroclita* *K. interior*	Dong et al, 2012b Chen et al, 2006 Chen et al, 2002a
39	kadsurin	R_1+R_2=CH_2, R_7=R_9=R_{12}=H, R_{11}=OAc R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3	*K. polysperma* *K. heteroclita* *K. japonica* *K. oblongifolia* *K. interior* *K. ananosma*	Dong et al, 2012b Yang et al, 1992 Chen et al, 1973 Chen et al, 2002a Chen et al, 1996 Yang et al, 2011b
40	1-demethylkadsuphilin A	R_1+R_2 =CH_2, R_{11}=t-OCin R_3=R_5=R_6=R_8=R_{10}=CH_3, R_4=R_7=R_9= R_{12}=H	*K. philippinensis*	Shen et al, 2006
41	isogomisin O	R_1+R_2 =CH_2, R_7=R_9=R_{12}=H, R_{11}=OH R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3	*K. polysperma* *K. ananosma* *K. sp.s*	Dong et al, 2012b Yang et al, 2011b Jia et al, 2005
42	kadsuralignan G	R_1+R_2=CH_2, R_3=R_5=R_6=R_8=R_{10}=CH_3 R_{11}=OAng, R_4=R_7=R_9=R_{12}=H	*K. coccinea*	Hu et al, 2012
43	tiegusanin I	R_1+R_2=CH_2, R_8=R_{10}=H, R_{11}=OProp R_3=R_4=R_5=R_6=R_7=R_9=CH_3, R_{12}=OAng	*K. polysperma* *K. ananosma*	Dong et al, 2012b Yang et al, 2011a
44	yunnankadsurin B	R_1+R_2=CH_2, R_{11}=OH, R_7=R_{10}=R_{12}=H R_3=R_4=R_5=R_6=R_8=R_9=CH_3	*K. polysperma* *K. sp.s*	Dong et al, 2012b Jia et al, 2005
45	kadsuphilol I	R_1=R_2=R_3=R_5=R_6=R_8=R_{10}= CH_3 R_4=R_7=R_9=H, R_{11}=OH, R_{12}=OAc	*K. philippinensis*	Shen et al, 2009
46	kadsuphilin K	R_1=R_2=R_3=R_5=R_6=R_8=R_{10}=CH_3 R_4=R_7=R_9=H, R_{12}=OH, R_{11}=OAc	*K. philippinensis*	Shen et al, 2008
47	kadsuphilol J	R_1=R_2=R_3=R_5=R_6=R_8=R_9=CH_3 R_4=R_7=H, R_{10}=OH, R_{11}=OAc, R_{12}=OAng	*K. philippinensis*	Shen et al, 2009
48	kadsuphilol K	R_1+R_2=CH_2, R_3=R_5=R_6= R_8=R_9= CH_3 R_{10}= R_{11}=OH, R_4=R_7=H, R_{12}=OBz	*K. philippinensis*	Shen et al, 2009

(To be continued)

(Continued Table 1)

No.	Compounds	Structures	Plant sources	References
49	kadsuphilol L	R_1+R_2=CH_2, R_3=R_7=H, R_{12}=OAc, R_{10}=OH R_{11}=OCin, R_4=R_5=R_6=R_8=R_9= CH_3	*K. philippinensis*	Shen et al, 2009
50	kadsuphilol B	R_1+R_2=CH_2, R_4=R_7=R_9=H R_3=R_5=R_6=R_8=R_{10}=CH_3, R_{11}=OBz, R_{12}=OAc	*K. philippinensis*	Shen et al, 2007a
53	acetylepigomisin R	R_1+R_2=R_5+R_6=CH_2, R_3=R_4=R_8=R_{10}=CH_3 R_7=R_9=R_{11}=H, R_{12}=OAc	*K. coccinea*	Ban et al, 2009
56	ananolignan E	R_1+R_2=CH_2, R_{11}=OH, R_{12}=βOAc R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3, R_7=R_9=H	*K. ananosma*	Yang et al, 2011b
57	ananolignan F	R_1+R_2=CH_2, R_{11}=OAc, R_7=R_9=H, R_{12}=βOAc R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3	*K. ananosma*	Yang et al, 2011b
58	ananolignan G	R_1+R_2=CH_2, R_7=R_9=H, R_{11}=OProp, R_{12}=βOAc R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3	*K. ananosma*	Yang et al, 2011b
59	ananolignan H	R_1+R_2=CH_2,R_7=R_9=H, R_{11}=OIsobut, R_{12}=βOAc R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3	*K. ananosma*	Yang et al, 2011b
60	ananolignan I	R_1+R_2= CH_2, R_7=R_9=H, R_{11}=OBut, R_{12}=βOAc R_3=R_4=R_5=R_6= R_8=R_{10}=CH_3	*K. ananosma*	Yang et al, 2011b
61	ananolignan J	R_1+R_2=CH_2, R_7=R_9=H, R_{11}=OIsoval, R_{12}=βOAc R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3	*K. ananosma*	Yang et al, 2011b
62	ananolignan K	R_1+R_2=CH_2, R_7=R_9=H, R_{11}=OBz, R_{12}=βOAc R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3	*K. ananosma*	Yang et al, 2011b
63	ananolignan L	R_1+R_2=CH_2, R_7=R_9=H, R_{11}=OAc, R_{12}=βOTig R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3	*K. ananosma*	Yang et al, 2011b
64	ananolignan M	R_1+R_2=CH_2, R_7=R_9=H, R_{11}=OIsobut, R_{12}=βOAng R_3=R_4=R_5=R_6= R_8=R_{10}= CH_3	*K. ananosma*	Yang et al, 2011b
65	ananolignan N	R_1+R_2= CH_2, R_7=R_9=H, R_{11}=OBut, R_{12}=βOAng R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3	*K. ananosma*	Yang et al, 2011b
66	kadsuphilin C	R_1+R_2=CH_2, R_4=R_7=H, R_{10}=OH R_3=R_5=R_6=R_8=R_9=CH_3, R_{11}=OAc, R_{12}=OBz	*K. philippinensis*	Shen et al, 2007b
67	kadsuphilin E	R_1=R_2=R_3=R_5=R_6=R_8=R_9=CH_3 R_4=R_7=H, R_{10}=OH, R_{11}=OAc, R_{12}=OBz	*K. philippinensis*	Shen et al, 2007b
68	schizanrin G	R_1+R_2=CH_2, R_4=R_7=H, R_{10}=OH R_3=R_5=R_6=R_8=R_9=CH_3, R_{11}=OAc, R_{12}=OAng	*K. philippinensis* *K. matsudai*	Shen et al, 2007b Wu et al, 2003
69	schizanrin F	R_1+R_2=CH_2, R_{12}=OBz, R_7=H, R_{10}=OH, R_{11}=OAc R_3=R_4=R_5=R_6=R_8=R_9=CH_3	*K. philippinensis* *K. matsudai* *K. coccinea* *K. oblongifolia*	Shen et al, 2007b Wu et al, 2003 Li et al, 2006 Liu et al, 2009b
70	schizanrin H	R_1=R_2=R_3=R_4=R_5=R_6=R_8=R_9=CH_3, R_{12}=OBz R_7=H, R_{10}=OH, R_{11}=OAc	*K. matsudai* *K. coccinea*	Wu et al, 2003 Li et al, 2006
71	kadsuphilin D	R_1+R_2=CH_2, R_4=R_9=H, R_7=R_{12}=OH, R_{11}=OAc R_3=R_5=R_6=R_8=R_{10}=CH_3	*K. philippinensis*	Shen et al, 2007b
72	kadsuphilin F	R_1+R_2=CH_2, R_4=R_9=H, R_7=R_{12}=OH, R_{11}=OBz R_3=R_5=R_6=R_8=R_{10}=CH_3	*K. philippinensis*	Shen et al, 2007b
73	heteroclitalignan A	R_1+R_2=CH_2, R_3=R_7=H, R_{10}=OH R_4=R_5=R_6=R_8=R_9=CH_3, R_{11}=OBz, R_{12}=OAc	*K. heteroclita*	Wang et al, 2006b
74	heteroclitalignan D	R_1+R_2=CH_2, R_7=H, R_{10}=OH, R_{11}=OBz, R_{12}=OAc R_3=R_4=R_5=R_6=R_8=R_9=CH_3	*K. heteroclita*	Wang et al, 2006b
75	heteroclitalignan B	R_1+R_2=CH_2, R_7=H, R_{10}=OH, R_{11}=Oprop R_{12}=OAng, R_3=R_4=R_5=R_6=R_8=R_9=CH_3	*K. heteroclita*	Wang et al, 2006b
76	kadsurarin	R_1+R_2=CH_2, R_7=H, R_{10}=OH, R_{11}=OAc R_3=R_4=R_5=R_6=R_8=R_9=CH_3, R_{12}=OAng	*K. heteroclita* *K. matsudai* *K. longipedunculata* *K. oblongifolia*	Wang et al, 2006b Li et al, 2000 Liu et al, 1991 Liu et al, 2009b
77	heteroclitin A	R_1+R_2=CH_2, R_7=R_9=R_{12}=H R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3 R_{11}= $COCH(CH_3)CH_2CH_3$	*K. heteroclita*	Chen et al, 1992

(To be continued)

(Continued Table 1)

No.	Compounds	Structures	Plant sources	References
78	heteroclitin B	$R_1+R_2=CH_2$, $R_7=R_9=R_{12}=H$ $R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3$, R_{11}=OAng	*K. heteroclita* *K. oblongifolia*	Chen et al, 1992 Huang et al, 2011
79	heteroclitin C	$R_1+R_2=CH_2$, $R_7= R_9=R_{12}=H$ $R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3$, R_{11}=OTig	*K. heteroclita*	Chen et al, 1992
80	kadsuralignan I	$R_1+R_2=CH_2$, R_4=Ang, $R_7=R_9=R_{12}$=H, R_{11}=OH $R_3 =R_5=R_6= R_8=R_{10}=CH_3$	*K. coccinea*	Li et al, 2007
81	kadsuralignan K	$R_1+R_2=CH_2$, $R_7= R_9=R_{12}=H$ R_4=Bz, R_{11}=OH, $R_3=R_5=R_6=R_8=R_{10}=CH_3$	*K. coccinea*	Li et al, 2007
82	kadangustin L	$R_1+R_2=CH_2$, $R_7=R_9$=H, $R_{11}=R_{12}$=OH $R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3$	*K. angustifolia*	Gao et al, 2012
83	ananonin K	$R_1=R_7=R_9$=H, $R_{11}=R_{12}$=OAc $R_2=R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3$	*K. ananosma*	Yang et al, 2011a
84	ananonin L	$R_1=R_7=R_9$=H, R_{11}=OAc, R_{12}=OAng $R_2=R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3$	*K. ananosma*	Yang et al, 2011a
85	ananonin M	$R_1=R_7=R_9$=H, R_{11}=OH, R_{12}=OBz $R_2=R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3$	*K. ananosma*	Yang et al, 2011a
86	ananonin N	$R_1=R_7=R_9$=H, R_{11}=OAc, R_{12}=OBz $R_2=R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3$	*K. ananosma*	Yang et al, 2011a
87	ananonin A	$R_1+R_2=CH_2$, $R_7=R_9$=H, R_{11}=OH, R_{12}=OBz $R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3$	*K. ananosma*	Yang et al, 2011a
88	ananonin B	$R_1+R_2=CH_2$, $R_7=R_9$=H, R_{11}=OAc, R_{12}=OBz $R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3$	*K. ananosma*	Yang et al, 2011a
89	ananonin C	$R_1+R_2=CH_2$, $R_7= R_9$=H, R_{11}=OProp, R_{12}=OBz $R_3 =R_4=R_5=R_6=R_8=R_{10}=CH_3$	*K. ananosma*	Yang et al, 2011a
90	ananonin D	$R_1+R_2=CH_2$, $R_7=R_9$=H, R_{11}=OBut, R_{12}=OBz $R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3$	*K. ananosma*	Yang et al, 2011a
91	ananonin E	$R_1+R_2=CH_2$, $R_7=R_9$=H, R_{11}=OIsobut, R_{12}=OBz $R_3 =R_4=R_5=R_6=R_8=R_{10}=CH_3$	*K. ananosma*	Yang et al, 2011a
92	ananonin F	$R_1+R_2=CH_2$, $R_7=R_9$=H, R_{11}=OIsoval, R_{12}=OBz $R_3 =R_4=R_5=R_6=R_8=R_{10}=CH_3$	*K. ananosma*	Yang et al, 2011a
93	ananonin G	$R_1+R_2=CH_2$, $R_7=R_9$=H, R_{11}=Oisoval, R_{12}=OAng $R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3$	*K. ananosma*	Yang et al, 2011a
94	ananonin H	$R_1+R_2=CH_2$, $R_3=R_7=R_9$=H, R_{11}=Oac, R_{12}=OAng $R_4=R_5=R_6=R_8=R_{10}=CH_3$	*K. ananosma*	Yang et al, 2011a
95	ananonin I	$R_1+R_2=CH_2$, $R_3=R_7=R_9$=H, R_{11}=Oprop, R_{12}=OAng $R_4=R_5=R_6=R_8=R_{10}=CH_3$	*K. ananosma*	Yang et al, 2011a
96	ananonin J	$R_1+R_2=CH_2$, R_{11}=OIsoval, $R_3=R_7=R_9$=H R_{12}=OAng, $R_4=R_5=R_6=R_8=R_{10}=CH_3$	*K. ananosma*	Yang et al, 2011a
97	kadsuralignan B	$R_1+R_2=CH_2$, R_7=H, R_{10}=OH, $R_{11}=R_{12}$=OAc $R_3=R_4=R_5=R_6=R_8=R_9=CH_3$	*K. coccinea*	Li et al, 2006
98	kadsuralignan A	$R_1+R_2=CH_2$, $R_3=R_4=R_5=R_8=R_{10}=CH_3$ $R_6=R_7=R_9=R_{12}$=H, R_{11}=OH	*K. coccinea*	Li et al, 2006
99	caproylbinankadsurin A	$R_1+R_2=CH_2$, $R_3=R_5=R_6=R_8=R_{10}=CH_3$ $R_4=R_7=R_9=R_{12}$=H, R_{11}=OCap	*K. japonica*	Ookawa et al, 1981
100	yunnankadsurin A	$R_1+R_2=CH_2$, $R_6=R_7=R_9=R_{11}$=H $R_3=R_4=R_5=R_8=R_{10}=CH_3$, R_{12}=oxo	*K. sp.s*	Shen et al, 2008
101	(±)-kadsutherin	$R_1+R_2=CH_2$, $R_7=R_9=R_{11}=R_{12}$=H $R_4=R_5=R_6=R_8=R_{10}=CH_3$, R_3=Ang	*K. coccinea*	Li et al, 1985
102	isokadsuranin	$R_1+R_2=CH_2$, $R_7=R_9=R_{11}=R_{12}$=H $R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3$	*K. coccinea*	Li et al, 1985
103	kadangustin A	$R_1=R_2=R_3=R_5=R_6=R_8=R_{10}=CH_3$ R_{12}=OH, $R_4=R_7=R_9$=H, R_{11}=OAc	*K. angustifolia*	Gao et al, 2008b
104	kadangustin C	$R_1=R_2=R_3=R_5=R_6=R_8=R_9=CH_3$ R_{10}=OH, R_{11}=OAc, $R_4=R_7$=H, R_{12}=OCin	*K. angustifolia*	Gao et al, 2008b

(To be continued)

(Continued Table 1)

No.	Compounds	Structures	Plant sources	References
105	kadangustin D	R_1=R_2=R_3=R_5=R_6=R_8=R_{10}=CH_3 R_{11}=OAc, R_4=R_7=R_9=H, R_{12}=OCin	*K. angustifolia*	Gao et al, 2008b
106	kadangustin E	R_1=R_2=R_3=R_5=R_6=R_8=R_{10}=CH_3 R_{11}=OAc, R_4=R_7=R_9=H, R_{12}=OBz	*K. angustifolia*	Gao et al, 2008b
107	kadangustin F	R_1=R_2=R_3=R_5=R_6=R_8=R_{10}=CH_3 R_4=R_7=R_9=H, R_{11}=OAc, R_{12}=OAng	*K. angustifolia*	Gao et al, 2008b
108	kadangustin G	R_1=R_2=R_3=R_5=R_6=R_8=R_{10}=CH_3 R_{11}=OAc, R_4=R_7= R_9=H, R_{12}=OTig	*K. angustifolia*	Gao et al, 2008b
109	schisantherin F	R_2=R_3=R_5=R_6=R_8=R_{10}=CH_3 R_{11}=OH, R_1=R_7=R_9=R_{12}=H, R_4=Ang	*K. angustifolia* *K. oblongifolia*	Gao et al, 2008b Huang et al, 2011
110	kadangustin B	R_1+R_2=R_5+R_6=CH_2, R_3=R_4=R_8=R_{10}=CH_3 R_7=R_9=H, R_{11}=OH, R_{12}=OAc	*K. angustifolia*	Gao et al, 2008b
111	schisantherin L	R_1+R_2=R_5+R_6=CH_2, R_7=R_9=H R_3=R_4=R_8=R_{10}=CH_3, R_{11}=OH, R_{12}=OAng	*K. angustifolia* *K. coccinea* *K. induta*	Gao et al, 2008b Ma et al, 2007 Liu and Li, 1993
112	schisantherin M	R_1+R_2=R_5+R_6=CH_2, R_7=R_9=H R_3=R_4=R_8=R_{10}=CH_3, R_{11}=OTig, R_{12}=OAng	*K. coccinea*	Liu and Li, 1993
113	schisantherin N	R_1+R_2=R_5+R_6=CH_2, R_7=R_9=H R_3=R_4=R_8=R_{10}=CH_3, R_{11}=R_{12}=OAng	*K. coccinea*	Liu and Li, 1993
114	gomisin R	R_1+R_2=R_5+R_6=CH_2, R_7=R_9=R_{12}=H R_3=R_4=R_8=R_{10}=CH_3, R_{11}=OH	*K. angustifolia* *K. coccinea*	Gao et al, 2008b Li et al, 2006
115	schisantherin P	R_1+R_2=R_5+R_6=CH_2, R_7=R_9=H R_3=R_4=R_8=R_{10}=CH_3, R_{11}=R_{12}=OH	*K. angustifolia* *K. coccinea* *K. induta*	Gao et al, 2008b Liu and Li, 1995b Ma et al, 2007
116	schisantherin Q	R_1+R_2=R_5+R_6=CH_2, R_3=R_4=R_8=R_{10}=CH_3 R_7=R_9=H, R_{12}=oxo, R_{11}=OH	*K. coccinea* *K. angustifolia*	Liu and Li, 1995b Gao et al, 2008b
117	propinquanin C	R_1+R_2=CH_2, R_4=R_5=R_6=R_8=R_9=CH_3 R_3=R_7=H, R_{10}=OH, R_{11}=OProp, R_{12}=OAng	*K. oblongifolia*	Liu et al, 2009b
118	schisantherin G	R_1+R_2=CH_2, R_{12}=OAng, R_4=R_5=R_6=R_8=R_9=CH_3 R_3=R_7=H, R_{10}=OH, R_{11}=OAc	*K. oblongifolia*	Liu et al, 2009b
119	heteroclitin Q	R_1+R_2=CH_2, R_{12}=OBz R_3=R_5=R_6=R_8=R_9=CH_3 R_4=R_7=H, R_{10}=OH, R_{11}=OAc	*K. oblongifolia* *K. heteroclita*	Liu et al, 2009b Xu et al, 2008a
120	gomisin B	R_1+R_2=CH_2, R_3=R_4=R_5=R_6=R_8=R_9=CH_3 R_7=R_{11}=H, R_{12}=OAng, R_{10}=OH	*K. heteroclite* *K. matsudai*	Han et al, 1992 Wu et al, 2003
121	heteroclitin P	R_1+R_2=CH_2, R_{12}=OAng, R_3=R_5=R_6=R_8=R_9=CH_3 R_{10}=OH, R_4=R_7=H, R_{11}=OBz	*K. heteroclita*	Xu et al, 2008a
122	kadsufolin A	R_1=R_2=R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3, R_{11}=OAng R_7=R_9=R_{12}=H	*K. oblongifolia*	Huang et al, 2011
123	kadsufolin B	R_1=R_2=R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3, R_{11}=OAc R_7=R_9=R_{12}=H	*K. oblongifolia*	Huang et al, 2011
124	kadsutherin A	R_1+R_2=CH_2, R_5+R_6=R_8=R_{10}=CH_3 R_3=R_4=R_7=R_9=R_{12}=H, R_{11}=OAng	*K. sp.s*	Lu and Chen, 2006
125	kadsutherin B	R_1+R_2=CH_2, R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3 R_7=R_9=R_{12}=H, R_{11}=OProp	*K. sp.s*	Lu and Chen, 2006
126	kadsurindutin H	R_1+R_2=R_5+R_6=CH_2, R_3=R_4=R_8=R_{10}=CH_3 R_7=R_9=H, R_{11}=OH, R_{12}=oxo	*K. induta*	Ma et al, 2009
127	kadsuphilin G	R_1+R_2=CH_2, R_3=R_5=R_6=R_8=R_{10}=CH_3 R_{12}=OH, R_4=R_7=R_9=H, R_{11}=OAc	*K. philippinensis*	Shen et al, 2008
128	kadsuphilin H	R_1+R_2=CH_2, R_{11}=OAng, R_3=R_5=R_6=R_8=R_{10}=CH_3 R_7=R_{12}=OH, R_4=R_9=H	*K. philippinensis*	Shen et al, 2008
129	kadsurindutin A	R_1+R_2=R_5+R_6=CH_2,R_{12}=OAng, R_7=H, R_{10}=OH R_3=R_4=R_8=R_9=CH_3, R_{11}=OAc	*K. induta*	Ma et al, 2007

(To be continued)

(Continued Table 1)

No.	Compounds	Structures	Plant sources	References
130	kadsurindutin B	R_1+R_2=R_5+R_6=CH_2, R_3=R_4=R_8=R_9=CH_3 R_7=H, R_{10}=R_{11}=OH, R_{12}=OAng	*K. induta*	Ma et al, 2007
131	schisantherin J	R_1+R_2=CH_2, R_7=H, R_{10}=OH R_3=R_4=R_5=R_6=R_8=R_9=CH_3 R_{11}=Oisobutyloyl, R_{12}=OBz	*K. longipedunculata*	Liu and Pan, 1991
132	renchangianin C	R_1=R_2=R_5=R_6=R_8=R_{10}=CH_3, R_3=R_4=R_7=R_9=H R_{11}=OAng, R_{12}=tran-OCin	*K. renchangiana*	Chen et al, 2004a
133	renchangianin A	R_1=R_2=R_5=R_6=R_8=R_9=CH_3, R_{10}=OH, R_{12}=OBz R_3=R_4=R_7=H, R_{11}=OAc	*K. renchangiana*	Chen et al, 2004a
134	renchangianin B	R_1=R_2=R_5=R_6=R_8=R_9=CH_3, R_{10}=OH, R_{12}=OBz R_3=R_4=R_7=H, R_{11}=OAng	*K. renchangiana*	Chen et al, 2004a
135	renchangianin D	R_2=R_5=R_6=R_8=CH_3, R_9, R_{10}=cyclo, R_{12}=OBz R_1=R_3=R_4=R_7=H, R_{11}=OAng	*K. renchangiana*	Chen et al, 2004a
136	kadsuphilin I	R_2=R_3=R_5=R_6=R_8=R_{10}=CH_3, R_{12}=OBz R_1=R_4=R_7=R_9=H, R_{11}=OAc	*K. philippinensis*	Shen et al, 2008
137	kadsuphilol P	R_1+R_2=CH_2, R_{12}=OBz, R_3=R_5=R_6=R_8=R_{10}=CH_3 R_4=R_7=R_9=H, R_{11}=OAc	*K. philippinensis*	Cheng et al, 2011
138	kadsuphilol Q	R_1=R_2=R_3=R_5=R_6=R_8=R_{10}=CH_3, R_4=R_7=R_9=H R_{11}=OAc, R_{12}=OBz	*K. philippinensis*	Cheng et al, 2011
139	kadsuphilol R	R_1+R_2=CH_2, R_4=R_7=H, R_3=R_5=R_6=R_8=R_{10}=CH_3 R_9=OH, R_{11}=R_{12}=OAng	*K. philippinensis*	Cheng et al, 2011
140	kadsuphilol S	R_1+R_2=CH_2, R_{12}=Oang, R_3=R_5=R_6=R_8=R_{10}=CH_3 R_4=R_7=H, R_9=OH, R_{11}=Prop	*K. philippinensis*	Cheng et al, 2011
141	kadsuphilol T	R_1+R_2=CH_2, R_{12}=OBz, R_3=R_5=R_6=R_8=R_{10}=CH_3 R_4=R_7=H, R_9=OH, R_{11}= OAng	*K. philippinensis*	Cheng et al, 2011
142	(+)-gomisin K_3	R_1=R_2=R_4=R_5=R_6=R_8=R_{10}=CH_3, R_4=R_7=R_9=OH	*K. matsudai*	Wu et al, 2003
143	kadsuphilol C	R_1+R_2=CH_2, R_3=R_5=R_6=R_8=CH_3 R_9, R_{10}-cyclo, R_4=R_7=H, R_{11}=R_{12}=OAng	*K. philippinensis*	Shen et al, 2007a
144	interiotherin B	R_1+R_2=R_5+R_6=CH_2, R_{10}=OH R_3=R_4=R_8=R_9=CH_3, R_7=R_{11}=H, R_{12}=OAng	*K. interior* *K. angustifolia*	Chen et al, 1996 Sun et al, 2011
145	kadoblongifolin A	R_1+R_2=CH_2, R_3=R_5=R_6=R_8=R_9=CH_3 R_7=OH, R_{11}=oxo, R_4=R_{10}=R_{12}=H	*K. oblongifolia*	Liu et al, 2009b
146	kadoblongifolin B	R_1+R_2=CH_2, R_3=R_4=R_5=R_8=R_9=CH_3 R_7=OH, R_{11}=oxo, R_6=R_{10}=R_{12}=H	*K. oblongifolia*	Liu et al, 2009b
147	interiotherin A	R_1+R_2=R_5+R_6=CH_2, R_3=R_4=R_8=R_{10}=CH_3 R_7=R_9=R_{11}=H, R_{12}=OBz	*K. interior*	Chen et al, 1996
148	schisantherin D	R_1+R_2=R_5+R_6=CH_2, R_{10}=OH R_3=R_4=R_8=R_9=CH_3, R_7=R_{11}=H, R_{12}=OBz	*K. interior* *K. angustifolia*	Chen et al, 1996 Sun et al, 2011
149	schisantherin B	R_1=R_2=R_3=R_4=R_8=R_9=CH_3, R_{12}=OAng R_5+R_6=CH_2, R_{10}=OH, R_7=R_{11}=H	*K. angustifolia*	Sun et al, 2011
150	angeloylgomisin R	R_1+R_2=R_5+R_6=CH_2, R_7=R_9=R_{11}=H R_3=R_4=R_8=R_{10}=CH_3, R_{12}=OAng	*K. interior* *K. longipedunculata*	Chen et al, 1996 Pu et al, 2005
151	angustifolin A	R_1+R_2=R_5+R_6=CH_2, R_3=R_4=R_8=R_{10}=CH_3 R_7=R_9=H, R_{11}=R_{12}=OBen	*K. angustifolia*	Chen et al, 1998
152	angustifolin B	R_1+R_2=R_5+R_6=CH_2, R_3=R_4=R_8=R_{10}=CH_3 R_7=R_9=H, R_{12}= OBen, R_{11}=OAc	*K. angustifolia*	Chen et al, 1998
153	angustifolin C	R_1+R_2= R_5+R_6=CH_2, R_3=R_4=R_8=R_{10}=CH_3 R_7=R_9=H, R_{12}=OBen, R_{11}=OH	*K. angustifolia*	Chen et al, 1998
154	acetylschisantherin L	R_1+R_2=R_5+R_6=CH_2, R_3=R_4=R_8=R_{10}=CH_3 R_7=R_9=H, R_{12}=OAng, R_{11}=OAc	*K. angustifolia* *K. coccinea*	Chen et al, 1998 Liu and Li, 1995b
155	gomisin G	R_1=R_2=R_3=R_4=R_8=R_9=CH_3 R_5+R_6=CH_2, R_{10}=OH, R_7=R_{11}=H, R_{12}=OBz	*K. interior* *K. matsudai*	Chen et al, 1997 Wu et al, 2003
156	(±)-kadsutherin	R_1=R_2=R_4=R_5=R_6=R_7=R_9=CH_3 R_3=Ang, R_{10}=OH, R_8=R_{11}=R_{12}=H	*K. coccinea*	Li et al, 1985

(To be continued)

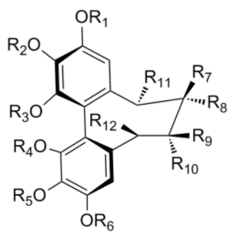
(Continued Table 1)

No.	Compounds	Structures	Plant sources	References
157	(±)-gomisin M_1	$R_1=R_2=R_4=R_8=R_{10}=CH_3$, $R_5+R_6=CH_2$ $R_3=R_7=R_9=R_{11}=R_{12}=H$	*K. longipedunculata* *K. heteroclita*	Tan et al, 1984 Han et al, 1992
158	angeloylgomisin M_1	$R_5+R_6=CH_2$, $R_1=R_2=R_4=R_8=R_{10}=CH_3$ R_3=Ang, R_9=OH, $R_7=R_{11}=R_{12}=H$	*K. longipedunculata*	Tan et al, 1984
159	(+)gomisin M_2	$R_1=R_2=R_3=R_8=R_{10}=CH_3$, $R_5+R_6=CH_2$ $R_4=R_7=R_9=R_{11}=R_{12}=H$	*K. longipedunculata*	Tan et al, 1984
160	kadsuranin	$R_1=R_2=R_3=R_4=R_8=R_{10}=CH_3$ $R_5+R_6=CH_2$, $R_7=R_9=R_{11}=R_{12}=H$	*K. longipedunculata* *K. interior*	Tan et al, 1984 Chen et al, 1997
161	schisantherin O	$R_4=R_7=R_9=R_{12}=H$, $R_1+R_2=CH_2$ $R_3=R_5=R_6=R_8=R_{10}=CH_3$, R_{11}=OAc	*K. coccinea*	Liu and Li, 1993
162	gomisin A (schisandrol B)	$R_1+R_2=CH_2$, $R_7=R_{11}=R_{12}=H$, R_9=OH, $R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3$	*K. interior* *K. heteroclita*	Chen et al, 1997 Han et al, 1992
163	schisandrin	$R_1=R_2=R_3=R_4=R_5=R_6=R_8=R_9=CH_3$ $R_7=R_{11}=R_{12}=H$, R_{10}=OH	*K. angustifolia*	Sun et al, 2011
164	gomisin H	$R_1=R_2=R_4=R_5=R_6=R_8=R_{10}=CH_3$ $R_3=R_7=R_9=R_{11}=R_{12}=H$	*K. coccinea*	Li et al, 1985
165	angeloylgomisin H	$R_1=R_2=R_4=R_5=R_6=R_8=R_{10}=CH_3$ $R_7=R_9=R_{11}=R_{12}=H$, R_3=Ang	*K. heteroclita* *K. longipedunculata*	Han et al, 1992 Li and Chen, 1986
166	schisanlignone A	$R_1=R_2=R_3=R_4=R_5=R_6=R_7=R_9=CH_3$ $R_8=R_{10}=R_{12}=H$, R_{11}=oxo	*K. sp.s*	Liu and Zhou, 1991
167	schisanlignone B	$R_2=R_3=R_4=R_5=R_6=R_7=R_9=CH_3$ $R_1=R_8=R_{10}=R_{12}=H$, R_{11}=oxo	*K. sp.s*	Liu and Zhou, 1991
168	longipedunin C	$R_1+R_2=CH_2$, $R_3=R_5=R_6=R_8=R_{10}=CH_3$ $R_4=R_7=R_9=R_{12}=H$, R_{11}=OBz	*K. longipedunculata*	Sun et al, 2006b
169	kadoblongifolin C	$R_1+R_2=CH_2$, $R_3=R_4=R_5=R_6=R_8=R_9=CH_3$ R_7=OH, R_{11}=oxo, $R_{10}=R_{12}=H$	*K. oblongifolia*	Liu et al, 2009b
170	schizandrin	$R_1=R_2=R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3$ $R_7=R_{11}=R_{12}=H$, R_9=OH	*K. interior* *K. heteroclita*	Chen et al, 1997 Han et al, 1992
171	ananolignan A	$R_1+R_2=CH_2$, $R_7=R_9=R_{12}=H$ R_{11}=OAc, $R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3$	*K. ananosma* *K. polysperma*	Yang et al, 2011b Dong et al, 2012b
172	ananolignan B	$R_1+R_2=CH_2$, R_{11}=βOAc, $R_7=R_9=H$, R_{12}=oxo $R_3=R_4=R_5=R_6=R_7=R_{10}=CH_3$	*K. ananosma*	Yang et al, 2011b
173	polysperlignan K	$R_1+R_2=CH_2$, $R_7=R_9=R_{12}=H$, R_{11}=βOH $R_3=R_5=R_6=R_8=R_{10}=CH_3$, R_4=Ac	*K. polysperma*	Dong et al, 2012b
174	kadsuphilol A	$R_1+R_2=CH_2$, $R_3=R_5=R_6=R_8=R_{10}=CH_3$ R_{11}=βOH, $R_4=R_7=R_9=R_{12}=H$	*K. philippinensis*	Shen et al, 2007a
175	kadsuphilol D	$R_1=R_3=R_5=R_6=R_8=R_{10}=CH_3$ R_{11}=βOCin, $R_2=R_4=R_7=R_9=R_{12}=H$	*K. philippinensis*	Shen et al, 2007a
176	kadsufolin C	$R_1+R_2=CH_2$, $R_3=R_4=R_5=R_8=R_{10}=CH_3$ R_{12}=t-OCin, $R_6=R_7=R_9=R_{11}=H$	*K. oblongifolia*	Huang et al, 2011
177	kadsufolin D	$R_1+R_2=CH_2$, $R_3=R_4=R_5=R_8=R_{10}=CH_3$ R_{12}= OBz, $R_6=R_7=R_9=R_{11}=H$	*K. oblongifolia*	Huang et al, 2011
178	(+)-deoxyschizandrin	$R_1=R_2=R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3$ $R_7=R_9=R_{11}=R_{12}=H$	*K. interior* *K. coccinea*	Chen et al, 1997 Wang et al, 2012b
179	schizanrin M	$R_1+R_2=CH_2$, $R_6=R_7=R_9=R_{11}=H$ R_{12}=oxo,$R_3=R_4=R_5=R_8=R_{10}=CH_3$	*K. japonica*	Kuo et al, 2005
180	schizanrin N	$R_1=R_2=R_3=R_8=R_{10}=CH_3$, R_{12}=oxo $R_4=R_7=R_9=R_{11}=H$, $R_5+R_6=CH_3$	*K. japonica*	Kuo et al, 2005
181	kadsumarin A	$R_1=R_2=R_3=R_8=R_9=CH_3$,R_{12}=OAc $R_5+R_6=CH_2$, $R_4=R_7=R_{10}=R_{11}=H$	*K. matsudai*	Kuo et al, 1999
182	ananolignan C	$R_1+R_2=CH_2$, R_{11}=OH, R_{12}=OH $R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3$, $R_7=R_9=H$	*K. ananosma*	Yang et al, 2011b
183	ananolignan D	$R_1+R_2=CH_2$, R_{11}=OAc, R_{12}=OH $R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3$, $R_7=R_9=H$	*K. ananosma*	Yang et al, 2011b

(To be continued)

(Continued Table 1)

No.	Compounds	Structures	Plant sources	References
184	ananolignan C	$R_1+R_2=CH_2$, $R_{11}=OH$, $R_{12}=OH$	*K. ananosma*	Yang et al, 2011b
		$R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3$, $R_7=R_9=H$		
185	ananolignan D	$R_1+R_2=CH_2$, $R_{11}=OAc$, $R_{12}=OH$	*K. ananosma*	Yang et al, 2011b
		$R_3=R_4=R_5=R_6=R_8=R_{10}=CH_3$, $R_7=R_9=H$		
186	gomicin D		*K. japonica*	Chen et al, 1977
187	kadsuphilin N	9-αCH_3	*K. philippinensis*	Lin et al, 2013
188	kadsulignan A	R=H	*K. coccinea*	Liu et al, 1989
189	kadsulignan B	R=OAc	*K. coccinea*	Liu et al, 1989
190	kadsulignan L	$R_1+R_2=CH_2$, $R_3=R_4=CH_3$	*K. coccinea*	Liu and Li, 1995a
			K. angustifolia	Gao et al, 2008b
			K. oblongifolia	Huang et al, 2011
191	kadsulignan M	$R_1+R_2=CH_2$, $R_3=CH_3$, $R_4=H$	*K. coccinea*	Liu and Li, 1995a
192	epoxideschisandrin C	$R_1+R_2=R_4+R_3=CH_2$	*K. angustifolia*	Gao et al, 2008b
193	kadsulignan N	$R_1=R_2=R_3=R_4=CH_3$	*K. coccinea*	Shinomiya et al, 2009
			K. matsudai	Li et al, 2000
194	neokadsuranin	$R_3+R_4=CH_2$	*K. coccinea*	Shinomiya et al, 2009
		$R_1=R_2=CH_3$	*K. interior*	Chen et al, 2002a
195	kadsuphilin O		*K. philippinensis*	Lin et al, 2013
196	kadsulignan K		*K. philippinensis*	Shen et al, 2006
	(heteroclitin G)		*K. sp.s*	Liu et al, 1992
			K. angustifolia	Gao et al, 2008b
			K. heteroclita	Yang et al, 1992
197	kadsuralignan D		*K. coccinea*	Li et al, 2006
198	kadsuphilin L	R=βOH	*K. philippinensis*	Shen et al, 2008
199	kadsuphilin M	R=αOH	*K. philippinensis*	Shen et al, 2008



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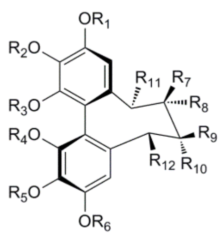

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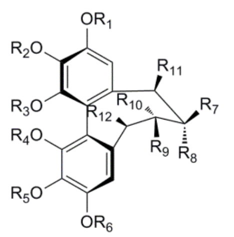

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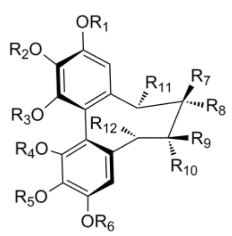

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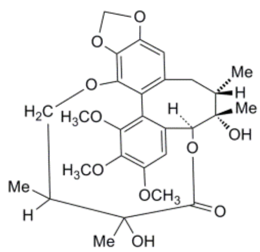

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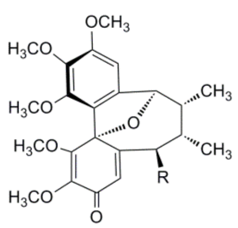

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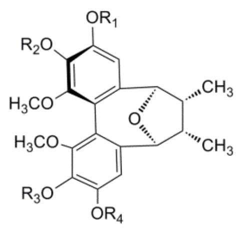

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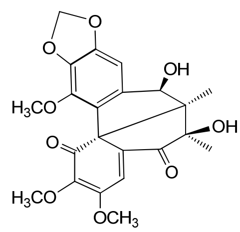

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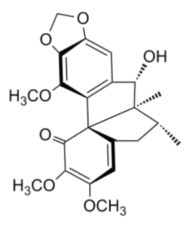

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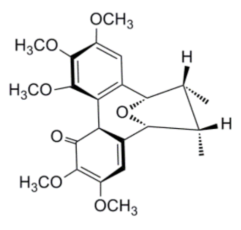

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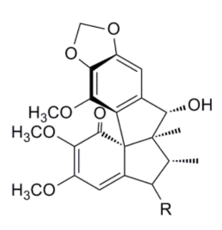

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Figure 2 Structures of lignans (A) isolated from genus *Kadsura* Kaempf. ex Juss.

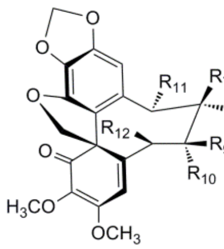
Table 2 Spirobenzofuranoid dibenzocyclooctadienes (B) isolated from genus *Kadsura* Kaempf. ex Juss.

No.	Compounds	Structures	Plant sources	References
200	heteroclitin D	R_1=R_4=R_6=H, R_2=OAng, R_3=R_5=CH_3	*K. heteroclita*	Chen et al, 1992
			K. interior	Chen et al, 2002a
201	heteroclitin E	R_1=OH, R_4=R_6=H, R_2=OAng, R_3=R_5=CH_3	*K. heteroclita*	Chen et al, 1992
202	isovaleroyloxokadsurane	R_1=R_4=R_6=H, R_2=OIsovaleroyl, R_3=R_5=CH_3	*K. longipedunculata*	Li et al, 1991
			K. coccinea	Li and Xue, 1990
203	acetoxyloxokadsurane	R_1=R_3=R_5=H, R_2=OAc, R_4=R_6=CH_3	*K. coccinea*	Li and Xue, 1990
			K. heteroclita	Pu et al, 2008b
204	isovaleroyloxokadsuranol	R_1=OH, R_2=OIsovaleroyl, R_3=R_5=CH_3, R_4=R_6=H	*K. coccinea*	Li and Xue, 1990
205	benzoyloxokadsurane	R_1=R_4=R_6=H, R_2=OBz, R_3=R_5=CH_3	*K. coccinea*	Li and Xue, 1990
			K. heteroclita	Pu et al, 2008b
206	propoxyloxokadsurane	R_1=R_4=R_6=H, R_2=OProp, R_3=R_5=CH_3	*K. coccinea*	Li and Xue, 1990
207	kadsulignan H	R_1=R_3=R_6=H, R_2=αOButanoyl, R_4=R_5=CH_3	*K. sp.s*	Liu et al, 1992
208	kadsulignan I	R_1=R_3=R_6=H, R_2=αOProp, R_4=R_5=CH_3	*K. sp.s*	Liu et al, 1992
209	kadsulignan J	R_1=R_3=R_6=H, R_2=αOIsovalcroyl, R_4=R_5=CH_3	*K. sp.s*	Liu et al, 1992
210	heteroclitin K	R_1=OBz=OBz, R_3=R_5=CH_3, R_4=R_6=H	*K. heteroclita*	Xu et al, 2007
211	heteroclitin I	R_1=OBz, R_2=OAng, R_3=R_5=CH_3, R_4=R_6=H	*K. heteroclita*	Xu et al, 2007
212	kadsulignan P	R_1=OAc, R_2=OCin, R_3=OH, R_4=R_5=CH_3, R_6=H	*K. oblongifolia*	Liu et al, 2011
213	kadsulignan C	R_1=OAc, R_2=OBz, R_3=OH, R_4=R_5=CH_3, R_6=H	*K. oblongifolia*	Liu et al, 2011
			K. longipedunculata	Liu et al, 1991
214	kadsulignan G	R_1=OBz, R_2=OAc, R_3=OH, R_4=R_5=CH_3, R_6=H	*K. oblongifolia*	Liu et al, 2011
			K. longipedunculata	Liu and Huang, 1992
215	kadsulignan D	R_1= R_2=OAng, R_3=OH, R_4=R_5=CH_3, R_6=H	*K. longipedunculata*	Liu et al, 1991
216	heteroclitin L	R_1=OAng, R_2=OBz, R_4=R_5=H, R_3=R_6=CH_3	*K. heteroclita*	Xu et al, 2007
217	kadsutherin C	R_1=O, R_2=OProp, R_3=R_5=CH_3, R_4=R_6=H	*K. sp.s*	Lu and Chen, 2006
218	kadsuphilol M	R_1=OAng, R_2=OAc, R_3=OH, R_4=R_5=CH_3, R_6=H	*K. philippinensis*	Shen et al, 2009
219	kadsuphilol E	R_1=OBz, R_2=OAng, R_3=OH, R_4=R_5=CH_3, R_6=H	*K. philippinensis*	Shen et al, 2007a
220	kadsuphilol F	R_1=OAng, R_2=OBz, R_3=OH, R_4=R_5=CH_3, R_6=H	*K. philippinensis*	Shen et al, 2007a
221	heteroclitin H	R_1=H, R_2=OTig, R_3=R_5=CH_3, R_4=R_6=H	*K. heteroclita*	Chen et al, 2006
222	heteroclitin O	R_1=OBz, R_2=OAng, R_3, R_4=cyclo,R_5=CH_3, R_6=H	*K. heteroclita*	Xu et al, 2008a
223	kadsutherin D	R_2=OAng, R_3=R_5=CH_3, R_1=R_4=R_6=H	*K. sp.s*	Lu and Chen, 2008
224	schiarisanrin A	R_1=H, R_2=OIsoval, R_4=R_6=CH_3, R_3=R_5=H	*K. matsudai*	Kuo et al, 2001b
225	schiarisanrin B	R_1=H, R_2=OAc, R_4=R_6=CH_3, R_3=R_5=H	*K. matsudai*	Kuo et al, 2001b
226	schiarisanrin C	R_1=H, R_2=OBz, R_4=R_6=CH_3, R_3=R_5=H	*K. matsudai*	Kuo et al, 2001b
227	schiarisanrin D	R_1=H, R_2=OCin, R_4=R_6=CH_3, R_3=R_5=H	*K. matsudai*	Kuo et al, 2001b
228	schiarisanrin E	R_1=R_3=R_5=H, R_2=OAng, R_4=R_6=CH_3	*K. matsudai*	Wu et al, 2003
229	kadsuphilol U	R_1=OAc, R_2=OCin, R_3=OH, R_4=R_5=CH_3, R_6=H	*K. philippinensis*	Cheng et al, 2011
230	interiorin B	R_1=R_4=H, R_2=OAng, R_3=CH_3	*K. interior*	Ding and Luo, 1990
			K. heteroclita	Pu et al, 2008b
231	interiorin	R_1=R_4=H, R_2=OAng, R_3=CH_3	*K. interior*	Shide et al, 1988
			K. heteroclita	Pu et al, 2008b
232	interiorin C	R_1=R_4=H, R_2=OAc, R_3=CH_3	*K. interior*	Ding and Luo, 1990
233	interiorin D	R_1=R_4=H, R_2=OBz, R_3=CH_3	*K. interior*	Ding and Luo, 1990
234	isointeriorin	R_1=R_4=H, R_2= OAng, R_3=CH_3	*K. interior*	Ding and Luo, 1990
235	heteroclitalignan C	R_1=OAng, R_2=OProp, R_3=OH, R_4=CH_3	*K. heteroclita*	Wang et al, 2006b
236	kadsulignan E	R_1=OAc, R_2=OBz, R_3=OH, R_4=CH_3	*K. heteroclite*	Wang et al, 2006b
			K. coccinea	Li et al, 2007
			K. longipeduncunlta	Liu and Huang, 1992
			K. oblongifolia	Liu et al, 2011
237	kadsulignan F	R_1=OAng, R_2=OAc, R_3=OH, R_4=CH_3	*K. longipeduncunlta*	Liu and Huang, 1992
			K. oblongifolia	Li et al, 2007
			K. coccinea	Liu et al, 2011
238	kadsulignan O	R_1=OAc, R_2=OCin, R_3=OH, R_4=CH_3	*K. oblongifolia*	Liu et al, 2011
239	heteroclitin J	R_1=R_2=OAng, R_3=OH, R_4=CH_3	*K. oblongifolia*	Liu et al, 2011
240	kadsuphilol V	R_1=OAc, R_2=OCin, R_3=OH, R_4=CH_3	*K. philippinensis*	Cheng et al, 2011

(To be continued)

(Continued Table 2)

No.	Compounds	Structures	Plant sources	References
241	interiotherin D		*K. interior*	Chen et al, 2002a
242	kadsuphilol G		*K. philippinensis*	Shen et al, 2007a
243	kadsuphilol H		*K. philippinensis*	Shen et al, 2007a
244	heteroclitin F	R=OAng	*K. heteroclita*	Yang et al, 1992
	(heterolitin F)		*K. interior*	Chen et al, 1997
245	taiwanschirin C	R=OBz	*K. matsudai*	Li et al, 2000
246	taiwanschirin D	R=OCap	*K. matsudai*	Li et al, 2000
247	taiwankadsurin A	1-OH, R_1=Ac, R_2=Bz, R_3=OAc, R_4=H	*K. philippinensis*	Shen et al, 2005b
248	taiwankadsurin B	1-OH, R_1=Bz, R_2=Ac, R_3=OAc, R_4=H	*K. philippinensis*	Shen et al, 2005b
249	taiwankadsurin C	R_1=Ac, R_2=Bz, R_3=H, R_4=OAc	*K. philippinensis*	Shen et al, 2005b
250	taiwankadsurin D	R_1=Ang, R_2=Ac, R_3=αOH, R_4=OCH_3	*K. philippinensis*	Lin et al, 2013
251	taiwankadsurin E	R_1=Ang, R_2=Ac, R_3=βOH, R_4=OCH_3	*K. philippinensis*	Lin et al, 2013
252	heteroclitin N	R_1=R_2=Ang, R_4=Ac, R_3=OH	*K. heteroclita*	Xu et al, 2008a
253	heteroclitin I		*K. heteroclita*	Pu et al, 2008b
254	heteroclitin J		*K. heteroclita*	Pu et al, 2008b



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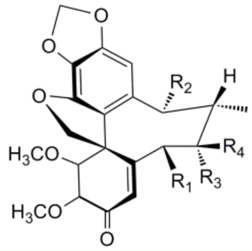

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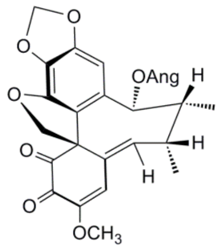

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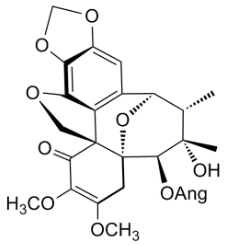

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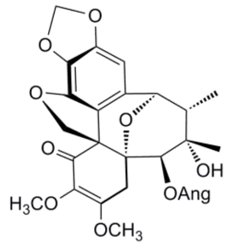

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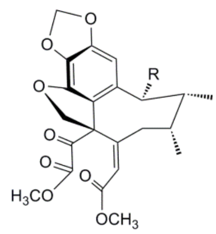

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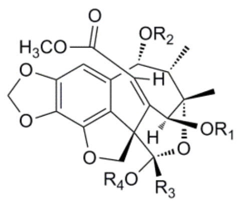

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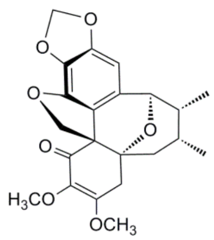

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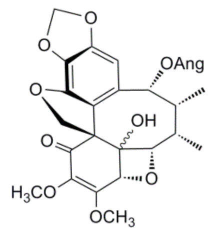

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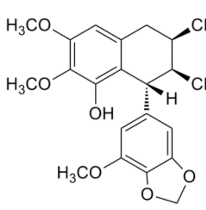
Figure 3 Structures of lignans (B) isolated from genus *Kadsura* Kaempf. ex Juss.

Table 3 Aryltetralins (C) isolated from genus *Kadsura* Kaempf. ex Juss.

No.	Compounds	Structures	Plant sources	References
255	kadsuralignan H		*K. coccinea*	Li et al, 2007
256	kadsurindutin C	R_1+R_2=R_5+R_6= CH_2, R_3=R_4=OCH_3	*K. induta*	Ma et al, 2009
257	kadsuralignan C	R_1=R_4=R_6=OCH_2, R_2=R_5=OH	*K. coccinea*	Li et al, 2006
258	otobaphenol	R_1=R_5=R_6=OCH_2, R_3=OH, R_4=H	*K. longipedunculata*	Pu et al, 2008a
259	arisantetralone A	R_1=R_4=H, R_2=R_3=R_5=CH_3	*K. longipedunculata*	Zaugg et al, 2011
260	arisantetralone B	R_1=R_3=R_5=CH_3, R_2=R_4=R_6	*K. longipedunculata*	Zaugg et al, 2011
261	arisantetralone C	R_1=R_6=H, R_2=R_3=R_4=R_5=CH_3	*K. longipedunculata*	Zaugg et al, 2011
262	arisantetralone D	R_1=R_5=H, R_2=R_3=R_4=R_6=CH_3	*K. longipedunculata*	Zaugg et al, 2011



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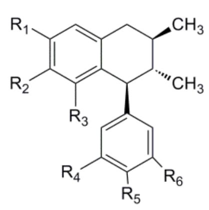

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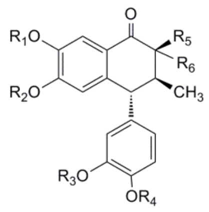
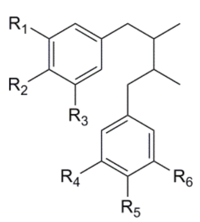


259−262

Figure 4 Structures of lignans (C) isolated from genus *Kadsura* Kaempf. ex Juss.

Table 4 Diarylbutanes (D) isolated from genus *Kadsura* Kaempf. ex Juss.

No.	Compounds	Structures	Plant sources	References
263	(+)-anwulignan	R_1+R_2=OCH_2O, R_3=R_4=H, R_5=OH	*K. longipedunculata*	Zaugg et al, 2011
		R_6=OCH_3	*K. heteroclita*	Liu et al, 1988
264	dihydroguaiaretic acid	R_1=R_5=OH, R_2=R_4=OCH_3, R_3=R_6=H	*K. longipedunculata*	Zaugg et al, 2011
265	monomethyl dihydroguaiaretic acid	R_1=OH, R_2=R_4=R_5=OCH_3, R_3=R_6=H	*K. longipedunculata*	Zaugg et al, 2011
266	saururenin	R_1+R_2=OCH_2O, R_3=R_6=H, R_4=R_5=OCH_3	*K. longipedunculata*	Zaugg et al, 2011
267	mesodihydroguaiaretic acid	R_1=R_6=OCH_3, R_3=R_4=H, R_2=R_5=OH	*K. longipedunculata*	Liu et al, 1988
			K. angustifolia	Chen et al, 1998
			K. heteroclita	Lu et al, 2008
			K. coccinea	
268	lengfantuanjing I	R_1=R_4=H, R_2=OH, R_3=OCH_3, R_5+R_6=OCH_2O	*K. coccinea*	Liu et al, 1989
269	isoanwulignan	R_1+R_2=OCH_2O, R_3=R_6=H, R_4=OCH_3, R_5=OH	*K. longipedunculata*	Pu et al, 2008a
270	4-[4-(3,4-dimethoxyphenyl)-2,3-dimethyl-butyl]-2-methoxy-phenol	R_1=R_2=R_4= OCH_3, R_3=R_6=H, R_5=OH	*K. longipedunculata*	Pu et al, 2008a
271	3-methoxy-3′,4′-(methylenedioxy)-9,9′-epoxylignan-4,7′-diol		*K. longipedunculata*	Pu et al, 2007b
272	kadcoccilignan		*K. coccinea*	Gao et al, 2012
273	kadangustin J	R=OCH_3	*K. angustifolia*	Gao et al, 2008b
274	kadangustin K	R=OH	*K. angustifolia*	Gao et al, 2008b
275	heteroclitin R	R_1=R_2=R_7=R_8=OCH_3, R_3=R_4=R_5=OH, R_6=H	*K. heteroclita*	Xu et al, 2010b
276	kadangustin H	R_1=R_2=R_6=R_7=OCH_3, R_3=H, R_4=R_5=R_8=OH	*K. angustifolia*	Gao et al, 2008b
277	kadangustin I	R_1+R_2=OCH_2O, R_3=R_6=R_7=OCH_3	*K. angustifolia*	Gao et al, 2008b
		R_4=R_5=R_8=OH		
278	meso-dihyroguaiaretic acid	R_1=R_6=OCH_3, R_2=R_3=OH, R_4=R_5=R_7=R_8=H	*K. angustifolia*	Gao et al, 2008b
279	kadsuphilin J		*K. philippinensis*	Shen et al, 2008



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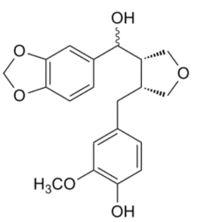

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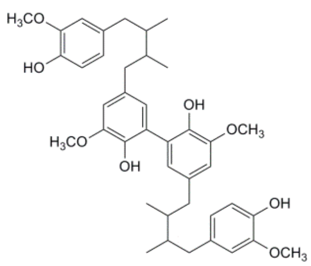

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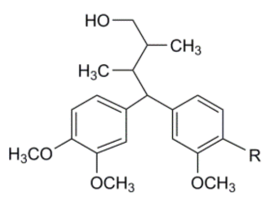

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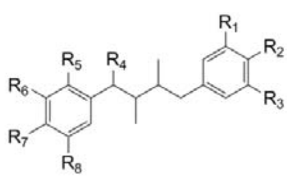

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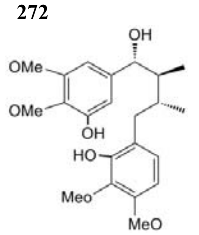

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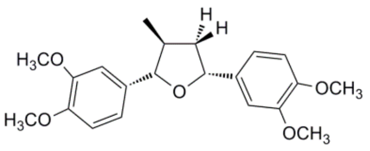
Figure 5 Structures of lignans (D) isolated from genus *Kadsura* Kaempf. ex Juss.



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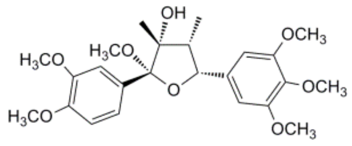

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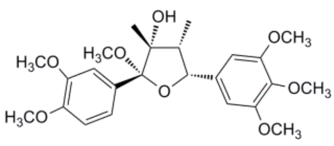

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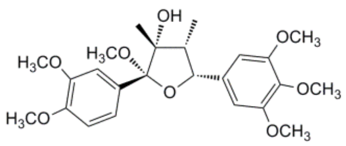

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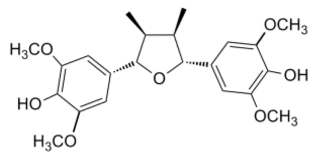

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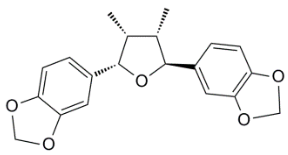

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Figure 6 Structures of lignans (E) isolated from genus *Kadsura* Kaempf. ex Juss.

2.2.1 Lanostane-type triterpenoids

1) Intact lanostanes (F) This category contained 16 compounds featured by a hydroxyl group or ketone at C-3. Among them, only four members belonged to the C-3 hydroxyl substitution series, including epianwuweizic acid (**1**) isolated from the fruits of *K. longipedunculata* and the stems of *K. angustifolia*, anwuweizic acid (**2**) isolated from *K. angustifolia*, isoanwuweizic acid (**4**) isolated from the roots of *K. heteroclita*, and 3-hydroxy-12-acetoxycoccinic acid (**15**) isolated from *K. coccinea*. Ten other members had a ketone at C-3, namely coccinic acid (**3**) from *K. coccinea*, (24*Z*)-3-oxo-12α-acetoxylanosta-8,24-dien-26-oic acid (**5**) and (24*Z*)-3-oxo-12α-hydroxylanosta-8,24-dien-26-oic acid (**6**) isolated from *K. longipedunculata*, and 12β-acetoxycoccinic acid (**7**), 12β-hydroxycoccinic acid (**8**), 12α-acetoxycoccinic acid (**9**), 12α-hydroxycoccinic acid (**10**), and schisanhenric acid (**11**) isolated from *K. heteroclita,* kadnanosic acid B (**14**) isolated from *K. ananosma*, and kadindutic acid (**16**) isolated from *K. induta*. In addition, kadpolysperins D (**12**) and N (**13**) isolated from *K. polysperma* had an acetoxy at C-3. (Table 5, Figure 7)

2) 3,4-Seco-lanostanes (G) There were nineteen 3,4-seco- lanostane type triterpenoids isolated from the plants of genus *Kadsura* Kaempf. ex Juss. including manwuweizic acid (**17**), kadsuric acid (**18**), kadpolysperins H (**19**), B (**20**), J (**24**), K (**25**), kadsuracoccinic acid A (**21**), C (**22**), B (**27**), seco-coccinic acid F (**23**), K (**28**), J (**32**), 3,4-seco-(24*Z*)-lanosta-4(30),8,24,triene-3,26-dioic acid (**26**), schisanlactone F (**30**), coccinilactone A (**31**), seco-coccinic acid G (**29**), kadnanosic acid A (**33**), kadnanolactones D (**34**) and R (**35**), and they were isolated from *K. coccinea*, *K. ananosma*, and *K. polysperma*, respectively. Moreover, manwuweizic acid (**17**) and kadsuric acid (**18**) were also isolated from *K. renchangiana*. (Table 6, Figure 7)

3) 18(13→12)-Abeo-lanostanes (H) The first 18(13→12)-abeo-lanostane, ananosic acid A (**40**), was isolated from the stem barks of *K. ananosma*. Further phytochemical studies on the same plants led to the discovery of ananosic acids B−D (**43−45**). Kadpolysperins C (**36**), L (**37**), M (**38**), E (**41**), F (**42**), G (**46**), I (**47**), 20(*R*),24(*E*)-3-oxo-9β-lanosta-7,24-dien-26-oic acid (**39**), seco-coccinic acids A−F (**48−53**), and I (**54**) were isolated and identified from *K. polysperma* and *K. coccinea*, respectively. (Table 7, Figure 8)

4) 14(13→12)-abeo-Lanostanes (I) Neokadsuranic acid A (**55**), the first compound with 14(13→12)-abeo-lanostane skeleton, was isolated from the stem of *K. heteroclita*. From the same plants, seco-neokadsuranic acid A (**60**) was obtained. Following the discovery of compounds **55** and **60**, other four compounds were isolated from other species, including neo- kadsuranic acids B−C (**57−58**) (from *K. longipedunculata*), 3-hydroxy-neokadsuranic acid A (**56**) from *K. coccinea*, and kadpolysperin A (**59**) from *K. polysperma*. (Table 8, Figure 9)

5) Norlanostanes (J) Only two norlanostanes were obtained from *Kadsura* plants, namely micranoic acid A (**61**) and seco-coccinic acid H (**62**) isolated from *K. coccinea* (Li et al, 2008; Shinomiya et al, 2009; Wang et al, 2012c). This sub-type featured an unusual octanor-triterpenoid backbone degraded by the oxidative fission of the C-17−C-20 bond. (Figure 9)

2.2.2 Cycloartane-type triterpenoids

1) Intact cycloartanes (K) This category of cycloartane-type triterpenoids featured a hydroxyl group or a ketone at C-3. There was only one C-3 hydroxyl-substituted member. Isoschizandrolic acid (**63**) was isolated from an unidentified species of genus *Kadsura* Kaempf. ex Juss. Three C-3 ketone compounds, namely heteroclic acid (**64**), cycloartenone (**65**), and schisandronic acid (**66**) were isolated from the stems of *K. heteroclita*. Another one, namely kadsulactone (**67**), was isolated from *K. longipedunculata*. (Table 9, Figure 9)

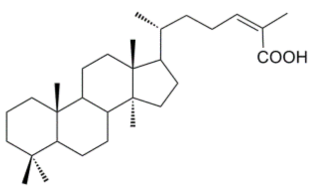
2) 3,4-Seco-cycloartanes (L) 3,4-Seco-cycloartanes were abundant in the plants of genus *Kadsura* Kaempf. ex Juss., and 38 triterpenoids belonged to this group. Phytochemical studies on the roots and stems of *K. heteroclita* collected from different places resulted in the isolation of kadsuranic acid A (**68**), changnanic acid (**69**), nigranoic acid (**70**), heteroclitalactones A−C (**73−75**), D (**91**), and E (**92**), F (**76**), G−M (**96−102**), schisanlactone E (**77**), 3,4-secolanosta-4(28),24-dien-26-oic acid 22,26-lactone (**78**), 3,4-secolanosta-4,24-dien-26-oic acid 22,26-lactone (**79**), 3,4-secolanosta-4(28),6,24-trien-26-oic acid 22,26-lactone (**80**), and schisanlactone B (**86**). Other 3,4-seco-cycloartanes triterpenoids were isolated and identified from other species, such as nigranoic acid (**70**), angustific acid B (**71**), angustifodilactones A (**104**) and B (**105**) from *K. angustifolia*, changnanic acid (**69**), schisanlactone E (**77**), kadsulactone acid (**82**), kadsudilactone (**84**), schisanlactone A (**93**) from *K. longipedunculata*, kadnanolactones B (**72**), C (**85**) from *K. ananosma*, lancilactones A (**94**), B (**95**), C (**82**), kadsulactone A (**87**) from *K. lancilimba*, polysperlactones A (**103**), B (**83**), schisanlactone E (**77**) from *K.polysperma*, kadsuphilactone B (**88**) from *K. philippinensis*, kadsulactone A (**87**), renchang-lactone A (**89**) from *K.renchangiana*, and kadsudilactone (**84**), kadsuphilactone B (**88**), and kadcoccilactone Q (**90**) from *K. coccinea*. (Table 10, Figure 10)

3) 14(13→12)-Abeo-cycloartanes (M) From the leaves and stems of *K. longipedunculata*, longipedlactones A−C, E−F, H, L, M, J (**106−114**), longipedlactones D, G, I, N (**115−118**), K (**119**), O (**120**), and P (**121**) were isolated, which showed an unprecedented rearranged pentacyclic system. Some of them were also isolated from other species, such as *K. ananosma*, *K. coccinea*, and *K. heteroclita*. Moreover, kadcoccilactones A (**123**), B (**124**), and P (**122**) were also isolated from *K. coccinea* and *K. heteroclita*, respectively. (Table 11, Figure 11)

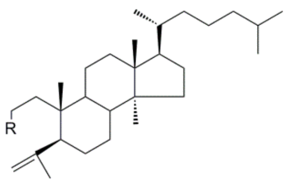
4) Norcycloartane (N) There was only one norcycloartane triterpenoid isolatd from the plants of genus *Kadsura* Kaempf. ex Juss. Micranoic acid B (**125**), an octanor-triterpenoid due to the loss of the entire C-17 side chain, was isolated from *K. angustifolia* (Sun et al, 2011). (Figure 12)

Table 5 Intact lanostanes (F) isolated from genus *Kadsura* Kaempf. ex Juss.

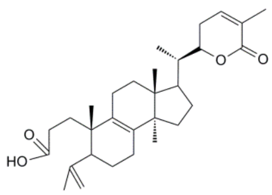
No.	Compounds	Structures	Plant sources	References
1	epianwuweizic acid	3-βOH;24(Z) -$\Delta^{8(9)}$	*K. longipedunculata* *K. angustifolia*	Liu et al, 1991; Chen et al, 2002b
2	anwuweizic acid	3-αOH,24(Z) –$\Delta^{8(9)}$	*K. angustifolia*	Chen et al, 2002b
3	coccinic acid	3-oxo,24(Z) -$\Delta^{9(11)}$	*K. coccinea*	Li and Xue, 1986; Song et al, 2010
4	isoanwuweizic acid	3-αOH,24(Z)-$\Delta^{9(11)}$	*K. heteroclita*	Dai et al, 1990
5	(24Z)-3-oxo-12α-acetoxyl anosta-8,24-dien-26-oic acid	3-oxo,12-αOAc,24(Z)-$\Delta^{8(9)}$	*K. longipedunculata*	Li et al, 1989
6	(24Z)-3-oxo-12α-hydroxyl anosta-8,24-dien-26-oic acid	3-oxo,12-αOH,24(Z)-$\Delta^{8(9)}$	*K. longipedunculata*	Li et al, 1989
7	12β-acetoxycoccinic acid	3-oxo,12-βOAc,24(Z)-$\Delta^{9(11)}$	*K. heteroclita*	Li et al, 1989c
8	12β-hydroxycoccinic acid	3-oxo,12-βOH,24(Z)-$\Delta^{9(11)}$	*K. heteroclita*	Li et al, 1989c
9	12α-acetoxycoccinic acid	3-oxo,12-αOAc,24(Z)-$\Delta^{9(11)}$	*K. heteroclita*	Li et al, 1989c
10	12α-hydroxycoccinic acid	3-oxo,12-αOH,24(Z)-$\Delta^{9(11)}$	*K. heteroclita*	Li et al, 1989c
11	schisanhenric acid	3-oxo,22-OAc,24(E)-$\Delta^{9(11)}$	*K. heteroclita*	Li et al, 1989c
12	kadpolysperin D	3-αOAc,12-βCH_3,20-βOH,24(Z)-$\Delta^{8(9)}$	*K. polysperma*	Dong et al, 2012a
13	kadpolysperin N	3-αOAc,12-αOH,24(Z)-$\Delta^{8(9)}$	*K. polysperma*	Dong et al, 2012a
14	kadnanosic acid B	3-oxo,22-OAc,24(E)-$\Delta^{8(9)}$	*K. ananosma*	Yang et al, 2010a
15	3-hydroxy-12-acetoxycoccinic acid	3-αOH,12-αOAc,24(E)-$\Delta^{9(11)}$	*K. coccinea*	Li and Xue, 1986;
16	kadindutic acid	3-oxo, 12-βCH_3, 24(Z)-$\Delta^{8(9), 13(17)}$	*K. induta*	Ma et al, 2009



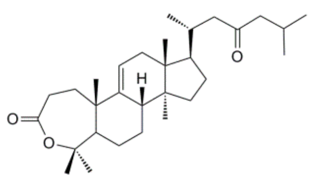
1−16 (F)



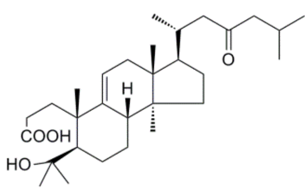
17−29 (G)



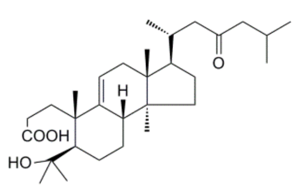
30 (G)



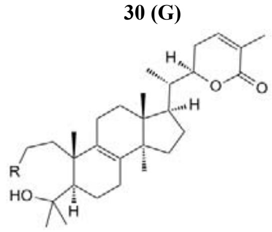
31 (G)



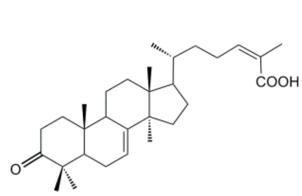
32 (G)



33 (G)



34−35 (G)



36−39 (H)

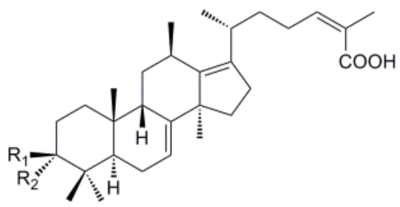
Figure 7 Structures of triterpenoids (F, G, and H) isolated from genus *Kadsura* Kaempf. ex Juss.

Table 6 3,4-Seco-lanostanes (G) isolated from genus *Kadsura* Kaempf. ex Juss.

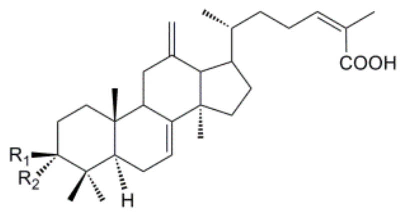
No.	Compound	Structure	Plant source	Reference
17	manwuweizic acid	27-=R=COOH,(24Z)-$\Delta^{8(9)}$	*K. polysperma*	Dong et al, 2012a
			K. ananosma	Yang et al, 2010a
			K. renchangiana	Chen and Chen, 2008
18	kadsuric acid	27-=R=COOH,(24Z)-$\Delta^{9(11)}$	*K. coccinea*	Li et al, 2008
			K. renchangiana	Chen and Chen, 2008
19	kadpolysperin H	27-=R=COOH,(24Z)-$\Delta^{8(9)}$	*K. polysperma*	Dong et al, 2012a
20	kadpolysperin B	27-=R=OAc,12-βCH$_3$,(24Z)-$\Delta^{8(9),13(17)}$	*K. polysperma*	Dong et al, 2012a
21	kadsuracoccinic acid A	27-=R=COOH,24(E)-$\Delta^{17(20)}$	*K. coccinea*	Li et al, 2008
22	kadsuracoccinic acid C	27-=R=COOH,(24E)-$\Delta^{9(11)}$	*K. coccinea*	Li et al, 2008
23	seco-coccinic acid F	27-=R=COOH,24(E)-$\Delta^{9(11)}$	*K. coccinea*	Wang et al, 2008
24	kadpolysperin J	27-=R=OAc,(24Z)-$\Delta^{8(9)}$	*K. polysperma*	Dong et al, 2012a
25	kadpolysperin K	27-=R=OAc,(24E)-$\Delta^{8(9)}$	*K. polysperma*	Dong et al, 2012a
26	3,4-seco-(24Z)-lanosta-4(30), 24,triene-3,26-dioic acid	27-=R=COOH,(24Z)-$\Delta^{8(9)}$	*K. heteroclita*	Li et al, 1989b
27	kadsuracoccinic acid B	R=COOH,8-βCH$_3$,24(Z)-$\Delta^{9(11),24(25)}$	*K. coccinea*	Li et al, 2008
28	seco-coccinic acid K	R=OAc,23-oxo,24(Z)-$\Delta^{9(11)}$	*K. coccinea*	Wang et al, 2012a
29	seco-coccinic acid G	R=COOH,24(Z)-$\Delta^{8(9),24(25)}$	*K. coccinea*	Wang et al, 2012a
30	schisanlactone F		*K. ananosma*	Yang et al, 2010a
			K. longipedunculata	Liu and Pan, 1991
31	coccinilactone A		*K. coccinea*	Wang et al, 2008
32	seco-coccinic acid J		*K. coccinea*	Wang et al, 2012a
33	kadnanosic acid A		*K. ananosma*	Yang et al, 2010a
34	kadnanolactone D	R=COOCH$_3$	*K. ananosma*	Yang et al, 2010a
35	kadcoccilactone R	R=COOH	*K. ananosma*	Yang et al, 2010a
			K. coccinea	Gao et al, 2008c

Table 7 18(13→12)-Abeo-lanostanes (H) isolated from genus *Kadsura* Kaempf. ex Juss.

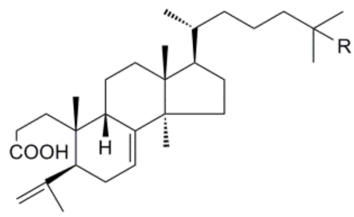
No.	Compounds	Structures	Plant sources	References
36	kadpolysperin C	3-αOAc,12-βCH$_3$,20-βOH,24(Z)	*K. polysperma*	Dong et al, 2012a
37	kadpolysperin L	3-oxo,2-αOAc,12-αOH,24(Z)	*K. polysperma*	Dong et al, 2012a
38	kadpolysperin M	3-oxo,12-αOH,24(Z)	*K. polysperma*	Dong et al, 2012a
39	20(R),24(E)-3-oxo-9β-lanosta-7,24-dien-26-oic acid	3-oxo	*K. coccinea*	Ban et al, 2009
40	ananosic acid A	R$_1$=H, R$_2$=OH	*K. ananosma*	Chen et al, 2001
			K. polysperma	Dong et al, 2012a
41	kadpolysperin E	R$_1$=R$_2$=O	*K. polysperma*	Dong et al, 2012a
42	kadpolysperin F	R$_1$=OH, R$_2$=H	*K. polysperma*	Dong et al, 2012a
43	ananosic acid B	R$_1$=H, R$_2$=OAc	*K. ananosma*	Chen et al, 2004b
			K. polysperma	Dong et al, 2012a
44	ananosic acid C	R$_1$=R$_2$=O	*K. ananosma*	Chen et al, 2004b
			K. polysperma	Dong et al, 2012a
45	ananosic acid D	R$_1$=H, R$_2$=OH	*K. polysperma*	Dong et al, 2012a
46	kadpolysperin G	R$_1$=OH, R$_2$=H	*K. polysperma*	Dong et al, 2012a
47	kadpolysperin I	26-COOH,24(Z)$\Delta^{24(25)}$	*K. polysperma*	Dong et al, 2012a
48	seco-coccinic acid F	$\Delta^{24(25)}$	*K. coccinea*	Wang et al, 2008
49	seco-coccinic acid A	23-oxo	*K. coccinea*	Wang et al, 2008
50	seco-coccinic acid B	23-oxo,$\Delta^{24(25)}$	*K. coccinea*	Wang et al, 2008
51	seco-coccinic acid E	24-βOH,$\Delta^{25(26)}$	*K. coccinea*	Wang et al, 2008
52	seco-coccinic acid C	23-oxo, R=OH	*K. coccinea*	Wang et al, 2008
53	seco-coccinic acid D	$\Delta^{23(24)}$, R=OH	*K. coccinea*	Wang et al, 2008
54	seco-coccinic acid I	24-βOH, R=OH	*K. coccinea*	Wang et al, 2012c



40−42



43−46



47−54

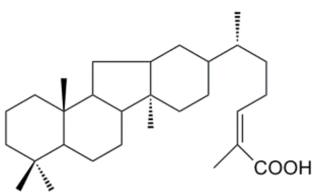
Figure 8 Structures of triterpenoids (H) isolated from genus *Kadsura* Kaempf. ex Juss.

Table 8 14(13→12)-Abeo-lanostanes (I) isolated from genus *Kadsura* Kaempf. ex Juss.

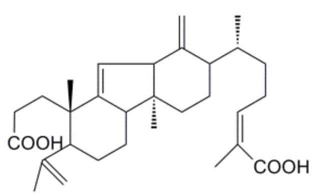
No.	Compounds	Structures	Plant sources	References
55	neokadsuranic acid A	3-oxo,(24Z)-$\Delta^{9(11),13(18)}$	*K. heteroclita*	Kangouri et al, 1989
56	3-hydroxy-neokadsuranic acid A	3-OH,13-oxo,$\Delta^{9(11)}$	*K. coccinea*	Song et al, 2010
57	neokadsuranic acid B	3-oxo,(24Z)-$\Delta^{8(9),13(18)}$	*K. longipedunculata*	Li et al, 1989a
			K. coccinea	Shinomiya et al, 2009
58	neokadsuranic acid C	3-oxo,13-βOH,13-αCH_3, (24Z)-$\Delta^{8(9)}$	*K. longipedunculata*	Li et al, 1989a
59	kadpolysperin A	3-αOAc,20-αCH_3,13-CH_3, (24Z)-$\Delta^{7(8),13(17)}$	*K. polysperma*	Dong et al, 2012a
60	seco-neokadsuranic acid A		*K. heteroclita*	Li et al, 1989b

Table 9 Intact cycloartanes (K) isolated from genus *Kadsura* Kaempf. ex Juss.

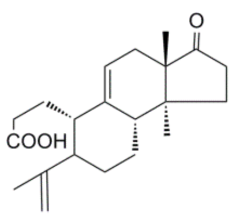
No.	Compounds	Structures	Plant sources	References
63	isoschizandrolic acid	R_1=COOH, R_2=H, 3-βOH	*K. sp.(s)*	Liu and Huang, 1988
64	heteroclic acid	R_1=COOH, R_2=OAc	*K. heteroclita*	Wang et al, 2006a
			K. coccinea	Gao et al, 2008c;
65	cycloartenone	R_1=CH_3, R_2=H	*K. heteroclita*	Wang et al, 2006a
66	schisandronic acid	R_1=COOH, R_2=H	*K. coccinea*	Gao et al, 2008c;
			K. heteroclita	Wang et al, 2006a
67	kadsulactone		*K. longipedunculata*	Wang et al, 2006a



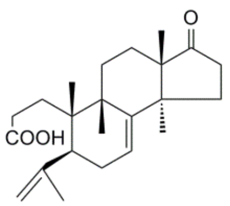
55−59 (I)



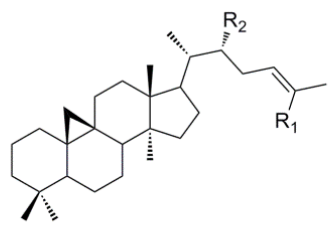
60 (I)



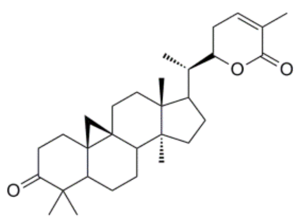
61 (J)



62 (J)



63−66 (K)

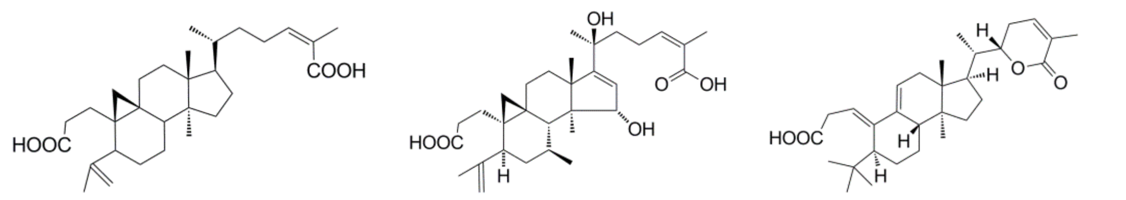


67 (K)

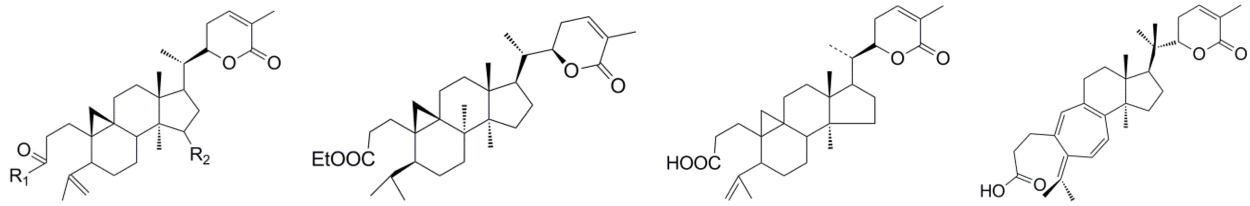
Figure 9 Structures of triterpenoids (I, J, and K) isolated from genus *Kadsura* Kaempf. ex Juss.

Table 10 3,4-Seco-cycloartanes (L) isolated from genus *Kadsura* Kaempf. ex Juss.

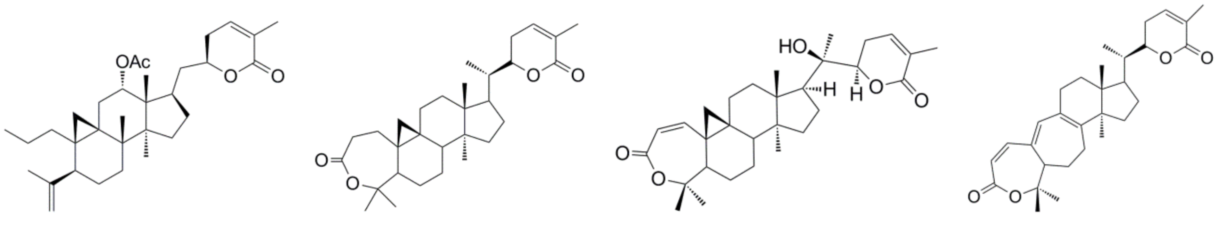
No.	Compounds	Structures	Plant sources	References
68	kadsuranic acid A	(24*Z*)-$\Delta^{17(20)}$	*K. heteroclita*	Xu et al, 2010a
69	changnanic acid	(24*Z*)-$\Delta^{6(7)}$	*K.longipedunculata*	Liu et al, 1991
			K. heteroclita	Wang et al, 2006a
70	nigranoic acid	(24*Z*)	*K. heteroclita*	Wang et al, 2006a
			K. angustifolia	Sun et al, 2006a
71	angustific acid B		*K. angustifolia*	Sun et al, 2006a
72	kadnanolactone B		*K. ananosma*	Yang et al, 2010a
73	heteroclitalactone A	R_1=OH, R_2=OAc	*K. heteroclita*	Wang et al, 2006a
74	heteroclitalactone B	R_1=OCH_3, R_2=OAc	*K. heteroclita*	Wang et al, 2006a
75	heteroclitalactone C	R_1=EtO, R_2=OAc	*K. heteroclita*	Wang et al, 2006a
76	heteroclitalactone F	R_1=OCH_3, R_2=H	*K. heteroclita*	Wang et al, 2006a
77	schisanlactone E	R_1=OH, R_2=H	*K. heteroclita*	Wang et al, 2006a
			K. longipedunculata	Jia et al, 2007
			K. polysperma	Pu et al, 2007
78	(8*R*,9*S*,22*R*)-3-ethoxy-3-oxo-9,19-cyclo-3,4-secolanosta-4(28),24-dien-26-oic acid 22,26-lactone	$\Delta^{4(28)}$	*K. heteroclita*	Wang et al, 2006a
79	(8*R*,9*S*,22*R*)-3-Ethoxy-3-oxo-9,19-cyclo-3,4-secolanosta-4,24-dien-26-oic acid 22,26-Lactone	$\Delta^{4(5)}$	*K. heteroclita*	Wang et al, 2006a
80	(8*R*,9*S*,22*R*)-3-ethoxy-3-oxo-9,19-cyclo-3,4-secolanosta-4(28),6,24-trien-26-oic acid 22,26-lactone	$\Delta^{4(28),6}$	*K. heteroclita*	Wang et al, 2006a
81	kadsulactone acid		*K. longipedunculata*	You et al, 1997
82	lancilactone C		*K. lancilimba*	Chen et al, 1999a
83	polysperlactone B		*K. polysperma*	Jia et al, 2007
84	kadsudilactone	9,19-cyclo	*K. longipedunculata*	Gao et al, 2008c
			K. coccinea	Luo et al, 2009
			K. heteroclite	
85	kadnanolactone C	19-βCH_3,$\Delta^{8(9)}$	*K. ananosma*	Yang et al, 2010a
86	schisanlactone B	9,19-cyclo,$\Delta^{1(2)}$	*K. heteroclite*	Wang et al, 2007
87	kadsulactone A	6-βOH, 9,19-cyclo,$\Delta^{1(2)}$	*K. lancilimba*	Chen et al, 1999a
			K. renchangiana	Chen et al, 2008
88	kadsuphilactone B		*K. philippinensis*	Shen et al, 2005a
			K. coccinea	Gao et al, 2008c
89	renchanglactone A	6-βOH,	*K. renchangiana*	Chen et al 2008
90	kadcoccilactone Q	5-αH,6-βOH,8-βH	*K. coccinea*	Gao et al, 2008c
91	heteroclitalactone D	12-αOAc	*K. heteroclita*	Wang et al, 2006a
92	heteroclitalactone E	12-αOAc,20-OH,$\Delta^{6(7)}$	*K. heteroclita*	Wang et al, 2006a
93	schisanlactone A		*K. longipedunculata*	Sun et al, 2006a;
94	lancilactone A	6-βOH	*K. lancilimba*	Chen et al, 1999a
95	lancilactone B	$\Delta^{6(7)}$	*K. lancilimba*	Chen et al, 1999a
96	heteroclitalactone G	R_1=R_2=R_3=H,$\Delta^{6(7)}$	*K. heteroclita*	Wang et al, 2007
97	heteroclitalactone H	R_1=OH, R_2=R_3=H,$\Delta^{6(7)}$	*K. heteroclita*	Wang et al, 2007
98	heteroclitalactone I	R_1=R_2=OH, R_3=H,$\Delta^{6(7)}$	*K. heteroclita*	Wang et al, 2007
99	heteroclitalactone J	R_1=OH, R_2=OAc, R_3=H,$\Delta^{6(7)}$	*K. heteroclita*	Wang et al, 2007
100	heteroclitalactone K	R_1=OH, R_2=O, R_3=H,$\Delta^{6(7)}$	*K. heteroclita*	Wang et al, 2007
101	heteroclitalactone L	R_1=H, R_2=H, R_3=OH	*K. heteroclita*	Wang et al, 2007
102	heteroclitalactone M		*K. heteroclita*	Wang et al, 2007
103	polysperlactone A		*K. polysperma*	Jia et al, 2007
104	angustifodilactone A	R=OH	*K. angustifolia*	Sun et al, 2011
105	angustifodilactone B	R=H	*K. angustifolia*	Sun et al, 2011



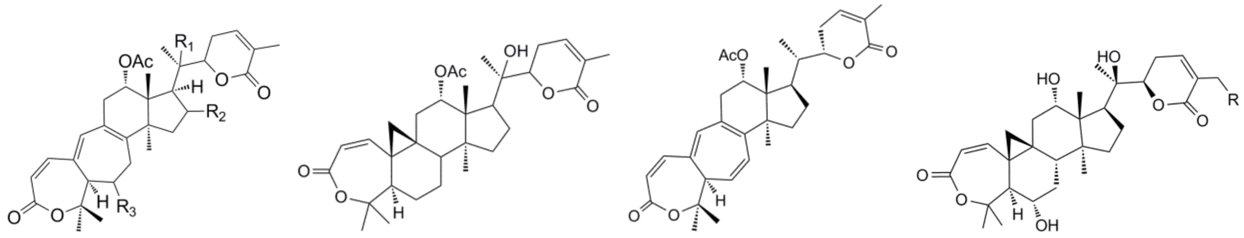
68−70 **71** **72**



73−77 **78−80** **81** **82**



83 **84−87** **88−90** **91−95**



96−101 **102** **103** **104−105**

Figure 10 Structures of triterpenoids (L) isolated from genus *Kadsura* Kaempf. ex Juss.

5) Kadlongilactone-type triterpenoids (O) Eleven kadlongilactone-type triterpenoids were isolated from the plants of genus *Kadsura* Kaempf. ex Juss. Kadlongilactones A−F (**126−131**) had been isolated from the leaves and stems of *K. longipedunculata*, and some of them were also isolated from *K. coccinea* and *K. angustifolia*. Since these compounds featured an unprecedented rearranged hexacyclic system, they were assigned to a new group, named kadlongilactone-type triterpenoids. Subsequent studies on *K. coccinea* led to the isolation of other five compounds, kadcoccilactones K−O (**132−136**). (Table 12, Figure 12)

2.2.3 Nortriterpenoids (P)

In earlier years, more than 60 highly oxygenated polycyclic nortriterpenoids had been isolated from the plants of genus *Schisandra* Michx., and some scholars assigned this series of unique nortriterpenoids as *Schisandra* nortrit-erpenoids (Xiao et al, 2008). But the lastest phytochemical studies showed 19 compounds were isolated from *Kadsura* plants. Kadcoccilactones A−F (**146−151**), H−J (**152−154**) and wuweizidilactone B (**155**) had been isolated from *K. coccinea* (Gao et al, 2008a). Another eight compounds, named kadnanolactones A (**137**), F (**138**), G (**139**), H (**140**), I (**141**), micrandilactones B (**143**), C (**142**), and wuweizidilactone H (**144**), were isolated from *K. ananosma* (Yang et al, 2010a). Moreover, kadsuphilactone A (**145**) was isolated from *K. philippinensis* (Shen et al, 2005a). (Figure 13)

2.2.4 Others triterpenoids (Q)

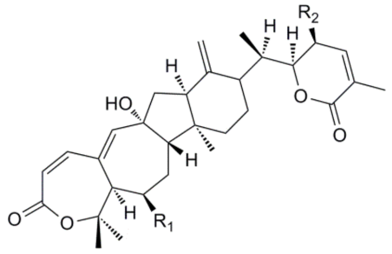
There were two other-type triterpenoids including angustific acid A (**156**) and kadnanolactone E (**157**) isolated from *K. angustifolia* (Sun et al, 2011) and *K. ananosma* (Yang et al, 2010a), respectively. Three new triterpenoids, kadcotriones A−C (**158−160**) were isolated from *K. coccinea* (Liang et al, 2013). (Figure 14)

2.3 Others

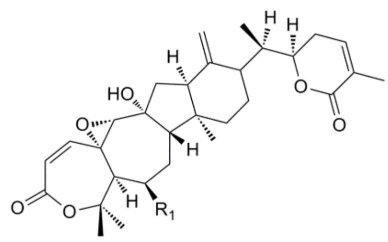
Some other kinds of chemical constituents were also isolated from genus *Kadsura* Kaempf. ex Juss. including flavonoids, sesquiterpenoids, etc. Seven flavonoids were isolated and identified from *K. oblongifolia* (Liu et al, 2009a), including kaempferol-3-*O*-*α*-L-arabofuranoside, kaempferol-3-*O*-α-*D*-arabinopyranoside, quercetin-3-*O*-α-*L*-arabofuranoside,

Table 11 14(13→12)-abeo-cycloartanes (M) isolated from genus *Kadsura* Kaempf. ex Juss.

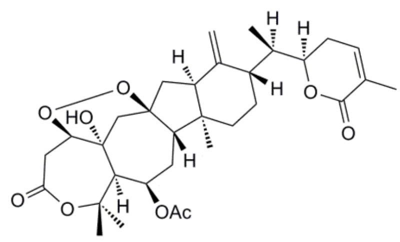
No.	Compounds	Structures	Plant sources	References
106	longipedlactone A	R_1=H, R_2=H,$\Delta^{16(17)}$	*K. longipedunculata*	Pu et al, 2006
			K. ananosma	Yang et al, 2010
			K. coccinea	
107	longipedlactone J	R_1=OAc, R_2=H,$\Delta^{16(17)}$	*K. heteroclita*	Pu et al, 2008b
			K. ananosma	
108	longipedlactone E	R_1=H, R_2=OH,$\Delta^{16(17)}$	*K. longipedunculata*	Pu et al, 2006
			K. coccinea	Gao et al, 2008c
109	longipedlactone F	R_1=OH, R_2=H,$\Delta^{16(17)}$	*K. longipedunculata*	Pu et al, 2006
			K. coccinea	Gao et al, 2008c
			K. ananosma	
110	longipedlactone B	R_1=H, R_2=H,17-βH	*K. longipedunculata*	Pu et al, 2006
			K. coccinea	Gao et al, 2008c
111	longipedlactone C	R_1=H, R_2=H,17-βOH	*K. longipedunculata*	Pu et al, 2006
			K. coccinea	Gao et al, 2008c
112	longipedlactone M	R_1=OAc, R_2=H,17-βOH	*K. ananosma*	Yang et al, 2010
113	longipedlactone L	R_1=OAc, R_2=H, 17-βH	*K. ananosma*	Yang et al, 2010
			K. heteroclita	
114	longipedlactone H	R_1=OH, R_2=H,17-βOH	*K. longipedunculata*	Pu et al, 2006
			K. ananosma	
115	longipedlactone D	R=H,$\Delta^{16(17)}$	*K. longipedunculata*	Pu et al, 2006
116	longipedlactone G	R=OH,$\Delta^{16(17)}$	*K. longipedunculata*	Pu et al, 2006
117	longipedlactone I	R=OH,17-βOH	*K. longipedunculata*	Pu et al, 2006
118	longipedlactone N	R=OAc	*K. ananosma*	Yang et al, 2010
119	longipedlactone K		*K. ananosma*	Yang et al, 2010
120	longipedlactone O	R_1=OAc, R_2=H	*K. ananosma*	Yang et al, 2010
121	longipedlactone P	R_1=OAc, R_2=OH	*K. ananosma*	Yang et al, 2010
122	kadcoccilactone P	R_1=H, R_2=OH	*K. coccinea*	Gao et al, 2008c
123	kadheterilactone A		*K. heteroclita*	Xu et al, 2010a
124	kadheterilactone B		*K. heteroclita*	Xu et al, 2010a



106−114



115−118



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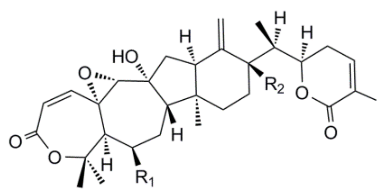

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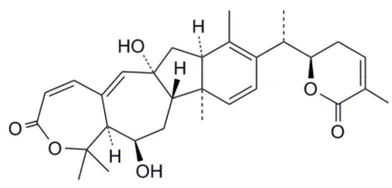

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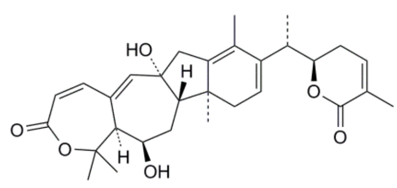


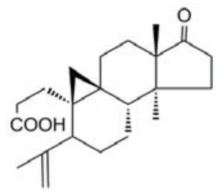
124

Figure 11 Structures of triterpenoids (M) isolated from genus *Kadsura* Kaempf. ex Juss.

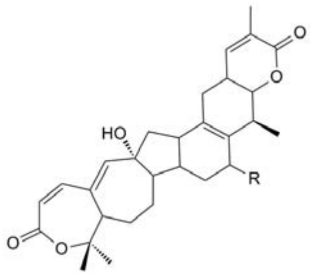
quercetin-3-*O*-α-*D*-arabinopyranoside, quercetin-3-*O*-β-*D*-glucopyranoside, quercetin, and kaempferol. In addition, two guaianolide-type sesquiterpenoids (4β,9β-dihydroxy-1α,5α-H-guaia-6,10(14)-dien and 4β,9β,10α-trihydroxy-1α,5α-H-guaia-6-en) were isolated and identified from *K. interior* (Dong et al, 2013).

3. Discussion

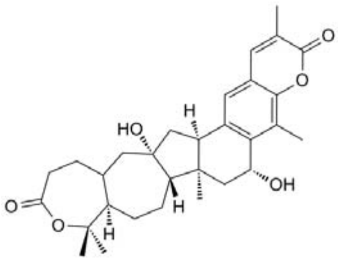
Lignans and triterpenoids were the main chemical constituents from the plants of genus *Kadsura* Kaempf. ex Juss. as summarized above. According to our previous investigation, lignans and triterpenoids exhibited various activities, including



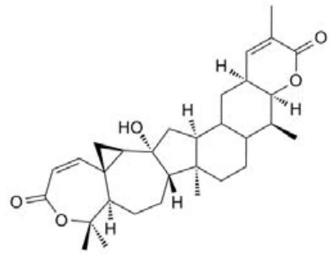
125 (N)



126−131 (O)



132−133 (O)

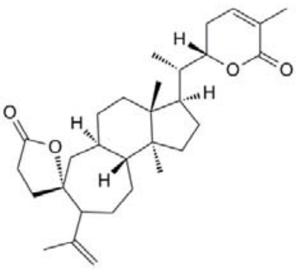


134−136 (O)

Figure 12 Structures of triterpenoids (N and O) isolated from genus *Kadsura* Kaempf. ex Juss.

Table 12 Kadlongilactone-type triterpenoids (O) isolated from genus *Kadsura* Kaempf. ex Juss.

No.	Compounds	Structures	Plant sources	References
126	kadlongilactone A	R=αOH	*K. longipedunculata*	Gao et al, 2008c
			K. coccinea	Pu et al, 2007a
			K. angustifolia	Pu et al, 2005
127	kadlongilactone C	R=αOCH_3	*K. longipedunculata*	Pu et al, 2007a
128	kadlongilactone D	R=βOH	*K. longipedunculata*	Gao et al, 2008c
			K. coccinea	Pu et al, 2007a
129	kadlongilactone E	R=βOCH_3	*K. longipedunculata*	Pu et al, 2007a
130	kadlongilactone F	16,17-cyclo	*K. longipedunculata*	Pu et al, 2007a
131	kadlongilactone B	R=oxo	*K. longipedunculata*	Gao et al, 2008c
			K. angustifolia	Pu et al, 2005
			K. coccinea	
132	kadcoccilactone K	19-βOCH_3, $\Delta^{1(10)}$	*K. coccinea*	Gao et al, 2008c
133	kadcoccilactone L	$\Delta^{1(2),10(19),}$	*K. coccinea*	Gao et al, 2008c
134	kadcoccilactone M	10,19-cyclo,$\Delta^{1(2)}$	*K. coccinea*	Gao et al, 2008c
135	kadcoccilactone N	10,19-cyclo,16-αOH,$\Delta^{13(17)}$	*K. coccinea*	Gao et al, 2008c
136	kadcoccilactone O	16,17-cyclo,13-βOCH_3,$\Delta^{10(19)}$	*K. coccinea*	Gao et al, 2008c



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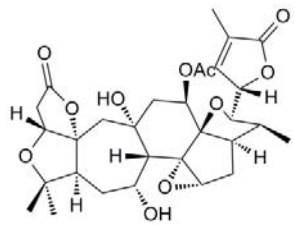

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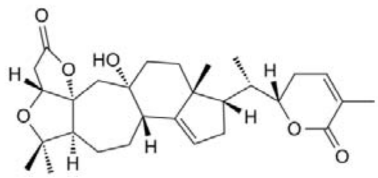

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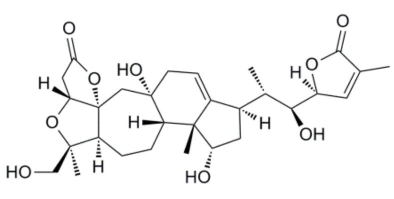

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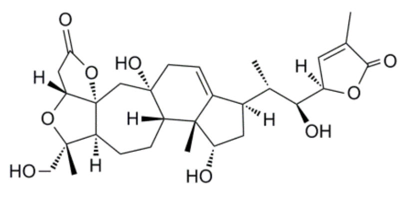

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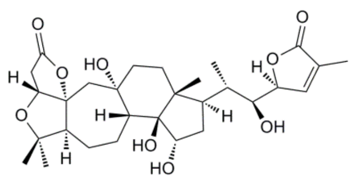

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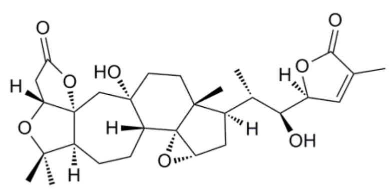

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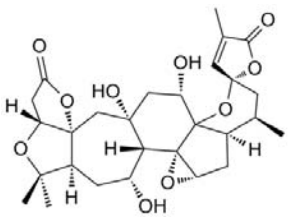

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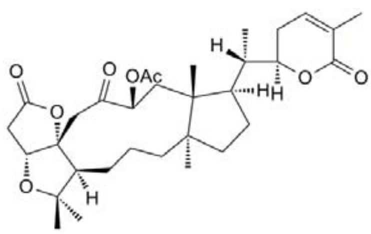

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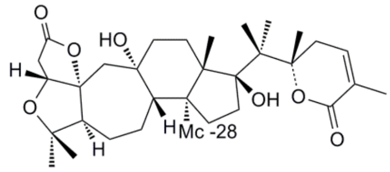

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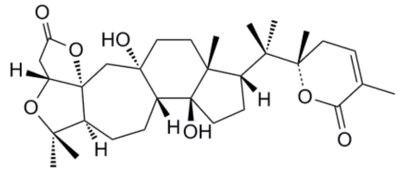

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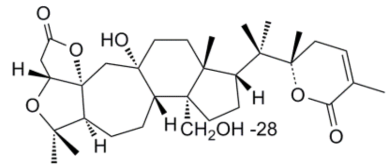

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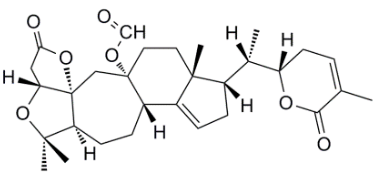

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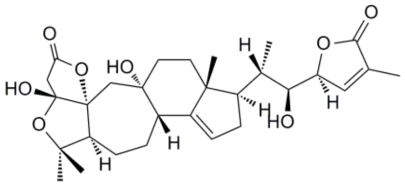

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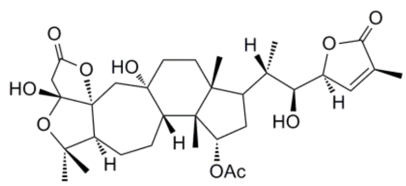

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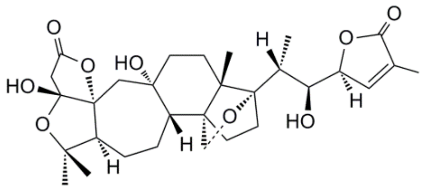

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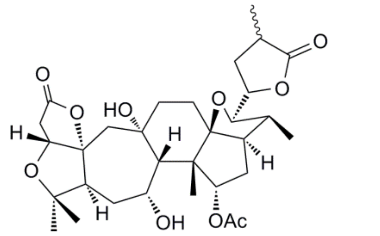

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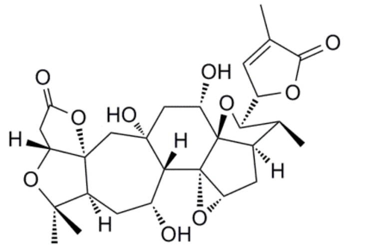

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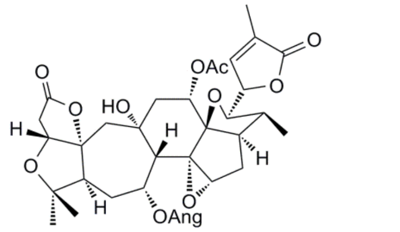

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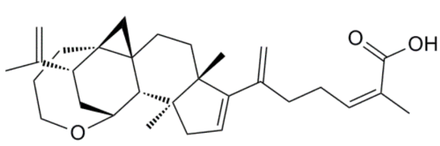
Figure 13 Structures of triterpenoids (P) isolated from genus *Kadsura* Kaempf. ex Juss.



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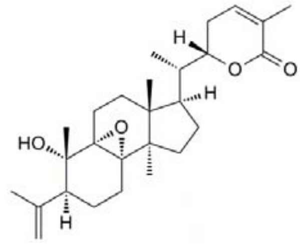

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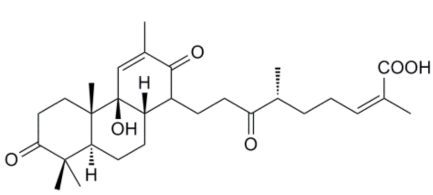

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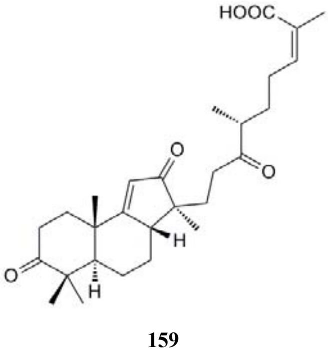

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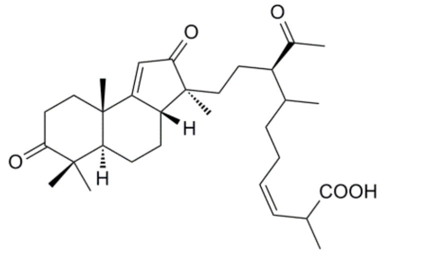

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Figure 14 Structures of triterpenoids (Q) isolated from genus *Kadsura* Kaempf. ex Juss.

anti-HIV, antitumor, antihepatitis, anti-oxidant, anti-platelet aggregation, immunomodulatory activities, neuroprotective effect, depigmentation effect, etc (Wang et al, 2013; Goh et al, 2013; Liu et al, 2014). Some promising compounds with good bioactivities were emerged, for example anti-HIV activity (gomisin G, kadsulignan N, etc), antitumor activity (ananosic acids A−C, etc), anti-oxidant activity (kadsuphilol C, kadsurin, etc), antihepatitis activity (acetylepigomisin R, etc), anti-platelet aggregation activity (heteroclitin D, etc), neuro-protective effect (ananolignan F, ananonin M, etc), and NO production inhibitory activity (kadsuralignans C, G, etc) (Liu et al, 2014).

Genus *Kadsura* Kaempf. ex Juss. is a good source with considerable characteristic chemical constituents and potential bioactivities. With the development and improvement of pharmacological models, some valuable lead compounds would be acquired by continuous and in-depth studies. Moreover, some pharmacophylogenetics and structure-activity relationships would greatly increase the opportunity of finding new and promising lead compounds and promote the reasonable development and utilization of the plants in genus *Kadsura* Kaempf. ex Juss.

4. Conclusion

Phytochemical studies on the plants of genus *Kadusra* Kaempf. ex Juss. led to the isolation and identification of more than 450 compounds, including 285 lignans and 160 triterpenoids. Lignans and triterpenoids are the main characteristic constituents from the plants of genus *Kadsura* Kaempf. ex Juss., and some of them exhibit unprecedented structural skeleton and exciting bioactivities, which has brought great interests and challenges for phytochemists and pharmacologists. Genus *Kadsura* Kaempf. ex Juss., the economically and medicinally important plants, consists of 16 species in the world, but only about eight species are investigated in-depth. So it is necessary to further carry out the chemical, pharmacological, and pharmacophylogenetic study on the other plants of genus *Kadsura* Kaempf. ex Juss.

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