

Electronic Supplementary Information

**Overview of the chemistry and biological activities of natural atisine-type
diterpenoid alkaloids**

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Table 1S. Naturally occurring atisine-type diterpenoid alkaloids

No	Name	Plant source	Ref.
atisine-type C₂₀-diterpenoid alkaloids			
1	cochleareine	<i>A. cochleare</i>	[1]
2	barpubesine C	<i>A. barbatum</i> var. <i>puberulum</i>	[2]
3	dihydroatisine	<i>A. zeravschanicum</i>	[3]
		<i>A. heterophyllum</i>	[4]
		<i>A. coreanum</i>	[5]
		<i>A. tanguticum</i>	[6]
		<i>C. hellespontica</i>	[7]
		<i>D. staphisagria</i>	[8, 9]
		<i>S. japonica</i> var. <i>acuminata</i>	[10, 11]
5	dihydroajaconine	<i>A. gymnandrum</i>	[12]
		<i>A. heterophyllum</i>	[13]
		<i>C. ambigua</i>	[14]
		<i>C. orientalis</i>	[15]
		<i>D. ajacis</i>	[16]
		<i>S. japonica</i> var. <i>acuminata</i>	[17]
6	atidine	<i>A. anthoroideum</i>	[18]
		<i>A. heterophyllum</i>	[19]
		<i>A. rotundifolium</i>	[20]
		<i>A. zeravschanicum</i>	[21]
		<i>A. kusnezoffii</i>	[22]
7	beiwusine A	<i>A. kusnezoffii</i>	[22]
8	beiwusine B	<i>A. kusnezoffii</i>	[22]
9	spiramine G	<i>S. japonica</i> var. <i>acuminata</i>	[23, 24]
10	spiramine H	<i>A. kusnezoffii</i>	[22]
		<i>S. japonica</i> var. <i>stellaris</i>	[25]
		<i>S. japonica</i> var. <i>acuminata</i>	[23]
11	spiramine I	<i>S. japonica</i> var. <i>acuminata</i>	[23]
12	consorientaline	<i>C. orientalis</i>	[26]
13	chellespontine	<i>A. naviculare</i>	[27]
		<i>A. rotundifolium</i>	[20]
		<i>C. hellespontica</i>	[7]
		<i>C. raveyi</i>	[28]
		<i>D. staphisagria</i>	[29]
		<i>D. peregrinum</i>	[30]
		<i>S. japonica</i> var. <i>acuta</i>	[31]
14	spiratine A	<i>S. japonica</i> var. <i>acuta</i>	[31]
15	ajaconine	<i>A. anthoroideum</i>	[18]
		<i>A. rotundifolium</i>	[20]
		<i>A. stenocarpa</i>	[32]
		<i>C. raveyi</i>	[28]
		<i>C. aconiti</i>	[33]

		<i>C. ambigua</i>	[14]
		<i>C. axilliflora</i>	[34]
		<i>C. hohenackeri</i>	[35]
		<i>C. oliveriana</i>	[36]
		<i>C. orientalis</i>	[37]
		<i>D. ajacis</i>	[38]
		<i>D. carolinianum</i>	[39]
		<i>D. chitralense</i>	[40]
		<i>D. brunonianum</i>	[41]
		<i>D. delavayi</i>	[42]
		<i>D. elatum</i>	[43]
		<i>D. tatsienense</i>	[44]
		<i>D. virescens</i>	[45]
16	deacetylspiramine F	<i>D. ajacis</i>	[46]
		<i>S. japonica</i> var. <i>ovalifolia</i>	[47]
17	spiramine F	<i>S. japonica</i> var. <i>acuminata</i>	[23, 48]
		<i>S. japonica</i> var. <i>acuta</i>	[49]
		<i>S. japonica</i> var. <i>ovalifolia</i>	[50]
		<i>S. japonica</i> var. <i>stellaris</i>	[25]
18	spiramine E	<i>S. japonica</i> var. <i>acuminata</i>	[24]
19	ouvrardiandine A	<i>A. ouvrardianum</i>	[51]
20	ouvrardiandine B	<i>A. ouvrardianum</i>	[51]
21	atisine	<i>A. anthora</i>	[52]
		<i>A. anthoroideum</i>	[53]
		<i>A. tanguticum</i>	[54, 55]
		<i>A. bulleyanum</i>	[56]
		<i>A. coreanum</i>	[5, 57]
		<i>A. gigas</i>	[58]
		<i>A. gymnandrum</i>	[12, 59]
		<i>A. heterophylloides</i>	[60]
		<i>A. heterophyllum</i>	[61, 62]
		<i>A. napellus</i>	[63]
		<i>A. naviculare</i>	[64]
		<i>A. orochryseum</i>	[65]
		<i>A. palmatum</i>	[66]
		<i>A. racemulosum</i>	[67]
		<i>A. rotundifolium</i>	[20]
		<i>A. septentrionale</i>	[68]
		<i>A. taipaicum</i>	[69]
		<i>A. tanguticum</i>	[70]
		<i>A. vaginatum</i>	[71]
		<i>A. zeravschanicum</i>	[21]
		<i>C. regalis</i>	[72]
		<i>D. albocoeruleum</i>	[73]
		<i>D. honanense</i>	[74]
		<i>D. peregrinum</i>	[30]
			[75]
		<i>D. virgatum</i>	[76]

		<i>D. staphisagria</i>	[8]
22	atisinone	<i>A. heterophyllum</i>	[77]
23	delphatisine A	<i>D. chrysotrichum</i>	[78]
24	delphatisine B	<i>D. chrysotrichum</i>	[78]
25	delphatisine C	<i>D. chrysotrichum</i>	[79]
26	Spiramine Z-1	<i>S. japonica</i> var. <i>ovalifolia</i>	[80]
27	honatisine	<i>D. honanense</i>	[74]
28	spiramine Z-2	<i>S. japonica</i> var. <i>ovalifolia</i>	[80]
29	spiramine Z-3	<i>S. japonica</i> var. <i>ovalifolia</i>	[80]
30	isoatisine	<i>A. anthora</i>	[52]
		<i>A. coreanum</i>	[81, 82]
		<i>A. naviculare</i>	[64]
		<i>A. heterophyllum</i>	[77]
		<i>A. koreanum</i>	[83]
		<i>A. palmatum</i>	[84]
		<i>A. richardsonianum</i>	[85]
		<i>A. rotundifolium</i>	[86]
		<i>A. zeravschanicum</i>	[21, 87]
		<i>C. raveyi</i>	[28]
		<i>D. honanense</i>	[88]
		<i>D. honanense</i>	[74]
31	heterophyllinine B	<i>A. heterophyllum</i>	[4]
32	spiramidine A	<i>S. japonica</i> var. <i>ovalifolia</i>	[89]
33	spiramidine B	<i>S. japonica</i> var. <i>ovalifolia</i>	[89]
34	spiramine C	<i>S. japonica</i> var. <i>acuminata</i>	[11] [17]
		<i>S. japonica</i> var. <i>stellaris</i>	[25]
		<i>S. japonica</i> var. <i>acuta</i>	[90]
		<i>S. japonica</i> var. <i>ovalifolia</i>	[50]
35	delphatisine D	<i>D. chrysotrichum</i>	[91]
36	spiramine D	<i>S. japonica</i> var. <i>ovalifolia</i>	[47]
		<i>S. japonica</i> var. <i>acuminata</i>	[11, 17]
		<i>S. japonica</i> var. <i>stellaris</i>	[25]
		<i>S. japonica</i> var. <i>acuta</i>	[90]
37	spiradine E (spiradine G)	<i>S. japonica</i>	[92]
38	spiradine F	<i>S. japonica</i> var. <i>acuminata</i>	[10]
		<i>S. japonica</i> var. <i>acuta</i>	[93]
		<i>S. japonica</i> var. <i>glabra</i>	[94]
39	spiramine A	<i>S. japonica</i> var. <i>acuminata</i>	[11]
		<i>S. japonica</i> var. <i>stellaris</i>	[25]
		<i>S. japonica</i> var. <i>acuta</i>	[50, 90]
		<i>S. japonica</i> var. <i>acuminata</i>	[17]
40	spiramine B	<i>S. japonica</i> var. <i>acuminata</i>	[11] [17]
		<i>S. japonica</i> var. <i>ovalifolia</i>	[47]
		<i>S. japonica</i> var. <i>glabra</i>	[94]
		<i>S. japonica</i> var. <i>insica</i>	[95]
		<i>S. japonica</i> var. <i>stellaris</i>	[25]
		<i>S. japonica</i> var. <i>acuta</i>	[90]
41	spiramine C2	<i>S. japonica</i> var. <i>acuminata</i>	[10]

42	spiramine U	<i>S. japonica</i> var. <i>acuta</i>	[90]
		<i>S. japonica</i> var. <i>acuta</i>	[96]
43	spiramine Q	<i>S. japonica</i> var. <i>insica</i>	[95, 97]
		<i>S. japonica</i> var. <i>stellaris</i>	[25]
		<i>S. japonica</i> var. <i>acuta</i>	[90, 96]
44	thalicsiline	<i>T. sessile</i>	[98]
45	spiramine T	<i>S. japonica</i> var. <i>acuta</i>	[90]
		<i>S. japonica</i> var. <i>acuta</i>	[96]
46	spiramine W	<i>S. japonica</i> var. <i>acuta</i>	[49]
47	spiramine P	<i>S. japonica</i> var. <i>insica</i>	[95]
		<i>S. japonica</i> var. <i>stellaris</i>	[25]
		<i>S. japonica</i> var. <i>acuta</i>	[49, 90, 96]
		<i>S. japonica</i> var. <i>acuminata</i>	[48]
48	19-oxodihydroatisine	<i>D. staphisagria</i>	[9]
49	22- <i>O</i> -acetyl-19-oxodihydroatisine	<i>D. staphisagria</i>	[9]
50	15,22- <i>O</i> -diacetyl-19-oxodihydroatisine	<i>D. staphisagria</i>	[9]
51	spiramine S	<i>S. japonica</i> var. <i>ovalifolia</i>	[89]
52	deacetylspiramine S/brunodelphinine A	<i>S. japonica</i> var. <i>ovalifolia</i>	[89]
		<i>D. brunonianum</i>	[99]
53	spiramine V	<i>S. japonica</i>	[32, 33]
54	spiramide	<i>S. japonica</i> var. <i>acuta</i>	[31]
55	spiramilactam A	<i>S. japonica</i> var. <i>ovalifolia</i>	[100]
56	spiramine R	<i>S. japonica</i> var. <i>insica</i>	[95]
57	spiramine X	<i>S. japonica</i> var. <i>acuta</i>	[93]
58	spiramine Y	<i>S. japonica</i> var. <i>acuta</i>	[93]
59	spiramilactams B	<i>S. japonica</i> var. <i>ovalifolia</i>	[100]
60	coryphidine	<i>A. coreanum</i>	[101]
61	azitine	<i>A. zeravschanicum</i>	[102]
		<i>C. hellespontica</i>	[7]
		<i>C. raveyi</i>	[28]
		<i>D. staphisagria</i>	[8, 9]
		<i>D. forrestii</i> var. <i>viride</i>	[39]
62	forrestline F	<i>S. japonica</i> var. <i>acuminata</i>	[10]
63	spirimine A	<i>S. japonica</i> var. <i>ovalifolia</i>	[103]
64	19- <i>O</i> -deethylspiramine N	<i>S. japonica</i> var. <i>acuta</i>	[31]
65	spiratine B	<i>S. japonica</i> var. <i>acuminata</i>	[48]
66	spiramine O	<i>S. japonica</i> var. <i>acuminata</i>	[104]
67	spirimine B	<i>S. japonica</i> var. <i>acuminata</i>	[10]
68	spiramine Z	<i>S. japonica</i> var. <i>acuta</i>	[93]
69	spiramine N	<i>S. japonica</i> var. <i>acuminata</i>	[105]
70	brunonine	<i>D. brunonianum</i>	[41]
71	spiramine J	<i>S. japonica</i> var. <i>acuminata</i>	[106]
72	spiramine L	<i>S. japonica</i> var. <i>acuminata</i>	[106]
73	spiramine M	<i>S. japonica</i> var. <i>acuminata</i>	[106]
74	spiramine K	<i>S. japonica</i> var. <i>acuminata</i>	[106]
75	13-(2-methylbutyryl)azitine	<i>D. scabriflorum</i>	[107]
76	isoazitine	<i>D. staphisagria</i>	[8]
77	leucostomine A	<i>A. leucostomum</i>	[108]
78	leucostomine B	<i>A. leucostomum</i>	[108]
79	barpubesine A	<i>A. barbatum</i> var. <i>puberulum</i>	[2]

80	barpubesine B	<i>A. barbatum</i> var. <i>puberulum</i>	[2]
81	uncinatine	<i>D. uncinatum</i>	[109]
82	aconicatisulfonine A	<i>A. carmichaelii</i>	[110]
83	aconicatisulfonine B	<i>A. carmichaelii</i>	[110]
84	barpuberudine	<i>A. barbatum</i> var. <i>puberulum</i>	[2]
85	brunonianine A	<i>D. brunonianum</i>	[111]
86	brunonianine B	<i>D. brunonianum</i>	[111]
87	brunonianine C	<i>D. brunonianum</i>	[111]
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Atisine-type <i>Bis</i> -diterpenoid alkaloids			
88	bulleyanine B	<i>A. bulleyanum</i>	[56]
89	piepunine	<i>A. piepunense</i>	[112]
90	bulleyanine A	<i>A. bulleyanum</i>	[56]
91	staphisagrine	<i>D. staphisagria</i>	[113]
92	staphisagnine	<i>D. staphisagria</i>	[113]
93	staphigine	<i>D. staphisagria</i>	[114]
94	staphinine	<i>D. staphisagria</i>	[115]
95	staphidine	<i>D. staphisagria</i>	[115]
96	staphimine	<i>D. staphisagria</i>	[116]
97	staphirine	<i>D. staphisagria</i>	[116]
98	staphisine	<i>D. staphisagria</i>	[116]

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