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Phytochemical constituents of selected *Vitis* species

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Abstract

The article gives a short overview of constituents isolated from *Vitis* species and their bioactivity. Also, some recently obtained results from the authors lab are included.

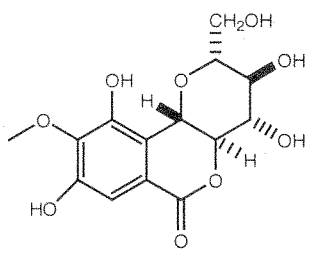
Introduction

Vitis repens Wight & Arm. (syn. *Cissus repens*)

There are 26 genera and 350 species in Vitaceae (order Vitales), including the famous grape wine. *Vitis repens* Wight & Arm. (syn. *Cissus repens*) is a wine that belongs to Vitaceae family. It is native to South (East) Asia, including Bangladesh and Myanmar. The botanical description of *Vitis repens* Wight & Arm. is as follows: Trendrillar climber, slender, scandent, glabrous, glaucous with fusiform to tuberculous rhizome. The tendrils borne at the nodes, opposed to the leaf, forked at the tips. Stems 6-angled with ridges and furrows. Leaves alternate, simple, the tips acuminate, margin serrulate, base truncate to cordate. White patch in pale green coloured leaf blade. Inflorescence axillary, compound umbellate cymes, flowers small yellowish green, bracteate. Fruits berries, globose, dark red, shining black in fully ripe [http://persoon.si.edu/myanmar/].

The rhizome of *Vitis repens* Wight & Arm. is used for the treatment of sore, carbuncles, ulcers, hepatitis and jaundice, peptic ulcer, tumors and hypertension in Myanmar traditional medicine. Prior to our work, there were no reports about the investigation of constituents from this species. Our phytochemical investigation program revealed only known compounds like polyphenols, fatty acids, and lignanes (compounds **1-8**, table 1) from the rhizome of *Vitis repens,* all of which are known from other plants [Jiang *et al.*, 2001; Khan *et al.*, 1986; Yoshida *et al.*, 1982].

Table 1. Compounds isolated from rhizomes of *Vitis repens*.



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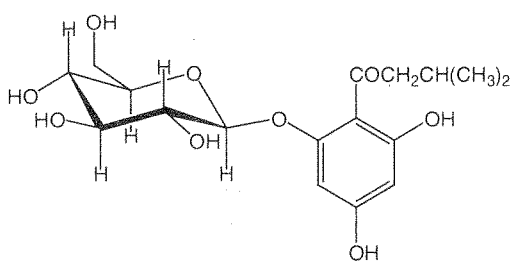

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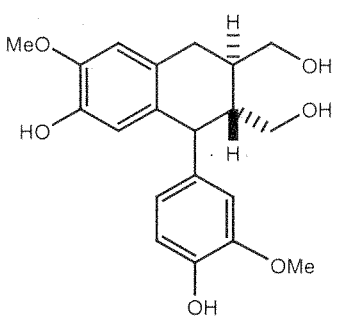

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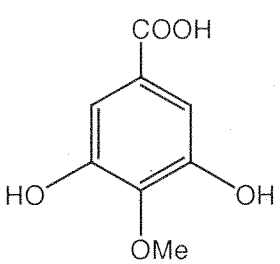

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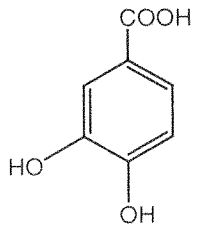

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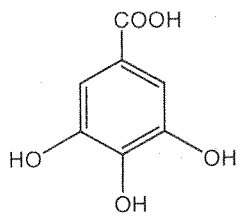

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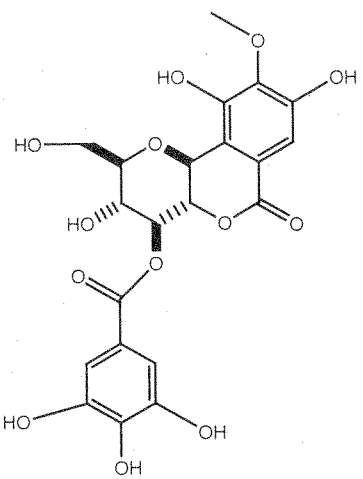

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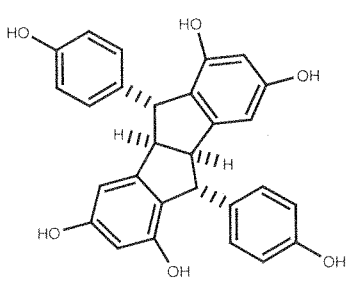

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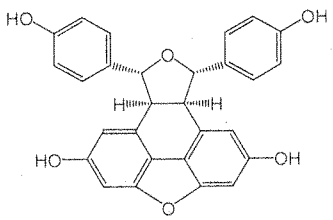
Table 2. Compounds described from *Vitis* spp.



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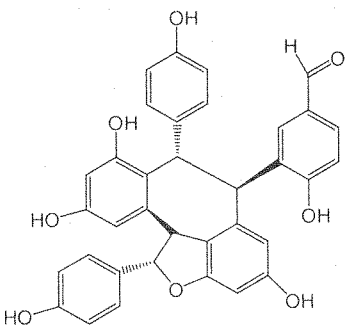

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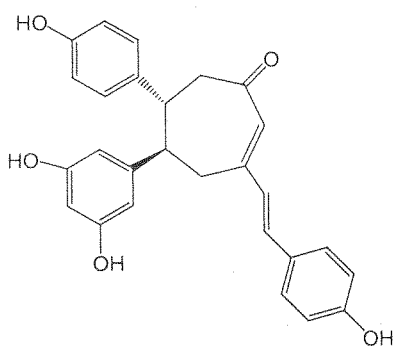

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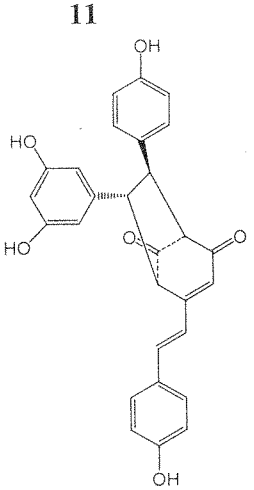

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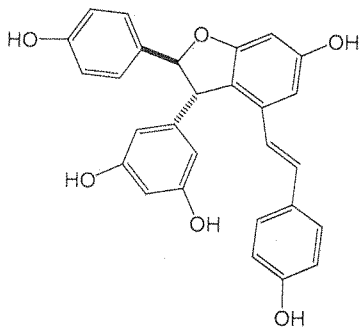

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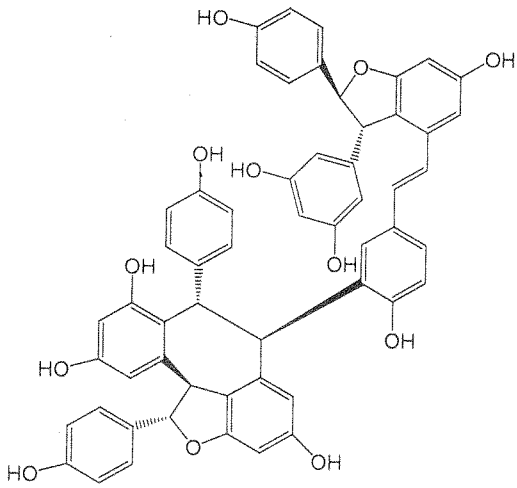

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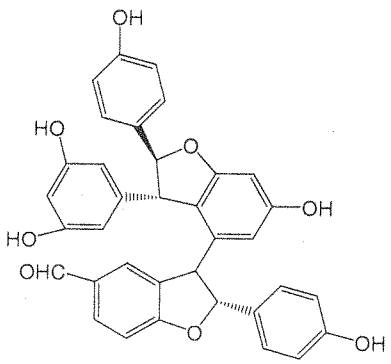

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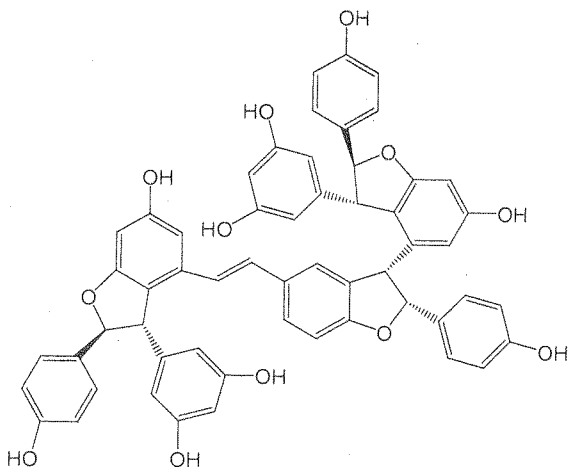

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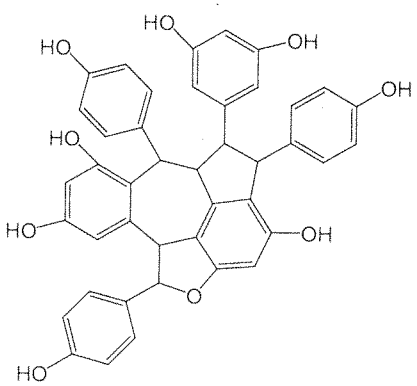

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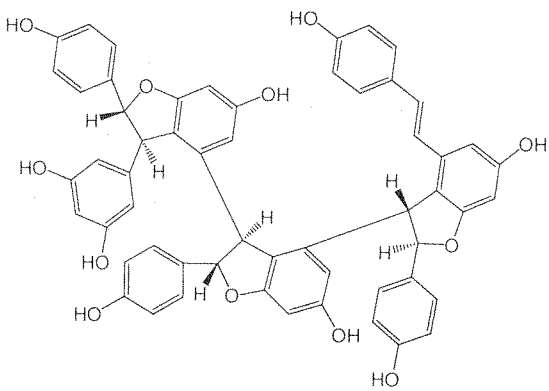

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Vitis thunbergii Sieb. & Zucc.

The roots of *V. thunbergii* are traditionally used for the treatment of diarrhea, fracture and injury, jaundice, and hepatitis in Taiwan. Plants in the genus *Vitis* commonly contain oligomers of resveratrol. Several polyphenols were isolated from the aerial parts of *V. thunbergii* [Dou *et al.*, 2003.]. Four new resveratrol derivatives, vitisinols A-D (**9-12**), together with (+)-ε-viniferin (**13**), (−)-viniferal (**14**), ampelopsin C (**15**), miyabenol A (**16**), (+)-vitisin A (**17**), and vitisin C (**18**) were also isolated from the roots [Huang *et al.*, 2005].

Vitis vinifera L. (grape wine)

The knowledge of compounds isolated from grape wine and especially its fermentation and food processing products (wine, various liquors, raisins etc.) is immense and beyond the scope of this article. One of the most famous compounds is the stilbene resveratrol. Together with a number of related compounds like hydroxystilbenoids isolated from *Vitis vinifera* var. *'Kyohou'* named vitisin C (**18**) and viniferal (**14**), (+)-vitisin A (**17**) and (+)-cis-vitisin A [Ito & Niwa, 1996; Ito *et al.*, 1998] they are antioxidants (see table 3), although there is evidence that the anthocyanes in red grapes have even greater antioxidant power. Only recently we discovered that grape seed contains high levels of tocotrienols, previously only known from palms [Horvath *et al.*, 2004; Horvath *et al.*, 2006].

Bioactivities of *Vitis* spp.

As pointed out, studies relating to grape wine must be omitted here. As a general reference to *Vitis* spp. antioxidant and blood modifying activity, a recent work of Huang et al. may act as a point of entry [Huang *et al.*, 2005]. They tested some resveratrol derivatives for their antioxidative activities and their inhibitory effects on arachidonic acid (AA)- and 9,11-dideoxy-11α,9α-epoxy-methanoprostaglandin $F_{2\alpha}$ (U46619, TXA_2 analogous)-induced platelet aggregation as shown in table 3. Aspirin was used as positive control (32.7 μM). All compounds, with the exception of vitisinol B (**10**) and (+)-ε-viniferin (**13**), showed potent activities. The free radical scavenging activities of all compounds tested were more potent than that of Trolox.

Table 3. Effect of compounds isolated from *Vitis* species on the platelet aggregation induced by arachidonic acid (AA) and 9,11-dideoxy-11α,9α-epoxy-methanoprostaglandin $F_{2\alpha}$ (U46619, TXA_2 analogous), and on ABTS (2,2′-azinobis(3-ethylbenzothiazoline-6-sulfonic acid) [Huang *et al.*, 2005]

	IC_{50} (μM)		Free radical scavenging activity
	AA	U46619	EC_{50} (μM)
Structure			
vitisinol B (**10**)	>100	7.8 ± 2.2	3.6 ± 0.1
vitisinol C (**11**)	13.4 ± 2.2	10.5 ± 3.4	4.5 ± 0.1
vitisinol D (**12**)	15.0 ± 4.8	5.7 ± 1.4	4.1 ± 0.1
(+)-ε-viniferin (**13**)	>100	>100	2.8 ± 0.1
(−)-viniferal (**14**)	7.0 ± 2.9	3.1 ± 2.5	4.4 ± 0.1
ampelopsin C (**15**)	8.1 ± 1.1	5.9 ± 0.9	5.4 ± 1.2
miyabenol A (**16**)	9.0 ± 1.6	7.5 ± 2.0	6.6 ± 1.2
(+)-vitisin A (**17**)	10.3 ± 1.2	13.3 ± 2.1	13.8 ± 2.7
(+)-vitisin C (**18**)	5.7 ± 1.3	3.9 ± 0.7	4.8 ± 0.1

We tested the activity of *Vitis repens* extracts on the sporulation of the phytopathogenic fungus *Cladosporium cucumerinum* according to the method described by Gottstein *et al.* 1982. We obtained at an amount of 500 μg of the *n*-hexane crude extract an inhibition zone (non growth of *C. cucumerinum*) of 95 mm² and for the water crude extract of 78 mm², respectively. Therefore, the activity was insufficient for further development.

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References

1. Dou, D. Q.; Ren, J.; Cooper, M.; He, Y. H.; Pei, Y. P.; Takaya, Y.; Niwa, M.; Chen, Y. J.; Yao, X. S.; Zhou, R 2003. J. Chin. Pharm. Sci. 12, 57-59.
2. Gottstein, D.; Gross, D.; Lehmann, H. 1982. Arch. Phytopathol. Pfl. 20, 111-116.
3. Horvath, G.; Wessjohann, L.; Guissez, Y.; Biebaut, E.; Caubergs, R. J.; Horemans, N. 2004. Acta Horticulturae 65 415-424.
4. Horvath, G.; Guissez, Y.; Wessjohann, L.; Caubergs, R. J.; Horemans, N. 2006. Phytochemistry 67, 1185-1195.
5. Huang, Y. L.; Tsai, W. J.; Shen, C. C.; Chen, C. C. 2005. J. Nat. Prod. 68, 217-220.
6. Ito, J.; Gobaru, K.; Shimamura, T.; Niwa, M. 1998. Tetrahedron 54, 6651-6660.
7. Ito, J.; Niwa, M. 1996. Tetrahedron 52, 9991-9998.
8. Jiang, Z. H.; Tanaka, T.; Sakamoto, M.; Jiang, T.; Kouno, I. 2001. Chem. Pharm. Bull. 49, 1036-1038.
9. Khan, M. A.; Nabi, S. G. Prakash, S.; Zaman, A. 1986. Phytochemistry 25, 1945-1948.
10. Yoshida, T.; Seno, K.; Takama, Y.; Okuda, T. 1982. Phytochemistry 21, 1180-1182.