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TRITERPENOIDS OF *SAMBUCUS NIGRA* AND *S. CANADENSIS**

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Key Word Index—*Sambucus nigra*; *S. canadensis*; Caprifoliaceae; *n*-alkanes; palmitic acid; α - and β -amyrin; ursolic acid; oleanolic acid; sitosterol; stigmasterol; campesterol; quercetin; rutin.

The occurrence of triterpenoids in several *Sambucus* species has been reported [1–8]. It is of chemotaxonomic interest to examine triterpenoid components in the leaves of the following two elders.

Plant. *Sambucus nigra* L., cultivated in Kyoto Herbal Garden, Takeda Chemical Industries, Ltd., Kyoto, Japan and *S. canadensis* L., cultivated in Botanical Garden, Faculty of Science, Osaka City University, Osaka, Japan.

Previous work. Ursolic acid and oleanolic acid from leaves [7] and α -amyrin, betulin, α -amyrone, ursolic acid and oleanolic acid from bark [2, 3] on triterpenoids of *S. nigra*. None on triterpenoids of *S. canadensis*.

Present work. The dried leaves of *S. nigra* and *S. canadensis* were separately extracted with MeOH. The MeOH extracts were concentrated respectively to syrup which was extracted successively with *n*-hexane, Et₂O and hot H₂O.

Constituents of *S. nigra*. The *n*-hexane extract was chromatographed on silica gel, affording a mixture of *n*-alkanes (C₂₅–C₃₁), mp 64–66° (mainly *n*-nonacosane and *n*-hentriacontane, IR and GLC), colourless viscous liquid (*A*), and sitosterol, mp 141–142° (mmp, co-TLC and IR; ace-

tate, mp 125–127°, mmp, co-TLC and IR; containing small amount of stigmasterol and campesterol, GLC). *A* showed the properties similar to a mixture of α -amyrin and β -amyrin palmitates previously isolated from leaves of *S. sieboldiana* var. *miquelli* [8]. Hydrolysis of *A* gave a mixture, mp 182–184°, of α -amyrin and β -amyrin (7:3)(co-TLC, IR and GLC) and palmitic acid, mp 59–60° (mmp and IR; containing small amount of myristic, stearic and arachidic acids, GLC of methyl esters). The above data suggested *A* to be a mixture mainly of α -amyrin and β -amyrin palmitates.

The Et₂O extract was chromatographed on Si gel, yielding ursolic acid, mp 278–280° (mmp, co-TLC and IR; acetate, mp 277–279°, mmp, co-TLC and IR). The crude crystals of ursolic acid was found to contain oleanolic acid (GLC of its methyl ester).

The H₂O extract was chromatographed on polyamide and the MeOH eluate was rechromatographed on Si gel, affording quercetin, mp 307° (decomp.) (mmp, co-TLC, co-PPC, IR and UV) and rutin [9], mp 192° (decomp.) (mmp, co-TLC, co-PPC, IR and UV).

Constituents of *S. canadensis*. The following compounds were identified using chromatographic and identifiable methods similar to the case of *S. nigra*. A mixture of *n*-alkanes (C₂₅–C₃₁ (mainly *n*-nonacosane), colourless viscous

* Part 3 in the series "Studies on the Constituents of *Sambucus* species." For Part 2 see Ref. [8].

Table 1. Distribution of triterpenoids in *Sambucus* species

Plant	Part* [Ref.]	α -Amyrin	β -Amyrin	Betulin	α -Amyrone	Ursolic acid	Oleanolic acid	Betulic acid
<i>S. canadensis</i>	L	+	+			+	+	
<i>S. chinensis</i>	L [5]	+				+		
<i>S. nigra</i>	{ L [7] B [2, 3]	+	+		+	+	+	
<i>S. racemosa</i>	B [4]	+		+				+
<i>S. sieboldiana</i>	{ L [1] W [6]	+		+		+	+	
<i>S. sieboldiana</i> var. <i>miquelii</i>	L [8]	+	+			+	+	

* L—leaves; B—bark; W—wood.

liquid almost composed of α -amyrin and β -amyrin palmitates, and sitosterol containing small amount of stigmasterol and campesterol from the *n*-hexane extract; ursolic acid and oleanolic acid from the Et₂O extract; rutin [10] from the H₂O extract.

Comment. Distribution of triterpenoids in *Sambucus* species so far studied including present work, was shown in Table 1. It was indicated that α -amyrin and ursolic acid are widely distributed, accompanying often β -amyrin and oleanolic acid. In addition betulin seems to be present in bark and wood but not in leaves.

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