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The Partial Demethylation of Flavones. III.*¹
Preparation of Rhamnetin and
7-O-Methylmyricetin.

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The synthesis of rhamnetin (I) has been reported by some workers.¹⁾ However, none of them used the partial demethylation procedure of quercetin pentamethyl ether. We obtained rhamnetin from it and 7-O-methylmyricetin (II) from myricetin hexamethyl ether by partial demethylation.

Reaction condition used was same with that in the case of the demethylation of apigenin trimethyl ether to genkwanin.³⁾ Rhamnetin was identified with a synthetic sample^{1b)} in itself and its acetate. When demethylated similarly myricetin hexamethyl ether³⁾ afforded a monomethyl ether of m.p. 267~268°. It was a new compound but should be 7-O-methylmyricetin (II) because the observations reported by Simpson and Beton⁴⁾ and by this series of paper*¹ showed that the 7-methoxyl group in flavones is fairly resistant to demethylation. The UV spectrum of this compound is in accord with the structure (II) because this compound as well as rhamnetin exhibits no bathochromic shift of the low-wavelength absorption band on addition of a little fused sodium acetate⁵⁾ as shown in Table I. The compound (II)

TABLE I. Effect of Sodium Acetate on Low-Wavelength
Absorption Band of UV Spectra

Compounds	$\lambda_{\max}$ (m μ)		$\Delta\lambda$
	EtOH	EtOH-NaOAc	
Quercetin	257	268	11
Rhamnetin	257	257	0
Myricetin	255	266	11
Mono-O-methylmyricetin	255	255	0

gives pentaacetate, m.p. 220~222° and pentaethyl ether, m.p. 133~134°. The NMR spectra of the pentaacetate and the related compounds also suggested that the monomethyl ether should be 7-O-methylmyricetin (II) as shown in Table II, in which the signals of rhamnetin tetraacetate are included.

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TABLE II. NMR Signals (δ p.p.m.) of Methyl Protons^{a)}

Compounds	Assigned position in flavone nucleus					
	7	5	3	3'	4'	5'
Hexa-O-methylmyricetin	3.79	3.97	4.06	3.88	3.88	3.88
Myricetin hexaacetate	(2.28)	(2.40)	(2.36)	(2.28)	(2.36)	(2.28)
Mono-O-methylmyricetin pentaacetate	3.76	(2.44)	(2.36)	(2.27)	(2.36)	(2.27)
Penta-O-methylquercetin	3.81	3.88	4.04	3.88	3.86	
Quercetin pentaacetate	(2.24)	(2.41)	(2.28)	(2.28)	(2.28)	
Rhamnetin tetraacetate	3.76	(2.40)	(2.27)	(2.27)	(2.27)	
Tri-O-methylapigenin	3.82	3.82			3.72	
Apigenin triacetate	(2.27)	(2.48)			(2.24)	
Genkwanin diacetate	3.81	(2.51)			(2.26)	
Acacetin diacetate	(2.28)	(2.49)			3.74	

a) Figures in parentheses show the chemical shifts of acetyl protons.

Experimental*3

Rhamnetin (I)—A mixture of penta-O-methylquercetin (m.p. 145~146°, 0.5 g.), phenol (0.5 g.), Ac₂O (0.5 ml.), and hydroiodic acid (d=1.7, 7.5 ml.) was heated for 1 hr. in an oil bath at 120°, then poured into water (100 ml.) containing excess NaHSO₃ to give yellow substance which was filtered, washed with water and recrystallized from ethanol to afford yellow crystals (120 mg.), m.p. 280~282°. Further recrystallizations furnished minute yellow crystals, m.p. 286~286.5°, identical with synthetic^{1b)} rhamnetin by admixture and IR spectrum. *Anal.* Calcd. for C₁₆H₁₂O₇: C, 60.76; H, 3.82. Found: C, 60.49; H, 3.88.

Tetraacetate—Above rhamnetin was acetylated with Ac₂O and pyridine to give almost colorless needles, m.p. and mixed m.p. 189~190° (lit.^{1a)} 186~188°. *Anal.* Calcd. for C₂₄H₂₀O₁₁: C, 59.50; H, 4.16. Found: C, 59.49; H, 4.10.

7-O-Methylmyricetin (II)—Hexa-O-methylmyricetin³⁾ (m.p. 152~153°, 0.5 g.) was demethylated as described above to give yellow crystals (260 mg.), m.p. 253~255°. Further recrystallizations from methanol afforded yellow prisms, m.p. 267~268°. *Anal.* Calcd. for C₁₆H₁₂O₈: C, 57.83; H, 3.64. Found: C, 57.64; H, 3.46.

Pentaacetate—Colorless needles, m.p. 220~222°. *Anal.* Calcd. for C₂₆H₂₂O₁₃: C, 57.58; H, 4.09. Found: C, 57.53; H, 3.96. NMR data are in the Table I.

Pentaethyl Ether—7-O-Methylmyricetin (m.p. 266~268°, 440 mg.) was ethylated with diethyl sulfate (5 ml.) and 30% KOH solution (ca. 8 ml.). Recrystallization of the crude product from ethanol gave cream-colored needles (130 mg.), m.p. 133~134°. *Anal.* Calcd. for C₂₈H₃₂O₈: C, 66.08; H, 6.83. Found: C, 66.17; H, 6.58.

*3 Melting Points were uncorrected. NMR spectra were determined on a Hitachi H-60 instrument with pyridine as solvent and tetramethylsilane as internal reference. UV spectra were measured by a Hitachi ESP-2 Recording Spectrophotometer.