Hydrolysis of IX with KOH followed by decarboxylation with copper chromite[8] in quinoline gave II, mp 157—158.5°, [$C_{16}H_{12}N_2$], in 60% yield.

Moreover, we synthesized some other 6-substituted indole and 3,6′-biindole derivatives listed in Table I. When ethyl 7-methoxyindole-2-carboxylate[2] was used as a nucleophile, two isomeric biindole derivatives were isolated. In 1969, Gannon, *et al.*[9] reported the isolation of an undefined biindole derivative, mp 233—235°, from the reaction mixture of Fischer indolization of I with ethanolic hydrogen chloride. From the identities of the physical properties of both products, we believe that Gannon, *et al.* obtained diethyl 7-methoxy-4,6′-biindole-2,2′-dicarboxylate (XI) on their experiment.

Now, we can develop the abnormal Fischer indolization to a unique synthetic method.

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8) W.A. Lazier and H.A. Arnold, *Org. Synth. Coll. Voll.*, 2, 142 (1943).
9) W.F. Gannon, J.D. Benigni, D.E. Dickson and R.L. Minnis, *J. Org. Chem.*, **34**, 3002 (1969).

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Stereostructure of Rhodojaponin V and VII, Toxins of *Rhododendron japonicum*

From the flowers of *Rhododendron japonicum* SURINGER (Ericaceae), a famous poisonous tree in Japan, four toxic diterpenoids, rhodojaponin I, II, III,[1] and IV,[2] have been isolated. We have further noticed in the flowers the presence of other constituents which have been isolated and termed as rhodojaponin V and VII (R–V and R–VII). R–V has also been found in the roots, together with sparassol[3] and methyl orsellinate.

R–V, $C_{22}H_{34}O_7$ (M^+-18 *m/e* 392), mp 240—242°, was shown by the infrared and nuclear magnetic resonance (NMR) spectra to have four tertiary methyls (1.35, 1.47, 1.55, 1.87 ppm), hydroxyls (3560, 3440 cm^{-1}) one of which is secondary (4.00 ppm), one secondary O-acetyl (1725, 1230 cm^{-1}, 2.02, 6.10 ppm), and an epoxide (3.24, 4.15 ppm). Alkaline hydrolysis and acetylation of R–V were carried out to give deacetyl-R–V and R–V monoacetate, respectively, which were found to be identical with R–III (III)[1] and R–I (IV),[1] respectively. The C-14 hydrogen signal in the NMR spectrum of R–V appears at a lower-field region (6.10 ppm) as compared with that of R–III (III) (4.94 ppm), demonstrating that the C-14 hydroxyl is acetylated. R–V is thus concluded to have stereostructure I.

R–VII, $C_{24}H_{38}O_9$, mp 231—234°, was indicated by the spectral properties to possess four tertiary methyls (1.34, 1.46, 1.47, 1.80 ppm), hydroxyls (3425 cm^{-1}) two of which are secondary (3.98, 5.01 ppm, formation of di-O-acetyl-R–VII (V)), and two secondary O-acetyls

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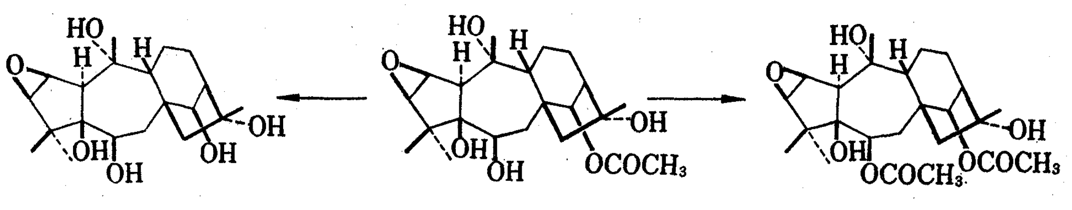
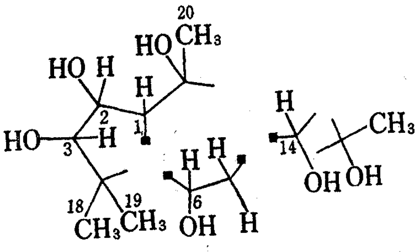
1) H. Hikino, K. Ito, T. Ohta, and T. Takemoto, *Chem. Pharm. Bull.* (Tokyo), **17**, 1078 (1969).
2) H. Hikino, N. Shoji, S. Koriyama, T. Ohta, Y. Hikino, and T. Takemoto, *Chem. Pharm. Bull.* (Tokyo), **18**, 2357 (1970).
3) K. Kinoshita, *Nippon Kagaku Kaishi*, **53**, 865 (1932).

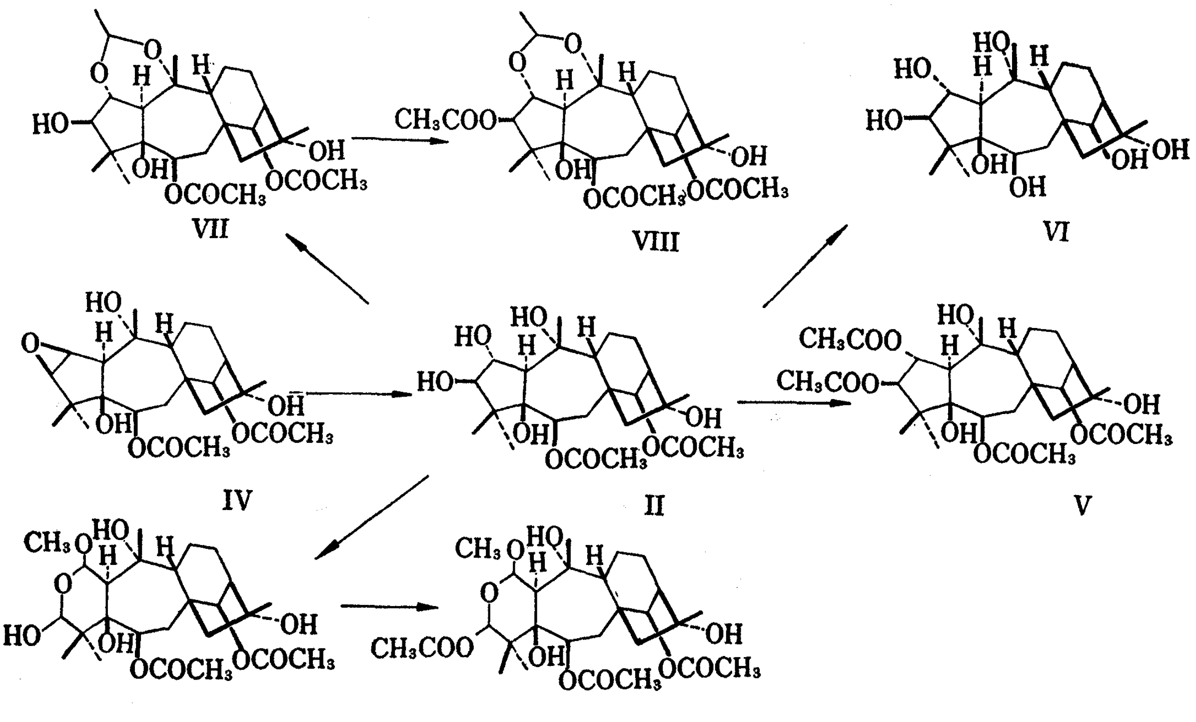


III I IV

(1720, 1230 cm^{-1}, 1.96, 2.31, 5.32, 6.19 ppm). Alkaline hydrolysis of R–VII gave the bisdeacetyl-R–VII (VI), $C_{20}H_{34}O_7$ (M^+-18 *m/e* 368), mp 161—163°. Analysis of the NMR spectrum of the heptaol (VI) with the aid of double resonance experiments showed the presence of the partial structure A. *Inter alia*, intramolecular nuclear Overhauser effects (NOE) were observed between the C-1 and C-6 hydrogens, the C-1 and C-14 hydrogens, the C-2 and C-20 hydrogens, and the C-3 and C-18 (and/or C-19[4]) hydrogens. Combined evidence, together with the simultaneous occurrence of R-VII with the other diterpenoids possessing the andromedane skeleton, demonstrate that R-VII has the same carbon skeleton. Consequently, bisdeacetyl-R-VII is concluded to have the structure VI. Comparison of the NMR spectra of R–VII and its bisdeacetyl-derivative (VI) indicates that the C-6 and C-14 hydrogen signals of the former occur at a lower-field region (5.32, 6.19 ppm) as compared with those of the latter (4.63, 4.99 ppm), showing that the C-6 and C-14 hydroxyls are acetylated in R–VII. The configurations of the 2,3-dihydroxyls were deduced from the facts that 1) the $J_{1,2}$ and $J_{2,3}$



A



VII VIII VI IV II V IX X

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[4] NOE's between the C-3 and C-18 hydrogens, and the C-3 and C-19 hydrogens were separately found in the spectrum of R-VII.

are 7 and 3—4 Hz, respectively, 2) an NOE was observed between the C-2 and C-20 hydrogens, 3) NOE's were found between the C-3 and C-18 hydrogens and between the C-3 and C-19 hydrogens, and 4) R–VII formed the ethylidene-derivative (VII) which on acetylation yielded the 3-O-acetyl-ethylidene-derivative (VIII), mp 202—202.5°. It is worthy to note that, on periodate oxidation in methanol, R–VII readily consumed the reagent to give the 2,3-seco-derivative (IX), mp 138—139°, whose structure was deduced by the optical rotatory dispersion and circular dichroism curves (no Cotton effect for *n*-*π** of aldehyde carbonyls), and the NMR spectra of the seco-derivative (IX) and its acetate (X) (no aldehyde hydrogen signals were found and instead two acetal hydrogen signals, a doublet, coupled to the C-1 hydrogen signal, and a singlet, were formed, the latter being shifted down-field on acetylation). In order to confirm the structure of R–VII thus assumed, R–I (IV) was treated with perchloric acid in acetone to furnish the cleaved product which was identified as R–VII. Based on the above evidence, it is concluded that R–VII is represented by stereoformula II.

Addendum in Proof (May 4, 1972) After the submission of this communication,we have learned that the Shinshu University group has isolated two new diterpenoids, rhodojaponin V and rhodojaponin VI, from plant source, *Rh. japonicum* (R. Irie and I. Tomida, *Tetrahedron Letters*, in press). Their rhodojaponin V has been identified as our rhodojaponin V. Although their rhodojaponin VI appears to be identical with our bisdeacetylrhodojaponin VII, their rhodojaponin VI is amorphous.

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