\textbf{\textit{$\beta$-nor-Conidendrin} *}

\textit{Holger Erdtman and Bengt Lindberg}

\textit{Organisk-kemiska Institutionen, Kungl. Tekniska Högskolan, Stockholm, Sweden}

Following the discovery of the antioxidant \textit{nor}-dihydro-guaiaretic acid\textsuperscript{1} in \textit{Larrea divaricata}, Fisher, Kyame and Bickford converted conidendrin (sulphite liquors lactone) by demethylation with hydrobromic acid, to a product called \textit{nor}-conidendrin\textsuperscript{2}. This product appears to possess promising antioxidising properties. Conidendrin (\textit{a}-conidendrin) occurs in the wood of several conifers, \textit{e.g.} \textit{Podocarpus spicatus}\textsuperscript{3}, several species of the spruce genus\textsuperscript{4} and most hemlocks (\textit{Tsuga})\textsuperscript{5}. Large amounts of conidendrin are available from the waste liquors from the sulphite digestion of western hemlock (\textit{Tsuga heterophylla}) and a convenient process of isolation from these liquors has been worked out\textsuperscript{6}. This makes conidendrin, previously an 'academic curiosity', a substance of potential technical importance.

The yield of pure \textit{nor}-conidendrin obtained with hydrogen bromide is unsatisfactory. Consequently experiments were instituted to increase the yield by employing milder processes of demethylation. It was found that \textit{a}-conidendrin could be smoothly demethylated by pyridinium chloride\textsuperscript{7} to yield a pure crystalline product of at least 85 per cent yield **. The high melting, dextrorotatory substance had a composition corresponding to the formula \textit{C}_{18}\textit{H}_{16}\textit{O}_{6}. It contained no methoxyl groups but four hydroxyl groups as shown by the formation of a tetra acetyl derivate, which is also dextrorotatory. On methylation with methyl sulphate, a tetramethyl derivative was obtained which showed a zero rotation. This substance is identical with the \textit{\beta}-dimethyl sulphite liquors lactone obtained by Holmberg\textsuperscript{8} by the isomerisation of the normal methylation product of conidendrin (\textit{a}-dimethyl sulphite liquors lactone) with sodium ethoxide in ethanol. It follows that the

* Also XIII contribution on the \textit{Constitution of resin phenols and their biogenetic relations.} Part XII, this journal 3 (1949) 896.

** Patent pending.
formation of our nor-conidendrin is due to the demethylation of \( \alpha \)-conidendrin with simultaneous isomerisation under the influence of the demethylating agent. It is therefore \( \beta \)-nor-conidendrin. It is possible that \( \alpha \)-nor-conidendrin occurs in the mother liquors. The dextrorotatory acetate obviously belongs to the same series of \( \beta \)-conidendrin derivates. Dr. Moyer \(^5\) suggests that the crystalline demethylating products of conidendrin should be termed conidendrols. Thus, \( \beta \)-nor-conidendrin would be termed \( \beta \)-conidendrol.

**EXPERIMENTAL PART**

\( \beta \)-nor-Conidendrin

Conidendrin (5.2 g) and pyridinium chloride (11 g) were heated to 180° for two hours on a salt bath. The hot reaction mixture was poured into 2 N hydrochloric acid (80 ml) and the solution extracted continuously with ether over night. After evaporation the residue was dissolved in acetone (250 ml) and filtered through a column of aluminium oxide (5 × 2 cm) to remove some coloured impurities. The acetone was evaporated and the residue (4.7 g. Calc. 4.8 g) recrystallised from water (100 ml). Yield 4.0 g m.p. 245—246°. From the mother liquor a second crop (0.1 g) was obtained by partial evaporation. Total yield 4.1 g or 85%. The residue is an oil probably containing \( \alpha \)-nor-conidendrin. Repeated recrystallisations yielded pure substance. M. p. 248—249° (uncorr.)

\[
[a]_{D}^{20} + 13° \text{ (Acetone } c = 2) \\
C_{18}H_{16}O_{6} \quad \text{Calc.} \quad C \quad 65.8 \quad H \quad 4.92 \\
\quad \text{Found} \quad 65.7 \quad 4.92
\]

\( \beta \)-nor-Conidendrin tetraacetate. This substance was obtained in a quantitative yield by acetylation with acetic anhydride in pyridine. From ethanol crystals of m. p. 174—175°.

\[
[a]_{D}^{20} + 11° \text{ (Acetone } c = 2) \\
C_{26}H_{24}O_{27} \quad \text{Calc.} \quad \text{CH}_3\text{CO} \quad 34.7 \quad \text{Found} \quad \text{CH}_3\text{CO} \quad 34.7
\]

\( \beta \)-nor-Conidendrin tetramethyl ether. This substance was prepared by methylation of \( \beta \)-nor-conidendrin with methyl sulphate and alkali in an inert atmosphere essentially according to the method described by Holmberg \(^7\) for the methylation of \( \beta \)-conidendrin. The crystalline product melted at 139—140°, solidified and melted again at 153°. It showed no optical rotation and was identical with a specimen prepared by Holmberg. (Mix. m. p.)

**SUMMARY**

\( \alpha \)-Conidendrin has been demethylated with a good yield by means of pyridinium chloride. The demethylation is accompanied by an optical inversion and the nor-conidendrin obtained belongs to the \( \beta \)-series of conidendrin deriv-
atives as proved by its methylation to a product identical with \( \beta \)-conidendrin dimethyl ether.

We wish to express our thanks to Dr. W. Moyer for a generous gift of conidendrin.

REFERENCES

7. Prey, V. *Ber.* 74 (1941) 1219.
8. Holmberg, B. *Ber.* 54 (1921) 2906.

Received June 20, 1949.