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Antineoplastic Natural Products and the Analogues VI.

Panaxydol, the cytotoxic Principle of the Panax Ginseng Root against L1210 Cell

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It was previously reported that the petroleum ether fraction of the Korean ginseng root shows cytotoxic activities against L1210, L5178Y, Hela cell and Sarcoma 180 cell (1). In this study the cytotoxic substance against L1210 cell was isolated over a silica gel column and a preparative HPLC, followed by the cytotoxic assay (2).

This substance was found to show a very strong cytotoxic activity against L1210 cell (ED_{50} =0.03μg/ml).

The IR-absorptions of the active substance at 3,450cm^{-1}, 2,250cm^{-1}, 1,630cm^{-1} and 1,110cm^{-1} suggested that it is an alcohlic acteylenic compound with double bond. The multiplets at 6.15~5.15ppm and 3.25~2.75ppm in its NMR-spectrum correspond to typical peak shapes of the allylic system, $CH_2=CH-\underset{|}{CH}$, and the butylene oxide moiety, $-CH_2-\overset{O}{\overset{/\backslash}{CH-CH}}-CH_2-$, respectively. The PMR of its trimethylsilylated product shows one trimethyl silyl peak at 0.20 ppm, so that the active substance is monohydroxy compound.

In order to chemically verify the presence of the epoxy group, the active substance was hydrolysed with dil-H_2SO_4/ethanol at room temperature for 24 hrs. The hydrolysed product was oxidized by periodic acid to result in isolation of n-octanal. In the EI mass spectrum, there appeared main peaks at 161, 141, 119 and 99 m/e. The isobutane chemiionization spectrum of the active substance shows an (M+1) peak at 261 m/e and (M+1-H_2O) ion as the major peak at 243m/e. The 141 and 99 m/e peaks correspond to the structural moieties of $+\overset{O}{\overset{/\backslash}{CH-CH}}-(CH_2)_6-CH_3$, which could produce n-octanal under above mentioned reactions, and of n-heptyl, respectively. From the spectroscopical and chemical findings, it is concluded that the active substance contains the strutural moieties; $CH_2=CH-\underset{|}{CH}-$, acetylene, hydroxy, $-\overset{O}{\overset{/\backslash}{CH-CH}}-(CH_2)_6-CH_3$.

A literature search revealed that 6 actylenic componds were isolated from the Korean ginseng root (3-7). By comparing the physical data, it turned out that the active substance is identical with panaxydol (5), one of 6 acetylenic compounds.

Recently it has been claimed that a substance was isolated from the fresh ginseng root and spectroscopically identified as heptadeca-1-en-4, 6-diyn-3, 9, 10-triol (7). However, it was found that its NMR spectrum was identical with that of the active substance. For this reason, the claimed substance should be also panaxydol.

$$n-C_7H_{15}-\overset{O}{\overset{/\backslash}{CH-CH}}-CH_2-C\equiv C-C\equiv-\underset{|}{CH}-CH=CH_2$$
$$OH$$

Panaxydol

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