

20-EPIPROTOPANAXADIOL, A GENUINE SAPOGENIN

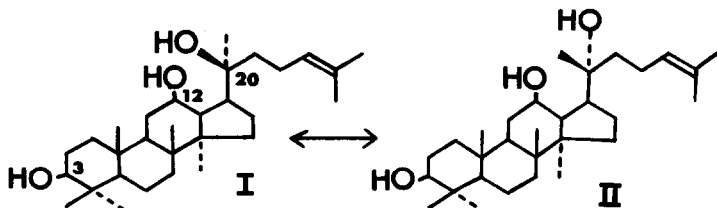
OF GINSENOSES R_{b-1} , R_{b-2} and R_c

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Although there were some confusions in the problem of the genuine saponins of neutral saponins of Ginseng, ginsenosides R_x ($x = a, b-1, b-2, c, d, e, (f), g-1, g-2, g-3, h-1, h-2$), it has now conclusively been established that the genuine sapogenin of ginsenosides R_{b-1} , R_{b-2} and R_c is 20-epi-protopanaxadiol (= 3-epi-betulafolienetriol; = 12 β -hydroxydammarenediol-II) (I).



As reported in our previous papers (1), the $C_{(20)}$ -hydroxyl of this type of compound is epimerized readily on treatment with acid. Therefore it would be reasonable to assume that the $C_{(20)}$ -R and $C_{(20)}$ -S epimers should exist in an equilibrium in the reaction mixture of the acid hydrolysis of ginsenosides R_x , though it has once been reported that the genuine sapogenin is proto-panaxadiol (II) having $C_{(20)}$ -R configuration, which was mainly obtained under the experimental conditions previously described (2).

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The $C_{(20)}$ -R type of compounds, protopanaxadiol, dihydroprotopanaxadiol and panaxadiol would have been separated out predominantly from the equilibrium mixture of R and S epimers by the sparing solubility and ready crystallization.

Avoiding the confusion by epimerization which would occur by the usual acid hydrolysis of saponin, ginsenosides R_{b-1} , R_{b-2} and R_c were oxidized respectively with sodium metaperiodate in an aq. solution. The precipitates produced by this reaction were washed successively with 2N H_2SO_4 and water, and then reduced with $NaBH_4$ in aq. ethanol. The reaction mixture was acidified with 2N H_2SO_4 to pH 1.8~2.0 and allowed to stand overnight at room temperature (3).

The aglycone obtained by this reaction was proved by thin layer and gas-liquid chromatography as being 20-epi-protopanaxadiol (= 3-epi-betulafoliene-triol) ($C_{(20)}$ -S), and the occurrence of protopanaxadiol ($C_{(20)}$ -R) was excluded conclusively. Treatment of the mixture of ginsenosides R_{b-1} , R_{b-2} and R_c in a larger amount by the same procedure as described above afforded crystalline 20-epi-protopanaxadiol, m.p. 199-200°.

Thus the genuine sapogenin of ginsenosides R_{b-1} , R_{b-2} and R_c has been established as being 20-epi-protopanaxadiol ($C_{(20)}$ -S) from which protopanaxadiol ($C_{(20)}$ -R) is derived as an artifact by the epimerization of $C_{(20)}$ -OH during the process of acid hydrolysis of the saponins.

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References

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