

Isolation of Ascorbic Acid and Rhamnosides from Sea Water

THE presence in sea water of a substance that is physiologically active in oysters and that can be measured photometrically with *n*-ethyl carbazole has been reported by Collier, Ray, and Magnitzky (1). Comparison of the *n*-ethyl carbazole absorption spectrum formed in sea water with spectra of pure carbohydrates led to the conclusion that more than one carbohydrate was taking part in the determination. Methods to isolate and identify the compounds were then sought.

The carbohydrates were removed from sea water onto a column of activated charcoal, as described by Whistler and Durso (2). They were then removed from the column by elution with ethanol. Evaporation of the eluate gave two white crystalline compounds, which were separated by their different solubilities in 50% ethanol. The substance that precipitates in 50% ethanol, as yet unidentified, gives some indication of being a rhamnoside.

Evaporation of the alcohol-water mixture produced a crystalline compound which, in water solution, gave an ultraviolet absorption spectrum similar to that reported for dehydroascorbic acid by Herbert, Hirst, Percival, Reynolds, and Smith (3).

In order to study the similarity between the absorption spectra more closely, we prepared a solution of dehydroascorbic acid by oxidizing ascorbic acid in the presence of Cu^{++} . The absorption spectrum of this oxidation product agreed very closely with that

of our compound from sea water, both in water and in 79% H_2SO_4 . The colors resulting from the reaction of the oxidized ascorbic acid and from our sample with 2,4-dinitrophenyldiazine exhibited the same spectra. The amount of sample available was too small to allow any extensive recrystallization and, therefore, any comparison of melting points with those reported in the literature was not feasible.

Absorption spectra from samples of sea water taken in various parts of the Gulf of Mexico agreed closely with the spectra we had run on oxidized ascorbic acid. We concluded from these curves that the vitamin is present in the sea largely in the form of dehydroascorbic acid. The amounts of vitamin as shown by the absorption spectra did not agree with the calculated amounts of carbohydrate found by the *n*-ethyl carbazole method. The discrepancy is probably due to the as yet unidentified "rhamnoside," which shows some color with *n*-ethyl carbazole. This "rhamnoside" is by far the most abundant carbohydrate in sea water. We have found concentrations as high as 0.1 g/l of the "rhamnoside" from inshore waters.

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References

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