LXII. CHEMICAL INVESTIGATIONS OF FRUITS AND THEIR PRODUCTS.

II. THE FATE OF SUGAR DURING "CIDER SICKNESS."

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THE disease known as "Cider Sickness" or "Second Fermentation" is, amongst all the disorders to which cider is liable, the most dreaded by cider makers in this country. It has been much studied by Barker [1906, 1907, 1911, 1912, 1, 2] who has shown that it is caused by a specific organism which attacks chiefly sweet ciders of low acidity when the temperature becomes somewhat raised. It causes a very rapid disappearance of the sugar, together with the formation of alcohol, acetaldehyde, formaldehyde, carbon dioxide, and hydrogen. He also obtained conclusive evidence that part of the sugar was converted into some non-reducing substance, which could not then be isolated nor its nature ascertained.

Since the acetylation method described in the preceding paper had proved so convenient for the isolation of sorbitol from apple juice it was decided to employ it for the investigation of the non-reducing substances present in "sick" cider. A quantity of the latter in which the "sickness" fermentation had been allowed to proceed to the ultimate limit was therefore concentrated under diminished pressure, purified by means of basic lead acetate, and the solids contained in the filtrate acetylated in the manner described in the foregoing paper. The resulting acetylated material, after purification in the manner employed when isolating the hexa-acetylsorbitol (preceding paper, p. 417), was obtained in noticeably greater yield than the corresponding product from the fresh juice. It could not, however, be induced to crystallise either by long keeping or by inoculating with a crystal of hexa-acetylsorbitol. When, however, a small particle of hexa-acetyl-*D*-mannitol was introduced crystallisation commenced and, during the course of some weeks, gradually spread throughout the viscid mass, but the proportion of crystalline material deposited was not large. The very viscid mixture was then brought on to a porous tile and allowed to drain in an atmosphere saturated with alcohol vapour. The white solid so obtained, after one crystallisation from alcohol, melted at 123° and was identified as hexa-acetyl-*D*-mannitol. A small amount of hexa-acetylsorbitol

was subsequently isolated from the viscid material which had been absorbed by the tile.

Since no mannitol could be detected in apple juice after fermentation with yeast only, it appears evident that fermentation by the "sickness" bacillus results in the reduction of a portion of the sugar present to mannitol, a change which is known to be brought about by certain other bacteria and which is in harmony with the observation of Barker that hydrogen is evolved during "sickness" fermentation.

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