LXI. CHEMICAL INVESTIGATIONS OF FRUITS AND THEIR PRODUCTS.

I. APPLE JUICE AS A SOURCE OF SORBITOL.

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THE material generally employed as a source of the hexahydric alcohol, sorbitol, namely, the berries of the Mountain Ash (*Pyrus aucuparia*, Gaertn.), is not always readily obtainable, even at the appropriate season of the year. Moreover, in the author's experience, it is by no means always an easy matter to isolate sorbitol from this source. During an investigation on the constituents of apples it has been found that they contain an appreciable proportion of sorbitol and, since apples are always obtainable and the isolation of sorbitol from them may easily be accomplished, it would appear that this fruit affords the most convenient source for the compound in question. The method employed for the isolation of sorbitol from apples is briefly as follows.

The apple juice was first concentrated under diminished pressure to about one-third its volume. A slight excess of basic lead acetate solution was then added and the resulting precipitate removed by filtration. The filtrate, after being deprived of lead by means of hydrogen sulphide, and the excess of the latter removed, was fermented with yeast in an incubator until the evolution of carbon dioxide had apparently ceased¹. The mixture was then considerably concentrated under diminished pressure and again treated with basic lead acetate as previously described, after which the filtrate, which was now much diminished in volume, was again fermented, as it was found that an appreciable amount of sugar always remained after the first fermentation was apparently complete. A final clearing with lead was then employed and the filtrate, after being deprived of lead, was evaporated as far as possible under diminished pressure.

The gum-like residue so obtained was then covered with an excess of acetic anhydride, some pyridine added as a catalyst, and the mixture cautiously warmed on a water-bath, when acetylation occurred rapidly after the temperature had been somewhat raised. When the first vigorous reaction was over the mixture was kept boiling for 1 hour to ensure complete acetylation, after

¹ The addition of some "yeast water" and a little ammonium phosphate greatly accelerates the fermentation.

which it was cooled to about 50° and water cautiously added to decompose the excess of acetic anhydride present. Finally, a considerable excess of water was added and the mixture extracted several times with ether. The combined ethereal extracts were washed several times with water and then extracted successively with aqueous sodium carbonate and sodium hydroxide, after which they were again washed with water, and dried. During the extraction with alkalis and the final washing with water appreciable amounts of brown, resinous products were removed. On evaporating nearly all of the solvent from the purified ethereal extract a pale yellow residue was obtained, which soon crystallised in aggregates of hard, colourless prisms. The latter were deprived of adhering, pale yellow, viscid material by draining on a porous tile in an atmosphere saturated with ether. After recrystallisation from ethyl acetate colourless prisms melting sharply at 99° were obtained, and were identified as hexa-acetylsorbitol. In *Richter's Lexicon* the latter compound is described as a syrup, on the authority of Vincent and Delachanal [1889] but Thorpe [1912] gives the melting point as 99°, in accordance with the value found by the present author. Hexa-acetylsorbitol is readily soluble in alcohol, moderately so in ethyl acetate and rather sparingly soluble in ether. It dissolves slightly in boiling water.

For the regeneration of sorbitol 2 % aqueous sulphuric acid was added to a quantity of the above-described hexa-acetyl derivative and the mixture boiled in a flask attached to a reflux condenser until solution was complete. Steam was then passed through the mixture until acetic acid was no longer removed, after which the sulphuric acid was exactly precipitated by the addition of aqueous baryta, and the filtrate from the barium sulphate evaporated to dryness under diminished pressure. The residue so obtained was dissolved in alcohol from which it slowly separated in colourless crystals which, after drying, melted at 110°, and were identified as *d*-sorbitol.

REFERENCES.

- Vincent and Delachanal (1889). *Compt. Rend. Acad. Sci.* **109**, 676.
Thorpe (1912). *Dictionary of Applied Chemistry*, **1**, 648.