

## HONEY FROM THE APHIS OR PLANT LOUSE.

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Since the publication of my article on honey dew in the AMERICAN CHEMICAL JOURNAL, Vol. 13, pages 24 *et seq.*, I have had opportunity to examine several samples of honey collected by the bees from so called honey dew. Entomologists are not yet quite agreed in regard to the nature of honey dew, but most of them take the position that it is an exudation of the plant louse rather than an exudation from foliage which has been attacked by the plant louse. In other words the honey gathered from the plant louse has been twice digested, once in passing through the organism of the aphis, and once in passing through the organism of the bee.

In the examination of the pure honey dew collected from the trees, which is mentioned above, it was found that it contained a right-handed body having approximately a specific rotatory power of  $105^\circ$ , the rotation of arabinose. A sample of honey which was collected at the same time from the neighborhood, however, indicated that it was normal honey, showing that the bees did not store at least this sample of honey from the exudation above mentioned.

I had sent to me during the past summer a sample of honey with a statement that it was made by the bees gathering the honey from the plant louse. It had a right-handed polarization at a temperature of  $30^\circ$  of 23.10 divisions of the cane sugar scale and contained by inversion 5.21 per cent. of sucrose. In the dry substance it contained 71.58 per cent. of invert sugar, and the sum of the invert sugar and the sucrose, in the dry substance, was 77.62 per cent. It contained .62 per cent. of ash, making a total of 78.24 per cent. of solid matter by the determination of the invert sugar, the sucrose and the ash leaving 21.76 per cent. of solid matter presumably of the nature of the substance described in my first

paper. This sample of honey was polarized at  $88^{\circ}$ , at which temperature the invert sugar became optically neutral. Any excess of polarization, therefore, at that temperature must be due to the sucrose and other right-handed bodies present in excess or the dextrose and levulose or the invert sugar. The polarization at  $88^{\circ}$  of the sample under consideration was 40.30 divisions of the cane sugar scale. Deduct from this the polarization due to sucrose, namely, 5.21, and we have 35.09 divisions due to the rotation of the right-handed bodies in excess. This rotation must have been produced by the solid matter unaccounted for in the above analysis, namely, 21.76 per cent. Did this solid matter have the same specific rotatory power of cane sugar it would have polarized 21.76 divisions. If, on the other hand, it had the specific rotatory power mentioned above for the right-handed bodies, namely, 105, its polarization would be 34.9 divisions of the cane sugar scale which approximates very nearly to the actually observed polarization, namely, 35.09. Therefore it is certain that the right-handed body present in this sample is also one of the carbohydrates with a specific rotatory power of approximately 105, which confirms in every particular the results of the first investigation.

Unfortunately, the quantity of the sample which was sent me was only sufficient for the determinations mentioned, and therefore I did not have enough of the material to determine actually whether the substance present was arabinose or some other body or mixture of bodies with approximately the same specific rotatory power. I am promised, however, for next summer an abundant supply from the same source and I hope to be able to determine definitely the nature of this right-handed body.

Other samples of plant louse honey were also received by me and showed quite uniformly a slight right-handed rotation at ordinary temperatures, and also a marked deficiency of reducing sugar calculated as invert sugar. In every instance, also, so far observed, the percentage of ash in these plant louse honeys has been far above the average of the percentage of ash in pure floral honeys. The percentage of ash in six samples of honey, which were said to be of plant louse origin, are as follows seriatim : .62, .59, .79, .46, .78, .44.

It is true that in some samples of pure floral honey the percentage of ash approximates the percentage given, but in general it is very much less.

The three phenomena taken together, namely, right-handed polarization at ordinary temperatures, great deficiency in invert sugar, and high ash content appear to be, from the investigations so far made, analytical points by means of which a plant louse honey can be differentiated from a pure floral honey. It is understood, however, that the statement above made rests upon the analysis of six or eight samples of honey which, according to the reports received with the samples, were gathered largely from the exudations of the plant louse. An examination of a larger number of samples may show this dictum in regard to ash is not a reliable one, but the dicta respecting invert sugar and polarization are certainly correct. In other words, it appears possible, at the present time, to discriminate between a honey gathered by bees from exudations of plant lice and a pure floral honey extracted from the flowers themselves by the bees.