## XXVII. *On the Sugar of the Eucalyptus.* By James F. W. Johnston, *Esq.*, *M.A.*, *F.R.S.*

Read December 20, 1842.

In Van Dieman's Land a species of sugar or manna falls in drops or rounded opaque tears from several species of *Eucalyptus*. This is collected in considerable quantity, but it is doubtful still I believe whether it is a natural exudation of the trees from which it falls, or, like the different kinds of honey-dew in our own country, is the consequence of punctures made by insects.

I am indebted for a portion of this manna to Sir W. Jackson Hooker, to whom also I owe the above information regarding its origin. It is soft, slightly yellowish, opaque, is inferior in sweetness to cane-sugar or to ordinary manna, and is in small, rounded, slightly cohering masses. Æther extracts from it only a minute portion of wax, alcohol leaves behind only a small quantity of gum, while water dissolves it without sensible residue.

The aqueous solution crystallizes on evaporation in minute radiating prisms and prismatic needles which form rounded masses having a crystalline structure. It is obtained however from water in distinct crystals with much greater difficulty than from its solution in ordinary alcohol. In boiling alcohol it dissolves in considerable quantity, and is in a great measure precipitated in beautiful white but minute prismatic crystals as the solution cools. It not unfrequently deposits itself also in the form of a white hard and solid crust on the bottom and sides of the bottle into which the hot solution is filtered.

This sugar as it crystallizes from the alcoholic solution has

the same constitution as grape sugar, $C_{12}$ $H_{14}$ $O_{14}$, or $C_{24}$ $H_{28}$ $O_{28}$, but it differs from grape-sugar in its appearance, in in its relations to alcohol as above described, in the ease with which it can be obtained in a pure crystallized form, and in its relations to heat.

When suddenly heated at once to 200° or 212°, it melts and loses 5 atoms of water, whereas grape-sugar loses only *four*. But if it be first gradually heated and kept for two or three hours at 180° only, it will part with seven atoms of water *without melting*. In that respect it resembles a salt, which if heated suddenly will melt in its water of crystallization, but by a cautious regulation of the heat may be dried without undergoing fusion. If once melted, this sugar may be kept for several hours at 212° without losing *much* more than the five atoms, and it must be raised to 240° or 250° before it parts with the whole seven, and in every case in which I have made the experiment has even assumed a brown colour, owing to incipient decomposition before the seven atoms have been altogether removed.

When the seven atoms have been driven off by a heat not higher than 200°, the dry powder may be heated to 280°, when it begins to fuse, and may be kept for several hours at 300° without further loss or any change of colour.

After being thus heated the sugar attracts moisture rapidly from the air, and if left over night in a damp room it will assume the form of transparent globules of syrup, which gradually crystallize into colourless radiated masses having the original weight of the portion of sugar experimented upon. We may conclude therefore that the seven atoms are altogether water of crystallization.

When mixed with oxide of lead moistened with water and then gradually dried and heated to 300°, it *appeared* to lose two additional atoms of water without undergoing decomposition; but when exposed to the air on cooling, the mixture rapidly attracts water again from the air. When this mixture after thus heating is boiled with distilled water and thrown upon the filter, a solution of sugar passes through in which hydrosulphurets detect no trace of lead.

The following formulæ exhibit the constitution of this sugar and the loss of weight it undergoes at different temperatures:—

| | | Loss by experiment, per cent. |
|---|---|---|
| Crystallized sugar before or after heating . . . | $C_{24}$ $H_{21}$ $O_{21}$ + 7 HO | |
| Fused at 212° to 220° . | $C_{24}$ $H_{21}$ $O_{21}$ + 2 HO | 11·23 |

| | | Loss by experiment, per cent. |
|---|---|---|
| Dried without fusion between 180° and 300° | $C_{24}\ H_{21}\ O_{21}$ | 15·88 |
| Dried at 260° to 300° with oxide of lead . . | $C_{24}\ H_{19}\ Pb_2\ O_{21}$ ? | 20·82 ? |
| This again exposed to the air became . . . | $C_{24}\ H_{19}\ Pb_2\ O_{21} + 7\ HO$ ? | |

This sugar, in its relations to alcohol, in the ease and readiness with which it crystallizes from an alcoholic solution, and in the appearance of its crystals, has much resemblance to manna-sugar (Mannite). It is more soluble however in boiling alcohol than mannite, and is therefore obtained in larger quantity on the cooling of the alcohol in which it has been dissolved by the aid of heat. Mannite also, if heated gradually, may be raised to 300° (I do not know how much higher) without either melting or undergoing any loss of weight.

Eucalyptus-sugar gives a precipitate of a slightly brownish tinge with caustic baryta; and a white precipitate is also obtained by mixing it with a solution of ammoniacal trisacetate of lead. This salt of lead I am at present preparing for analysis, and I hope to have the honour of submitting the results to the Society at a future meeting. In the mean time the formulæ presented in this notice must be considered as open to correction.