

water except as nitrates. The very word 'manuro' means cultivation which promotes both the production of available nitrogen and its accumulation as nitrates.

Nitrogen has, therefore, not only a nutritive function in bacterial and plant metabolism, but probably also that of an oxygen carrier in biological oxidation and in plant respiration.

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¹ Comber, N. (1930), *The Fertilizer and Feeding Stuff Journal*, 25, 419.

² Stickland, L. H., *Biochem. J.*, 25, 1543; 1931.

THE relevant statements made by Sir Frederick Keeble in his lecture to the Royal Institution, of which the article referred to by Mr. Barritt was a summary, were as follows: "Soil bacteria other than those which break down organic nitrogen by gradual stages into ammonia may set the nitrogen free again and in the interplay of these ammonia-forming and nitrogen-liberating bacteria are to be discovered the secrets of soil fertility and infertility. . . . Life must therefore depend on the resultant of these opposing forces, the nitrogen-fixers and the nitrogen liberators and hoarders."

If we take the words "the resultant of these opposing forces" in the dynamic sense, there does not seem to be much call for criticism, for the ingestion of nitrogenous compounds by bacteria must for the time being remove them from the sphere of action of the plant. In the long run, of course, the hoarding is not opposed to the fixing, for the nitrogen becomes available.

THE WRITER OF THE ARTICLE.

Synthesis of *d*- and *l*-Ascorbic Acid (Vitamin C)

In a preliminary communication¹ we reported that by treatment of osones with hydrocyanic acid, succeeded by hydrolysis, we obtained products which possessed the strong reducing power of ascorbic acid. Starting from *d*-xylosone we were able to isolate a small amount of the reducing substance as the crystallised acetone derivative. From the melting point, analysis and iodine-titration, we considered the substance to be the acetone derivative of *d*-ascorbic acid.

Meanwhile we have improved the synthetic method in such a way that the free acids are obtained as pure crystals from both *d*- and *l*-xylosone. The products have the following constants:

d-Form. m.p. 187–189° (cor. decomp.) $[\alpha]_D^{25} = -48^\circ$ ($c=1$ in methanol)
Found C=41.06 per cent, H=4.72 per cent. Alkali-equiv. 176.2,
Iodine-equiv. 87.4

Calcul. C=40.89 per cent, H=4.58 per cent. Alkali-equiv. 176.1,
Iodine-equiv. 88.0

l-Form. m.p. 186–189° (cor. decomp.) $[\alpha]_D^{25} = +48^\circ$ ($c=0.85$ in methanol)

Found C=41.05 per cent, H=4.77 per cent. Alkali-equiv. 175.5,
Iodine-equiv. 87.1

For the natural ascorbic acid Vargha gives $[\alpha]_D^{25} = +50^\circ$ ($c=1$ in absolute methanol)²

A sample of natural ascorbic acid, for which we thank Prof. Szent-Györgyi, showed a melting point 187°–189° (cor. decomp.). A mixture with the synthetic *l*-form melts unaltered at 187°–189°, while with the *d*-form a strong depression is shown. When equal amounts of the *l*- and *d*-form are crystallised

together, they give crystals of melting point 168°–169° (cor.) and $\alpha_D = 0^\circ$.

There can, therefore, be practically no doubt that the synthetic *l*-form is identical with natural ascorbic acid. Experimental details and the results of physiological tests will be published later in the *Helv. chim. Acta*.

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¹ *Helv. chim. acta*, 16, 561; 1933.

² *NATURE*, 130, 847, Dec. 3, 1932.

Reducing Property of Aqueous Humour

EXPERIMENTS on the significance of the aqueous humour in the lens's metabolism, which I have been carrying out during the past few years¹, have shown that the power of the aqueous humour of cattle and of the rabbit to reduce methylene blue does not depend upon the presence of an enzyme, but essentially upon a reducing substance which is present in the trichloroacetic acid filtrate and can be titrated with iodine. The trichloroacetic acid filtrate, as well as the aqueous humour in which the protein has been deactivated by heating, obtained from 1 c.c. of aqueous humour, unites with approximately 1 c.c. of a *N*/500 iodine solution.

These reducing substances are sensitive to oxygen in an alkaline medium, whereas in an acid milieu and in the presence of oxygen they retain their power to reduce iodine. The reduction of methylene blue by aqueous humour can be accelerated by increasing the alkalinity and by the addition of sodium cyanide (NaCN). These reducing substances create an electrical potential in the aqueous humour which is measurable, well defined, easily reproduced, and the intensity of which depends upon the concentration of the aqueous humour; it is determined, therefore, by the concentration of the reducing substances.

SH-containing substances, such as glutathione and thioncin, are not demonstrable in aqueous humour.

The nature of the oxygen sensitivity, the power to reduce iodine, the creation of a well-defined and reproducible oxidation-reduction potential the intensity of which depends upon the concentration of the reducing phase, the acceleration of the methylene blue reduction by means of NaCN and alkalis, the fact that SH-containing substances are not present in appreciable amounts in aqueous humour, induces me to believe, in conformity with recent results obtained by Tillmans, Szent-Györgyi, v. Euler and others, that the above-mentioned reducing substances of the aqueous humour should probably be considered as vitamin C. This has led me to further, as yet, unfinished experiments.

L. J. Harris's recent communication² stating that he has found large amounts of vitamin C in aqueous humour, is of the utmost importance, for we ought now, in the light of the reducing substances which I have found and characterised, to denote them as vitamin C.

The vitamin C of the aqueous humour stands in a close relationship to the metabolism of the lens. It is traceable by iodine titration only in minimal