XLIV. NOTE ON THE COLOURING MATTER OF RED TORULAE.

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Some years ago I undertook in conjunction with Mr F. G. S. Baker, an investigation of the red torulae with the object of isolating as many distinct species as possible, and of obtaining results which might serve as a basis of classification. In connection with this work, during which six different species were obtained and studied, I commenced a subsidiary investigation of the red colouring matter present in these organisms.

One of the six species of torulae above referred to was grown on large plates containing wort-agar. When a sufficient quantity had accumulated the growth was scraped off, care being taken to remove as little of the agar surface as possible. It was then dried at a low temperature and was thoroughly ground with fine sand. The resulting material was then extracted with various solvents, chloroform and carbon disulphide giving the best results. In the case of both these solvents deep red solutions were obtained, which on cautious evaporation gave a coloured residue containing fat and probably some phytosterol. With the small quantities obtained the separation of these fatty substances was found to be impossible, and consequently no crystals could be got. It was found at the commencement of the work that the solution in chloroform when warmed and exposed to the light quickly became colourless, a fact which suggested that the colouring matter might be allied to carotene. The extracted substance behaved like carotene in certain other respects, being practically insoluble in water, and dissolving in concentrated sulphuric acid with a deep blue colour. About the time the work had reached this stage, Schimon presented to the University of Munich, a dissertation dealing with certain red coloured lower fungi. He appears to have obtained the same general reactions for the extracted colouring matter,

and concluded that it was identical with carotene. Prior to the publication of this dissertation, I had commenced a study of the absorption spectrum of the colouring matter, with the object of comparing it with that of carotene, and I observed that the two were not by any means the same. The examination was first made in carbon disulphide solution, with a glass prism, and the spectra were photographed, using Wratten and Wainwright's "Panchromatic" plates. In the case of the colouring matter from the torula, the light passed between wave lengths 5900 to about 7000, whilst in the case of carotene, a much larger amount of the yellow portion of the spectrum was visible, the range of wave lengths being from about 5500 to 7000. In view of these results, I decided to make an examination of the colouring matter with a quartz prism, so as to obtain some information in regard to the far violet. The source of light used consisted of a Nernst lamp, and the solution of the colouring matter was contained in a Baly tube permitting of a progressive increase in the thickness of the solution examined without changing the containing vessel. For each exposure the position of the sodium lines was recorded by means of a small reflecting prism attached to the instrument, and on each plate the copper arc was photographed as an additional aid to fixing the position of the bands. Solutions of pure carotene (prepared from carrots) in carbon disulphide were compared side by side with corresponding solutions of the torula colouring matter. In both cases observations were made in thicknesses 1, 2, 3, 4, 5, 6, 8, 10, 13, 16, 20, 25, 32, 40, 50, and 63 millimetres. The strength of the carotene solution was 5.3 milligrams per litre, and the solution of the torula colouring matter was made of such a strength that the intensity of the absorption bands was comparable with that of the carotene bands. Wratten and Wainwright's "Allochrome" plates were used, as these are insensitive to red light of greater wave length than about 5890. These, however, show a thin absorption band in the green, due to the colouring matter used in the preparation of the plates. "Panchromatic" plates were found to be less suitable for the purpose. The resulting spectrographs were found to differ very considerably and in a manner which might have been anticipated from a consideration of the absorption spectra as observed with the glass prism. It was found that in the case of the colouring matter of the torula, practically the whole of the yellow is cut off in solutions of sufficient concentration, whereas even in very much stronger solutions of carotene the whole of the yellow passes. Moreover the absorption band in the blue is much wider in the case of carotene than in the case of the torula colouring matter.

It is clear from these observations, either that the colouring matter of the torula consists of some other substance than carrotene, or that it consists of a mixture of carrotene with some other colouring matter. The solubility of the torula colouring matter in light petroleum appears to indicate that it does not belong to the xanthophyll group.

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