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Specific Rotation and Phosphate Content of Cold-Water-Soluble Fractions of Ground Corn and Wheat Starches.

JOHN FIELD, 2D. (Introduced by C. L. Alsberg.)

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Starch, as it occurs in nature, is not soluble in cold water, and hence one cannot determine the specific rotation of the untreated substance. The several soluble starches, which have formed the basis of numerous optical studies, represent natural starches altered either by heating or treatment with reagents, or by treatment with enzymes, or by some combination of the above procedures.

The reported values of the specific rotation of the various starches range from 216.0° to 182.0°. This wide range of results indicates that the determinations were made on starches hydrolyzed to a varying extent, or on untreated solutions so opalescent as to prevent accurate evaluation of the specific rotation.

It was shown by Alsberg, Griffing, and Field[1] that clear solutions could be prepared from purified starch by dry-grinding in a pebble-mill, dispersion in cold water, and centrifugation. This technique is particularly effective with wheat and corn starches. These solutions are water-clear, dialyze through collodion, and give an intense blue with iodine. Such solutions are always very dilute.[2, 3]

The specific rotation of these solutions has been determined. The source of light employed was an electric lamp of the type described in Circular 44, U. S. Bureau of Standards, page 34. Determinations of the concentration of the starch solutions were made by the method of Munson and Walker.

The average of a number of determinations gave 196.0° for the specific rotation of the cold-water-soluble portion of ground corn starch, and 194.7° for wheat starch, with the light-source specified. This difference is not significant in view of the fact that it lies in the range of analytical error in determining the concentrations of such dilute solutions. These determinations afford no evidence that the cold-water-soluble fractions of ground corn and wheat starches differ in character.

Furthermore it has been found that the cold-water-soluble fractions of ground corn and wheat starches contain no phosphate,

[1] Alsberg, C. L., Griffing, E. P., Field, J., *J. Am. Chem. Soc.*, 1926, xlviii, 1299.

[2] Alsberg, C. L., *J. Ind. and Eng. Chem.*, 1926, xviii, 190.

[3] Field, J., and Becking, L. G. M. B., *J. Gen. Physiol.*, 1926, ix, 445.

which confirms some earlier observations by Samec.[4] The recently published method of Embden was used in testing for phosphate.[5]

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Induced Encystment and Excystment of a Marine Euplotes, Sp. Nov.

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A new species of Euplotes, a marine hypotrichous ciliate, found in San Francisco Bay can be readily induced to encyst and excyst at will by the following method.

By means of a micro-mouth pipette, from 25 to 35 organisms picked at random from a thriving culture are placed on a slide or coverslip within a drop of the culture medium. The slide (or coverslip) is then placed in a moist chamber to allow gradual evaporation to take place. The rate of evaporation under these conditions at about 22° C. gives the best results. Within 1 to 10 hours, or even less time, encystment occurs. This process includes a gradual decrease in motility of the organisms until they become fixed to the slide, whereupon they gradually assume a rounded form. External organelles at first can be recognized within the cyst wall but later disappear from view. Excystment takes place when a small drop of fresh culture medium, tap, or distilled water is added to the drop containing the cysts. The time required for complete excystment depends upon the age of the cyst and varies from a few minutes to 1 or 2 hours. A contractile vacuole reappears and functions slowly soon after the addition of water. The cyst wall breaks, usually just above the contractile vacuole. The contents stream to the outside, external organelles make their appearance, and soon the organism again becomes free-swimming.

The above method has proved to be an excellent means for studying the structural changes which occur during cystment. The coverslip is inverted upon a depression slide, the edges sealed with vaseline, and now the slide may be placed under a microscope. There the processes of encystment and excystment can be studied with any magnification, including oil immersion. This coverslip method provides also a means of making permanent slides without danger of

[4] Samec, M., *Koll. Chem. Beihefte*, 1914, vi, 23.

[5] Embden, G., *Z. fur physiol. Chem.*, 1921, cxiii, 138.