SPECIAL ARTICLES

EFFECT OF INDOLE-3-ACETIC ACID ON PHOTOSYNTHESIS

W. MITCHELL and CH. L. HAMNER[1] have recently shown that indole-3-acetic acid (heteroauxin) "stimulates plants to synthesize more solid matter, without causing a corresponding increase in leaf area." The authors' conclusion is based on experiments with young decapitated kidney-beans (*Phaseolus vulgaris*), where a lanoline paste containing indole-3-acetic acid was applied on the cut surface of the stem end. Such plants accumulated in the course of three days almost twice as much dry matter as did the control under identical environmental conditions. The control plants were also decapitated but treated with lanoline paste without heteroauxin.

The most probable explanation of the interesting fact established by Mitchell and Hamner is that heteroauxin from the paste on the cut surface penetrated into the green leaves of the experimental plants and intensified their photosynthetic activity. This assumption is supported by the experiments conducted by the authors during the summer of 1938.

Pairs of leaves were cut off from various plants (lilac, poplar, jasmine, hemp, hydrangea and others), care being taken to choose leaves as similar as possible in regard to age, size and position on the stem. The leaves were placed into two glass chambers, the lower ends of the leaf petioles being immersed in a Knop solution, and the intensity of photosynthesis determined. Electric lighting was employed. The surface of the chambers was cooled by a stream of running water in order to avoid overheating the leaves. The leaves were lighted for about one and three quarters of an hour. After several hours, a second determination was made of the quantity of carbonic acid decomposed by these leaves under the same conditions of lighting and in the course of an equal interval of time. These two determinations made it possible to estimate the photosynthetic activity of the leaves experimented on. It was expressed in milligrams of carbonic acid decomposed by one square decimeter of leaf surface in one hour.

One of the leaves was then immersed with the lower end of the petiole in a Knop solution containing 1 mg of heteroauxin per liter of water; while the other (control) was immersed in a Knop solution without heteroauxin. After several hours both leaves were again placed in the chambers and the intensity of assimilation was determined under the previous environmental conditions.

These experiments, repeated many times with various subjects, showed in the vast majority of cases a considerable intensification of photosynthesis under the influence of the indole-3-acetic acid introduced into the leaf. Thus, the hemp leaf, whose photosynthetic activity was expressed by figures of 10.00 and 9.60 mg in the first two determinations in the Knop mixture (with a four-hour interval between experiments), gave 19.24 mg and, in four hours, 18.00 mg of decomposed CO_2 after being kept in a Knop solution with heteroauxin (1 mg per liter) for nine hours. The control leaf gave the following values on parallel determinations: 12.10; 12.90; 14.73; 13.80. It should be noted that the photosynthetic activity in the control leaf kept in a Knop solution remained at the same level for the subsequent thirty hours; whereas, the experimental plant receiving the same solution with the addition of heteroauxin showed a considerable reduction of photosynthesis towards the end of the experiment (control, 14.83 mg; experimental leaf, 2.10 mg).

In another experiment on hydrangea, where the leaf was kept for 24 hours in a Knop solution with heteroauxin, the intensity of photosynthesis increased from 5.10 to 14.88 mg, while in the control leaf a decrease—from 3.34 to 2.14 mg—was observed.

Using higher heteroauxin concentrations (10 mg per liter) did not cause any changes in photosynthesis in our experiments.

Thus we arrive at the conclusion that indole-3-acetic acid causes a temporary intensification of photosynthesis on being directly introduced into the assimilating tissues of the green leaf in very low concentrations.

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[1] *Botan. Gazette*, March, 1938, p. 569.

GROWTH OF SOME HEMOLYTIC STREPTOCOCCI ON A CHEMICALLY DEFINED MEDIUM

HEMOLYTIC streptococci have previously been grown in complex media containing tissue extracts and have not been successfully cultured on mixtures of pure chemicals. Many problems dealing with the metabolic activity of these organisms would be aided if it were possible to know all the constituents of the medium on which the bacteria were grown. We have been able to obtain luxuriant growth of a representative strain of hemolytic streptococci on a medium containing only pure chemical compounds. The organism used was one of the Lancefield type D group, *S. zymogenes* strain H-6905.

We have recently shown[1] that a wide variety of hemolytic streptococci require riboflavin, pantothenic acid and a suitable reducing substance such as "reduced" iron. In addition, protein hydrolysates and

[1] D. W. Woolley and B. L. Hutchings, *Jour. Bact.*, in press.