

other rare earth on the column as the material is eluted. It was also noted that in the cases tested the pH of the solution which comes from the column varies with the rare earth being eluted and differs by about 0.05 of a pH unit for adjacent rare earths. With binary mixtures of 50–50% neodymium–praseodymium and neodymium–samarium, it has been found possible to recover from 60 to 90% of each of the rare earths in such purity that the other rare earths could not be detected spectrophotometrically in these fractions.

Work is being continued and the details of this process will be presented in a paper soon to be submitted for publication.

CONTRIBUTION No. 29
FROM THE INSTITUTE FOR
ATOMIC RESEARCH AND
THE DEPARTMENT OF
CHEMISTRY, IOWA
STATE COLLEGE
AMES, IOWA

F. H. SPEDDING
E. I. FULMER
BUELL AYERS
T. A. BUTLER
JACK POWELL
A. D. TRVEBAUGH
ROBERT THOMPSON

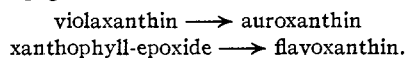
RECEIVED FEBRUARY 9, 1948

LEAF XANTHOPHYLLS

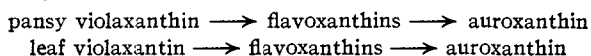
Sir:

Recently, a violaxanthin-like xanthophyll called xanthophyll-epoxide has been reported as a new leaf pigment.¹ However, earlier observations indicate that this leaf xanthophyll is spectroscopically identical with violaxanthin, obtained originally from pansies (*Viola*).² Moreover, leaf violaxanthin and pansy violaxanthin are chromatographically identical in Tswett columns of magnesia or of sugar.³

Karrer and co-workers also claim that, in spite of other similarities, violaxanthin and leaf violaxanthin (their xanthophyll-epoxide) yield different pigments when treated with acids¹



By contrast, I have found violaxanthin from the two sources to react with acids in the following way



Obviously, pansy violaxanthin and leaf violaxanthin are identical with respect to their reaction with acids. This xanthophyll, whether obtained from pansies or from leaves, should, therefore, be called violaxanthin, not xanthophyll-epoxide.

In spite of Karrer's assertions to the contrary,¹ numerous experiments confirm the complexity of the leaf pigment mixture. The leaves of some fifty plants, ranging from ferns to angiosperms, have yielded the following pigments: chlorophylls a and b (with traces of chlorophylls a' and b'), neoxanthin, zeaxanthin, violaxanthin,

(1) Karrer, Krause-Voith and Steinlin, *Helv. Chim. Acta*, **31**, 113 (1948).

(2) Kuhn, Winterstein and Lederer, *Z. physiol. Chem.*, **197**, 141 (1931).

(3) Strain, Manning and Hardin, *Biol. Bull.*, **86**, 169 (1944).

lutein, cryptoxanthin-like pigments and β -carotene = α -carotene. In leaves of eleven species of cycads representing six genera, taraxanthin, identical with taraxanthin from dandelions, accompanies the pigments just enumerated. In most of these plants, lutein is the principal xanthophyll, violaxanthin is slightly less abundant, neoxanthin occurs in small amounts, and zeaxanthin and the cryptoxanthin-like pigments are present in very small proportions. Traces of flavoxanthins are sometimes found in the leaf extracts.

When the pigments of fresh leaves are extracted with methanol or acetone, transferred to petroleum ether, adsorbed in columns of powdered sugar, and washed with petroleum ether containing 0.5% propanol, the following sequence of adsorbed pigments is obtained: neoxanthin, violaxanthin, (flavoxanthins), chlorophyll b, (taraxanthin), lutein plus zeaxanthin⁴ plus chlorophyll b', chlorophyll a, chlorophyll a', cryptoxanthin-like pigments and the non-adsorbed carotenes.

1,2-Dichloroethane, formerly employed for the resolution of leaf xanthophylls by adsorption,⁵ decomposes easily, especially in the presence of moisture, yielding hydrochloric acid. Unless special precautions are observed, the action of this acid on the leaf xanthophylls dissolved in dichloroethane may decrease the amount of violaxanthin and increase the amounts of flavoxanthins and isolutein.⁵

All these facts confirm the identity of violaxanthin from leaves and from pansies. They indicate that flavoxanthins can be converted into auroxanthin. They illustrate the complexity and the lability of the leaf xanthophylls. They point to precautions to be observed in the handling of leaf xanthophylls, and they illustrate problems in nomenclature arising from the use of different names for a single substance.

(4) Strain, *THIS JOURNAL*, **70**, 588 (1948).

(5) Strain, "Leaf Xanthophylls," Carnegie Inst. Wash., Publ. 490, Washington 1938.

CARNEGIE INSTITUTION OF WASHINGTON
DIVISION OF PLANT BIOLOGY
STANFORD, CALIFORNIA

HAROLD H. STRAIN

RECEIVED MARCH 29, 1948

A SYNTHESIS OF STREPTIDINE

Sir:

There has been reported¹ the synthesis of hexaacetylstreptamine from D-glucosamine by a method which establishes its configuration, and that of streptidine, as all-*trans*. We wish to record herein the conversion of hexaacetylstreptamine to streptidine sulfate monohydrate, thus completing the synthesis of the latter from D-glucosamine. Hexaacetylstreptamine was saponified with aqueous sodium hydroxide under reflux and the product was crystallized as the sulfate. The

(1) M. L. Wolfrom and S. M. Olin, *Abstracts of Papers*, 113th Meeting, Am. Chem. Soc., Chicago, Illinois, April 19–23, p. 5Q (1948).