

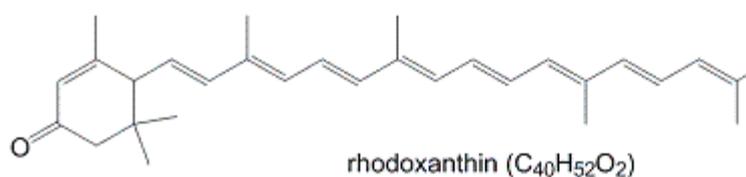
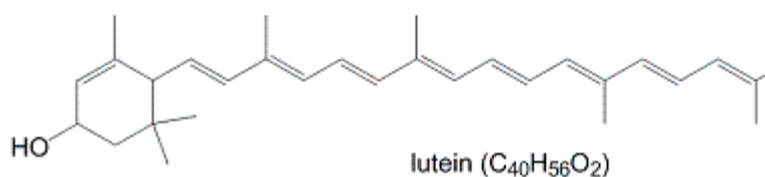
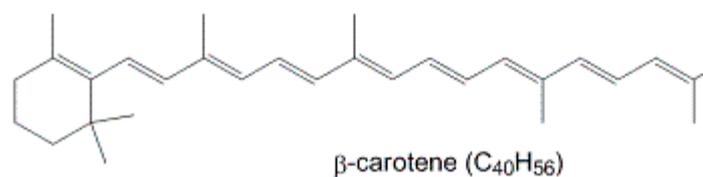
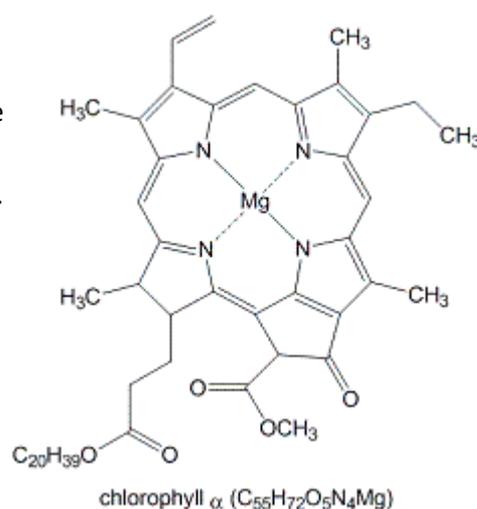
Separation and Estimation of Organic Compounds

by Judy Brittain

Experiment Overview

Chromatographic techniques are used to examine the coloured components (which include carotene and chlorophyll) of a mixture obtained by extraction of green leaves with acetone, and to separate the carotene from the other components. Students use two types of chromatography, thin layer and column chromatography, the former illustrating to the students the feasibility of separating components and the latter being used to separate the carotene to allow its quantitative determination.

Spectrophotometry is used to determine the percent by weight of each of chlorophyll and carotene in the leaves. The amount of chlorophyll in the leaf extract mixture can be quantified without its isolation from the leaf extract mixture. Chromatography is needed to separate the terpenes in the mixture - in this process, beta;-carotene is separated from xanthophylls such as lutein and rhodoxanthin. The image above shows the solution containing β -carotene, with the other yellow components still adsorbed to the column in the background.



Chromatography and spectroscopy are useful techniques not only for organic chemists and chemists in general, but also for biologists and health scientists. Students majoring in biology and health sciences are a significant cohort in year 1 classes at the University of Auckland.

Level of Experiment

This experiment is the first experiment in a first year course (and very often the first chemistry experiment for students at university level).

Keyword Descriptions of the Experiment

Domain

organic chemistry, general chemistry

Specific Descriptors

chromatographic separation, spectrophotometric determination

Course Context and Prerequisite Knowledge and Skills

Students in this first year course have diverse backgrounds in chemistry and generally have no previous exposure to spectroscopy theory or using a spectrophotometer. Spectroscopy is taught as a lecture topic in about week 6 of the course – well after this experiment, but using it as a ‘tool’ allows us to preview an upcoming topic and to enthuse students about laboratory work. Separation of components of a mixture using column chromatography is also new to students. The recognition of functional groups and principles of polarity, important in many aspects of organic chemistry, are reinforced. The laboratory assignment is written to cater for the diverse backgrounds in chemistry, such that all students can successfully carry out the experiment.

Time Required to Complete

Prior to Lab: 30 min (reading and completing a few questions)

In Laboratory: 2.5-3 h (includes completion of the results sheet)

After Laboratory: N/A

Experiment History

This experiment has a long history in the Department of Chemistry at the University of Auckland, and its origin is unknown.

Submission Details

The author listed is responsible for the educational analysis of this experiment; however, the submission of the experiment to ACELL is done on behalf of all academic staff in the Department of Chemistry at the University of Auckland.