

PHOTOSYNTHESIS. I MEASURE IT!

CNR-IbiMet, via Giovanni Caproni 8, Firenze

GOALS:

To offer a deeper knowledge about photosynthesis by measuring it, using the instruments provided by our Institute.

TARGET: students of age 15+ (better if they have knowledge of worksheet)

EXPERIMENT:

Evergreen trees or shrubs in school gardens fit very well with this project: students can carry on measurements during their school year and observe the assimilation rate changing over seasons, winter included.

A frontal lesson on photosynthesis process and instrument functioning is recommended before starting the experiment and the scientist or his technician or assistant has to be present during data recording for any need.

Fortnightly frequency would be great but difficult to do in consequence of the high students availability required (but they could participate in groups and then spread the recorded data) and of the local meteorological conditions (measurements have to be taken in full sun, so southern countries where high probability of good days exist, fit pretty well with this kind of experiment).

TOOLS :

- Gas Analyser (we have CIRAS-1), what it measures :
 - assimilation rate ($\mu\text{mol m}^{-2} \text{sec}^{-1}$),
 - cuvette humidity (%HR)
 - stomatal conductance ($\mu\text{mol m}^{-2} \text{sec}^{-1}$)
 - leaf temperature ($^{\circ}\text{C}$)
- evergreen trees or shrubs (leaves must be easy to reach)
- PC for elaborations

the students select the species and which kind of leaves to study, they formulate hypothesis on the behaviour they expect (what should I see over seasons? how much is the photosynthesis rate during winter? is the leaf age an influencing factor on photosynthesis rate? is leaf position in the canopy relevant on leaf behaviour?).

Then, they can establish the frequency and organize the surveys.

Measurements take ~30-60 minutes, depending on the number of replicates.

We suggest five measurements on leaves of different ages and different positions in the canopy (for example new leaves and 1 year old leaves in spring; sun leaves and shade leaves).

Data are recorded and saved by CIRAS-1; downloading is done by the scientist. Data are then given to the students for the elaboration.

By the results students can realise if their hypothesis were right.

If the school is provided by a meteorological station students can work with meteorological data and photosynthesis values.

METEO AT HOME

CNR-IbiMet, via Giovanni Caproni 8, Firenze

GOALS:

make the students handle with easy meteorological instruments and data analysis, enforcing the knowledge of their territory (the main meteorological parameters will show different values depending on altitude, exposition and land use).

Urban areas with asphalted coverage, heating systems, traffic, generally human activities will be compared with the countryside and little villages.

Each student that lives in villages or in the countryside is provided with a pluviometer and a Min Max thermometer.

Students will install the instruments near their home taking care of the proper ways of installation.

One frontal lesson on meteorological parameters and the used instruments is recommended and it should be held by a scientist.

TARGET: students of age 16+

INSTRUMENTS:

- Pluviometers, price: 3,6-9,8€ each
- Min-Max thermometer, price: 9-12€.
- Notes and pen

INSTALLATION WAY:

The thermometer is installed outside the house, in shade, possibly two meters high for reducing ground influences (presence of vegetation or concrete surfaces influences temperature in the firsts 2 meters) for instance on a house's wall or supported by a stake.

The pluviometer is installed outside, taking care of its location (free from any coverage such as canopies, roof...) and removing often leaves or external material that can obstruct it .

DATA RECORDING

Students are warmly requested to record temperature data **every day** (Minimum temperature and Maximum temperature, the amount of precipitation when it rains), and zero has to be done after every lecture.

Data recorded are:

Site

Date

Max temperature

Min temperature

precipitation

DATA ANALYSIS AND DISCUSSION

Students enter their data on a database or worksheets for the elaboration.

Comparison between different locations, results and discussions will be carried out.