Culturing Algae

Live Material Care Guide

Background

Algae are a special group of organisms that are found nearly everywhere—in oceans, freshwater lakes and streams, damp soil, in ice, on rocks and in the air. Algae are photosynthetic organisms that produce most of the Earth's oxygen. Most marine and aquatic food chains rely greatly on algae. They grow in very diverse environments and under a variety of conditions. Therefore, no one culture method can be utilized for all algae. Fortunately, the most commonly used species for laboratory purposes respond well to several different culture methods.

Algae are broadly defined by their pigment color and are often described in color terms such as green, brown, red, brown-yellow, etc. Blue-green algae (cyanobacteria) are included here since their culture requirements more closely resemble algae than bacteria. Algae come in all sizes—from single-celled organisms to very large seaweed varieties. Algae are extremely useful for laboratory purposes and respond well to a few simple culture methods.

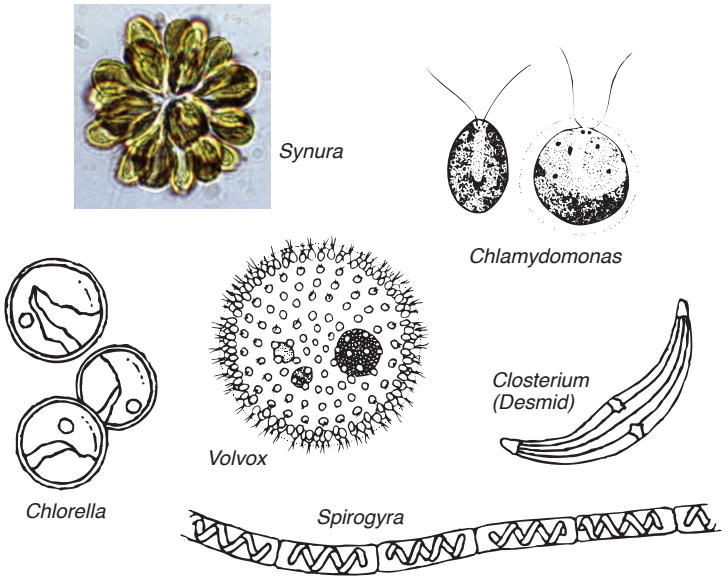

Figure 1. Common Algae

Culturing/Media

Upon arrival of algae cultures, loosen caps and aerate culture with a clean pipet. Caps should remain loosely in place to prevent contamination, yet permit free air exchange. In general, or if used within a week, cultures should receive diffuse not direct light. Since each culture is unique, see *Selected Algae Culture Requirements* table for specific media, temperature and lighting requirements. Most algae grow well at 16–22 °C.

A successful long-term culture medium for a specific algae must provide major nutrient salts, a usable source of nitrogen, a supply of carbon and a suitable pH. In addition, temperature and light conditions must be maintained for successful growth.

Maintain algae cultures in clean jars or in clean containers using the appropriate medium suggested for the specific species being cultured. Cultures should be placed in a window for light and loosely covered to reduce evaporation. For artificial lighting, use plant grow-lights or wide spectrum bulbs. Two common light cycles include 12 hous light followed by 12 hours dark or 16 hours light followed by 8 hours dark. The 16:8 cycle is recommended for short term cultures and the 12:12 cycle is recommended for long term cultures. Place cultures at a distance of 12–18 inches from the bulbs. Monitor the temperature of the culture—temperatures over 27 °C may be fatal for some algae species. Maintain temperature near 21 °C. Subculture to fresh media every six to eight weeks.

Most commonly purchased algae cultures can be grown using the two generic media described below. (Bristol's algae media and Knop's Solution are available from Flinn Scientific.) Unique species may require more specialized media for optimal growth. A literature search is advised to determine the best medium to use for subculturing.

Publication No. 10583
061616

Pringsheim's Soil–Water

Select a rich garden soil which has not been recently fertilized. Add 300 g of the soil to a heat-resistant gallon jar or 2000 mL beaker. Fill three-fourths full with distilled or deionized water and then add one gram of calcium carbonate ($CaCO_3$). Loosely plug or cap the jar and heat the mixture on a hot plate until it steams. Allow the mixture to steam for about one hour and then cool to room temperature. Repeat this procedure for three consecutive days. Either an autoclave or pressure cooker can be used to sterilize the soil-water as well. *Note:* To culture diatoms, add 10–30-mg of sodium metasilicate ($Na_2SiO_3 \cdot 9H_2O$) to every liter of medium. For culturing *Euglena*, before steaming add one-fourth of a softened pea seed, without the seed coat, to enhance growth. For culturing *Spirogyra*, omit calcium carbonate.

Bristol's Modified Medium

Prepare six stock solutions, each with one of the following salts dissolved in 400 mL of water.

Sodium nitrate, $NaNO_3$, 10 g

Calcium chloride, $CaCl_2 \cdot 2H_2O$, 1 g

Magnesium sulfate, $MgSO_4 \cdot 7H_2O$, 3 g

Potassium phosphate dibasic, K_2HPO_4, 3 g

Potassium phosphate monobasic, KH_2PO_4, 7 g

Sodium chloride, NaCl, 1 g

Combine 10 mL of each stock solution and dilute with 900 mL of distilled water. Add one drop of 1% iron(III) chloride solution (1 g iron(III) chloride in 100 mL of deionized water) and 40 mL of Pringsheim's soil–water extract. Autoclave the mixture at 121 °C for 15 minutes.

Selected Algae Culture Requirements

Algal Culture	Temperature Range	Lighting	Medium
Cyanobacteria			
Anabaena	16 °C to 22 °C	Low[@]–Moderate[†]	Bristol's or Pringsheim's
Oscillatoria	16 °C to 22 °C	Low[@]–Moderate[†]	Bristol's or Pringsheim's
Gloeocapsa	16 °C to 22 °C	Low[@]–Moderate[†]	Bristol's or Pringsheim's
Nostoc	16 °C to 22 °C	Low[@]–Moderate[†]	Bristol's or Pringsheim's
Chrysophyta			
Diatoms	16 °C to 22 °C	Moderate[†]–Bright*	Pringsheim's with sodium metasilicate
Synura	16 °C to 22 °C	Bright*	Pringsheim's
Green Algae			
Chlamydomonas	16 °C to 22 °C	Moderate[†]–Bright*	Bristol's or Pringsheim's
Chlorella	16 °C to 22 °C	Moderate[†]	Bristol's or Pringsheim's
Desmids	16 °C to 22 °C	Moderate[†]–Bright*	Pringsheim's
Eudorina	16 °C to 22 °C	Moderate[†]–Bright*	Bristol's or Pringsheim's
Gonium	16 °C to 22 °C	Moderate[†]–Bright*	Bristol's or Pringsheim's
Hydrodictyon	16 °C to 22 °C	Bright*	Bristol's
Oedogonium	16 °C to 22 °C	Moderate[†]	Bristol's
Pandorina	16 °C to 22 °C	Moderate[†]	Bristol's or Pringsheim's
Spirogyra	18 °C to 25 °C	Moderate[†]–Bright*	Pringsheim's without $CaCO_3$
Ulothrix	15 °C to 18 °C	Low[@]	Bristol's or Pringsheim's
Volvox[†]	20 °C to 24 °C	Moderate[†]–Bright*	Pringsheim's or Timothy Hay
Zygnema	16 °C to 22 °C	Moderate[†]	Pringsheim's
Red Algae (Rhodophyta)			
Batrachospermum	16 °C to 22 °C	Low[@]	Pringsheim's

Euglenophyta			
Euglena	21 °C to 25 °C	Bright*	Pringsheim's with a pea

* Bright light is approximately 1 foot from a south-facing window or 12–18″ from grow lights
† Moderate light is approximately 2 feet from a south-facing window or 18–24″ from grow lights
@ Low light is a north-facing window or typical room light

Disposal

Please consult your current *Flinn Scientific Catalog/Reference Manual* for general guidelines and specific procedures, and review all federal, state and local regulations that may apply, before proceeding. Algae cultures may be disposed of according to Flinn Biological Waste Disposal Method Type I. Do not release lab cultures into local environment as some species may be invasive.

Tips

- The school cafeteria is usually a good source for large culture jars—be sure to clean them with soap and water before using. The bottom half of clear plastic two-liter bottles also work well for housing algae cultures. Once jars are brought into the laboratory, they should not be used again for food.
- Excess media can be saved for future use if stored in a tightly sealed container in a dimly lit area.
- Have students study prepared slides before viewing the living specimens. See the *Flinn Scientific Catalog/Reference Manual* for the prepared slides.

Materials for *Culturing Algae* are available from Flinn Scientific, Inc.

Catalog No.	Description
LM1033	Anabaena, 30
LM1252	Batrachospermum, 30
LM1041	Chlamydomonas, 30
LM1043	Chlorella, 30
LM1045	Desmids, 30
LM1037	Diatoms, 30
LM1153	Eudorina, 30
LM1039	Euglena, 30
LM1029	Gloeocapsa, 30
LM1155	Gonium, 30
LM1047	Hydrodictyon, 30
LM1035	Nostoc, 30
LM1049	Oedogonium, 30
LM1031	Oscillatoria, 30
LM1151	Pandorina, 30
LM1051	Spirogyra, 30
LM1253	Synura, 30
LM1053	Ulothrix, 30
LM1055	Volvox, 30
LM1157	Zygnema, 30
FB1820	Bristol's Algae Medium, 100X, 100 mL
K0003	Knop's Solution, 500 mL
ML1378	Depression Slides, Single, Pkg of 12
FB1893	Well Chamber, Pkg of 5
FB0446	Culture Slides
MS5040	High School Compound Microscope

Consult your *Flinn Scientific Catalog/Reference Manual* for current prices.