Environmental Toxicology

Aquatic Macrophyte Testing

Smithers Viscient offers a variety of freshwater and marine aquatic macrophyte studies, including single species tests in 4-L beakers, moderate scale tests in plastic tubs with three to five species, and large scale studies involving up to 10 plant species. Our extensive laboratory and greenhouse space enables us to culture the required plant species year round. Sample protocols for all types of studies can be made available upon request.

Study Descriptions

Single Species Test — Smithers Viscient has tested six species that perform well in this format. The test design meets the requirements provided by the OECD Water-Sediment Myriophyllum spicatum Toxicity Test Guideline 239, with some modifications made for additional species. ¹Smithers Viscient was also part of the OECD validation team for the Myriophyllum study design. A replicate test vessel includes three plants of the same species rooted in a pot containing OECD artificial sediment, which is placed in a 4-L glass beaker containing 3.5-L of test solution. Test duration is 14 to 21 days. The test is conducted in an environmental chamber under fluorescent light and controlled temperature. The biological endpoints are yield and growth rate based on shoot length, shoot fresh weight and shoot dry weight. This type of test can be conducted year-round.

Large Aquaria or Tub Studies — Large aquaria, or tub studies, are conducted in 200-L to 300-L containers, and can contain three to five plant species within a replicate. The studies can be done outdoors from May to September, or can be performed in our greenhouse during the colder seasons. These studies typically include one emergent plant species and three or four submerged, rooted species. The exposure system and biological endpoints are similar to those used in outdoor pond studies.

Outdoor Pond Studies — This format is used for up to 10 species of submerged and emergent plants tested in 3,000-L replicated ponds. A natural sandy-loam soil serves as sediment within the pond, and the plants are placed in pots containing a mixture of sandy-loam and high organic commercial potting soil. The duration typically includes a 1- to 4-week culture/acclimation phase, and a 6-week exposure. Recovery can be viewed by comparing data from a short-term exposure (2 to 5 days) followed by a clean water renewal, to continuous 6-week exposure data. The test endpoints are shoot length and dry weight biomass and associated growth rate data. Ideally, the acclimation phase will begin in May with the exposure conducted in June or July. The outdoor ponds have been used for microcosm/mesocosm exposures in the past and monitoring of algal or invertebrate populations can be included in the study design.

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Aquatic Macrophyte Testing Experience

Over the past 15 years, Smithers Viscient has conducted numerous aquatic macrophyte tests, and with our extensive experience we can construct an aquatic macrophyte test design to meet a client’s specific needs. All of Smithers Viscient’s exposure systems are flexible enough to accommodate a variety of custom study designs, and we presently have study directors and full-time staff members dedicated to aquatic plants studies, as well as other staff members with pertinent training. Tests can vary in size from one species in individual containers, to 10 or more species in small outdoor artificial ponds. Tests can be run in a variety of settings including environmental chambers for temperature and light control, greenhouses for year-round testing under more natural light and temperature conditions, and outdoors in small tubs or ponds from May through September. Assessment on the effect on algal populations can be included in the study design, and tests can be inoculated with invertebrates or other organisms to provide a full microcosm exposure. Costs can vary widely depending on the size of the study, number of species, complexity of the test design, duration of the study, and amount of analytical support requested.

Species List

Monocots

*Elodea canadensis*: water weed — submergent
*Stuckenia pectinata* (formerly *Potamogeton pectinatus*): sago pondweed — sub/emergent
*Glyceria maxima*: reed sweetgrass — emergent
*Sagittaria latifolia*: arrowhead weed — emergent
*Vallisneria americana*: freshwater eelgrass — submerged

Dicots

*Nymphaea odorata*: water lily — emergent
*Ceratophyllum demersum*: coontail weed — submerged
*Myriophyllum heterophyllum*: variable milfoil — submerged
*Myriophyllum spicatum*: Eurasian water milfoil — submerged
*Mentha aquatica*: water mint — emergent
*Cabomba caroliniana*: fanwort — submerged

Fern

*Salvinia minima*: water fern — floating