AQUATIC PLANTS IN AQUACULTURE

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Introduction

Aquatic plants are plants whose photosyntically active parts are permanently or at least, for several months each year submerged in water or float on the surface of water. All vascular plants that may be encounterage growing in permanent or seasonally semipermanent water are included. There are many plants, paticulary in tropics, which grow on rocks or trees by streams, rivers and waterfalls. After rain they may be submerged in swiftly flowing water, sometimes for only a few hours or a days at atime. These plants are called rheophytes and, although specialized for this kind of habitat.

Fresh water macrophytees play a very important role in aquatic ecosystems. They provide, either directly or indirecly, food, shelter and variety of habitats for a large number of organisms, including wildfowl and economically important fish. It must be mention that rice, an aquatic plant, is the most important single crop species in the world. Many other aquatic plants are also of use to men as food, raw materials for industrial processes, building materials and manure in agriculture. Aquatic plants absorb dissolved minerials and enrich water with oxygen produced during photosynthesis. These property are of benefit to man as they assist in the maintenance of cleanwater and the help in the recovery of polluted water. Hower, in disturbs or newly constructed bodies of water rampant growth of aquatic plants may interfere with man's use of freshwater. They may obstruct water flow, navigation or water intake. They may also create conditions faverable for pests, diseases and vector affecting humans, animals and crop plants.

Aquatic plants biology

Plant anatomy

Although some plants lack a central stem, and plants such as mosses and ferns do not produce flowers, the anatomy of most plant can be split into four basic zones; the root stem, leaves, and flowers. All these parts play a vital role in the plant's basic functions, including growth, reproduction, nutrient-collection and storage.

1. Root

The root of most aquatic plants are combination of a number of central roots,with many smaller root trailing off. Terrestrial part roots have fine hairs for trapping moisture, but these are not present in aquatic plants, although they may develope when grown out of water. Some aquatic plants produce roots from rhizome that attaches to rocks and wood. Many aquatic plants grow from bulbs or tuber, which contain large reserves of nutrients.

2. Stem

A stem is present in most aquatic plants and performs two basic functions: support and transport. The stem's function is aided by supporting gass- or air-filled cell that provide buoyancy and help to keep the plant upright. Since the serrounding water provides much of a plant's support, aquatic stem are often much thinner more flexible than terrestrial

stems. Flexible stems allow the plant to move with the water, rather thantry to hold steady against it, risking damage.

3. Leaves

The leaves of a plant are essentialy tools forcoolecting sunlight to use in the process of photosynthesis. Gas exchange and some collection of nutrients is also carried out by the leaves. The leaves of errestrial plants have a thick, waxy outer layer called cuticle, which protects the plant from drying out. In aquatic plants this layeris muchthinner and liquid able to pass through much more easily, which help to plant to take up nutrients. Aquatic plants that produce aerial leaves often ahow two different leaf shapes below and above the water. This due to different environments and a change of cuticle layer.

4. flowers

Although not all aquatic plants are likely to produce flowers in the aquarium, the majority are flowering plants and will produce seeds and reproduce by flowering in nature. The flower are usually produced above water, where they can be pollinated by insects, just as terrestrials ones are. Some aquatic plants produce flowers beneath the water surface. In these instances, the seeds are capable of floating downstream and a few species do not produce flowers at all, prefeering to reproduce by purely asexual means.

The useful of aquatic plants

1. The use of aquatic plants for livestock feed and fertilizer
2. The use of aquatic plants for waste treatment
3. The use of aquatic plants for production of phycocolliods
4. The use of aquatic plants for ornamental purposes

Grouping of Aquatic Plants on the basis of natural habits ecology

1. Floating plants

Floating plants that live in surface layer of the water. Their roots float freely and their leaves may be on the surface, as in *Lemna* and *Riccia*. Though *Riccia* is a floating plant, it can be tied down on rocks or driftwood and grown fully submerged.

2. Submerged plants

Submersed plants that are rooted in the bottom and have leaves and stems that grow permanently under water. All photosynthetic parts submerged, assume to be the bottom-rooted.

3. Emerged plants

Some photosynthetic parts in contact with air, assume to be bottom rooted with assimilating parts in air. They may also flower under water or above water. This group includes many aquarium plants such as *Barclaya* and *Nymphaea*.

4. Suspended plants

Plants rooted in the bottom but with leaves reaching the water surface. They usually have well developed root and fragile stems. The flower as a rule above the water surface and, unlike the preceding group, they develop more conspicuous flowers. Land forms can develop.

5. Amphibious plants or marginal plants

Amphibious plants that can grow under water as well as on dry land. In the water they develop submersed as well as floating leaves and/or emerged aerial leaves. These are mainly bank side plants, of which many are important in the aquarium.

The aquarium plants

The role of aquatic plants in such dynamic aquatic ecosystem is so vital that the survival of other aquatic inhabitants such as fishes and other aquatic animals solely depend on its existence. As these plants, otherwise known as primary producers serve as the basis of food chain. They form the primary source of food for herbivores and later these herbivores become prey to the carnivores. Aquatic Plants are also the major source of oxygen for aquatic animals, its existence is crucial for maintaining the biological equilibrium of fresh water ecosystem. Fresh water planted aquarium is an symbolises dynamic fresh water ecosystem.

Aquarium Plant Propagation

1. Sexual propagation

In plants the flowers are termed perfect or bisexual if they have both the male and female organs. The ovary is at the base of pistil, while pollen is produced toward the tip of the stamens in the anthers. Bisexuality is probably the most common condition in aquatic plants. Propagation from seeds in necessary in the case of plants that do not reproduce vegetatively (*Aponogeton*), and species such as *Echinodorus* which reproduce faster and more abundantly by seed than vegetatively.

2. Asexual Propagation

Vegetative propagation is well known to aquarists. Some aquatic plants reproduced by rhizomes, others by roots. Many species of aquatic plants reproduced through large or small portions being able to root and continues growing after being removed from the parent plant.. This ability to produce new roots is so strong in some species that even parts of leaves will root. Runner cutting is the most widely used method and normally the easiest.

2.1 Runner cutting

Plants with short stem axis from runners, at the end of which young plants develop. Most of the runner plants like *Vallisneris, Sagittaria* etc. are propagated this way.

2.2 Stem cutting

Stem plants are propagated by cuttings. That is, by segments of stem axis which are placed in the ground, where they develop roots at the stem nodes. In genera *Ludwigia*, *Elodea*, *Ammania*, *Alternanthera*, and *Hygrophila* new cuttings are commonly taken from the axil of the main plant.

2.3 Rhizome division

The rhizomes of *Cryptocoryne* species, *Echinodorus* species, and other plants branch prolifically. At the ends of these lateral shoots there arise young plants that can be detached for purpose of propagation. If rhizomes are separated from the parent plant, new plants will develop from the dormant buds on them and become separated in the course of time. This is most useful in plants with a cylindrical rhizome that is long and creeping, such as *Anubias* and *Acorus.*

2.4 Adventitious plants

Adventitious plants develop on various parts of parent plant. For example, in water ferns (*Microsorium pteropus*) from bud along the leaf margins, in *Hygrophylla* species at the point of abscission of individual leaves that have been allowed to float on the water surface.

3. Micropagation

Aquatic plants are propagated in a sterile environment using just part of the plant like the meristematic region or the undifferentiated prothallus of a fern. Plants are generally grown in clear plastic or glass containers under controlled lighting and temperature. Normally a sterile jelly like medium is used (agar or similar) that has nutrients and sometimes antibiotics, hormones etc. to control the plants growth. Once the plants have reached a suitable size they are taken out of the container and hardened in greenhouse conditions. Most *Anubias* species are produced this way.

Aquarium Plant Cultivation

1. Terrarium culture

This method for amphibian and marginal plants that can grow on dry land and wet land.

1.1 Soiless culture

1.2 Hydroponics system

2. Submerged culture