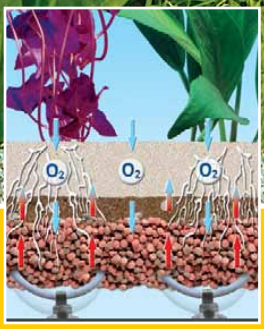
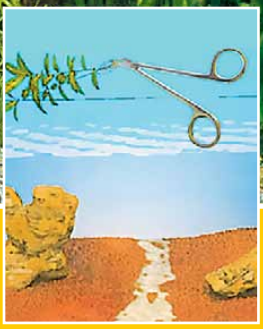
sera guide

Splendid plants in your aquarium





- Bottom ground
- Planting
- Fertilization

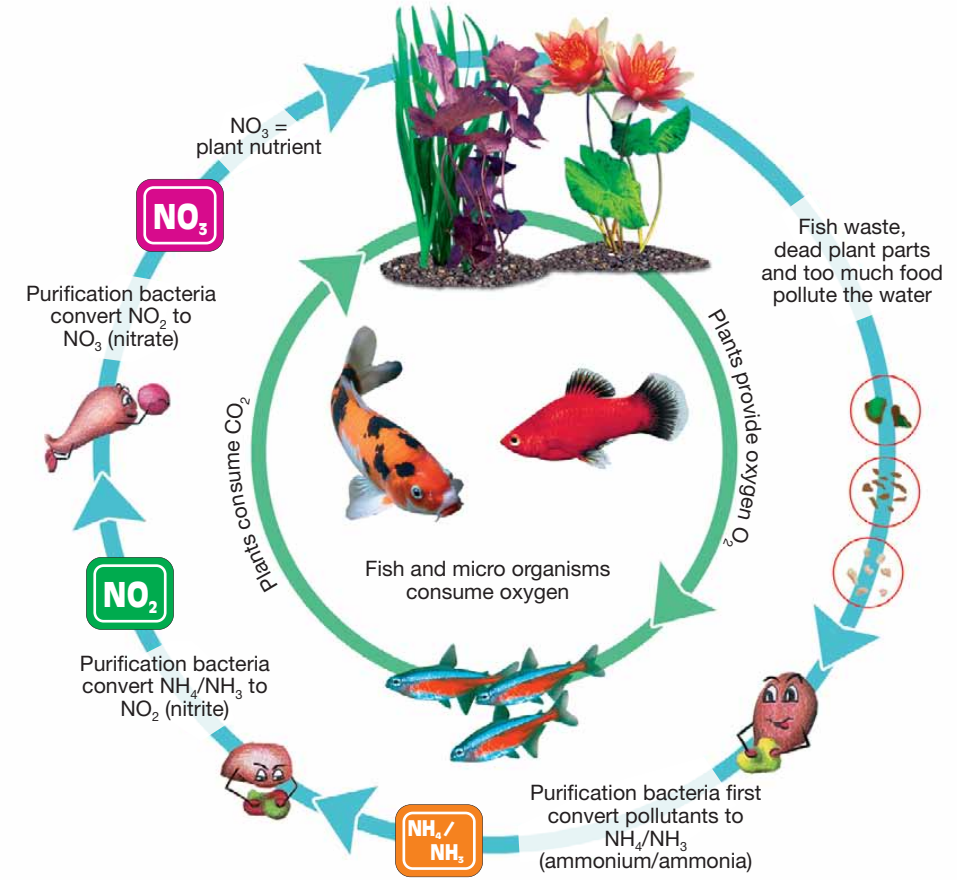
Contents

Aquatic plants fulfill many vital tasks in an aquarium. They are an essential component of the natural purification cycle. In cooperation with micro organisms, organic substances such as fish waste and uneaten food are processed in a way that the plants can utilize them as nutrients. During photo synthesis, plants produce oxygen and enrich the water with this vital element.

Only plants make an aquarium look exotic and decorative. The light display caused by water reflections and plants swaying in the current create unique fascination. Plants provide conditions as in nature, the possibilities to set up territories, and shelter and nutrition for aquarium inhabitants.

Natural purification cycle

The better this natural purification cycle functions, the less maintenance efforts are required. You will enjoy your aquarium or pond even more.



Only plants allow setting up an aquarium close to nature and creating its special exotic fascination. Plants allow fish and other water inhabitants to hide and form territories. This reduces stress for the fish. Plants also serve as food for some animals – although their owner will not exactly be happy about this.

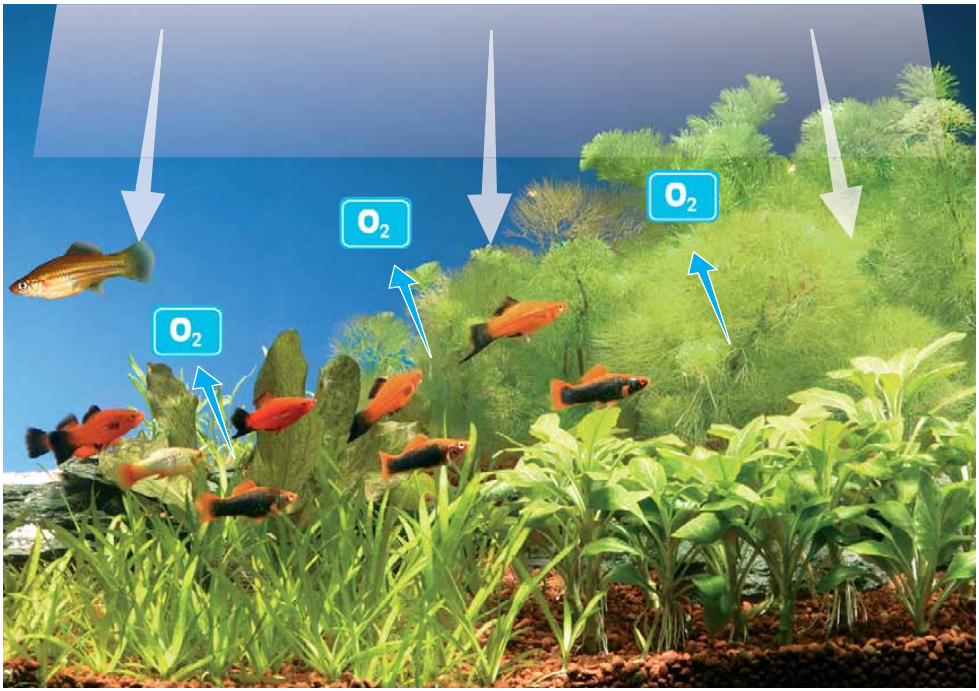
Fish feel well in optimally planted aquariums and live healthier. They will enjoy the aquarist with their entire agility and splendid colors. Knowing their requirements and accordingly fulfilling them is required to keep aquatic plants successfully. This especially includes:

- Light
- Balanced nutrient fertilization
- CO_2 supply

Light energy – the correct light

Plants are able to produce complex molecules (carbohydrates/sugars) they require for their growth from carbon dioxide (CO_2) and water while utilizing light energy. During this process, which is called photo synthesis, plants also produce oxygen that the fish need for breathing.

Aquarium plants require light of a certain composition for photo synthesis. The special **sera plant color** fluorescent tube provides red/blue color light. It perfectly matches the requirements of aquarium plants and enhances the natural colors of fish and plants. It can be combined with the other **sera** fluorescent tubes without any problems. This gives you the possibility to fulfill the light requirements of both fish and plants in the same way.



Balanced nutrient fertilization

Aquatic plants require a large number of nutrients for healthy, colorful growth. The growth will be affected if only a single nutrient is missing.

Depending on the plant, trace element and mineral uptake either takes place through the leaves, through the roots, or both. Therefore, there are fertilizer tablets (e.g. **sera florenette A**) which are placed in the bottom ground, and liquid fertilizers (e.g. **sera florena**) that are added to the water. Depending on the plant species you keep it is necessary to fertilize with tablets and liquid fertilizers as to ensure complete supply. Some rarer nutrients or trace elements do not remain stable for a long time in an aquarium, they must therefore be added daily. This is done with so-called daily fertilizers such as **sera flore daydrops** or **sera flore NPKdrops**.

CO_2 fertilization

NPKdrops for plant aquariums

Leaf fertilizer

Growth enhancer

Root fertilizer

Soil fertilizer

Active bottom ground

Daily fertilizer

Macro nutrients and trace elements

Macro nutrients include:

- N Nitrogen (N)
- P Phosphorus (P)
- S Sulfur (S)
- K Potassium (K)
- Ca Calcium (Ca)
- Mg Magnesium (Mg)

Nitrogen is taken up by the plants as nitrate (NO_3) or ammonium (NH_4^+). Among others, it is required for the building up amino acids, the basic units of proteins. Phosphorus is taken up as phosphate (PO_4^{3-}). It is important for obtaining energy in the cells.

Nitrogen and phosphorus containing compounds are already sufficiently available in the water due to uneaten food and organic waste. However, they first must be converted by micro organisms (e.g. **sera bio nitrivec**) into a form that can be utilized by plants. Additional fertilization with phosphate and nitrate is not necessary in aquariums stocked with animals. This would lead to the opposite and support the growth of unwanted algae.

However, phosphate and nitrate must be added in mere plant aquariums (also called "Dutch style aquariums"). **sera flore NPKdrops** are ideally suited for this purpose. They are exactly blended for densely planted aquariums with low or no fish stock. The ratio between the single elements is perfectly balanced to the requirements of aquatic plants.

Magnesium is the central component of chlorophyll (green leaf colorant), and it is essential for photo synthesis. The other macro nutrients are also required for the growth of aquatic plants.

Aquatic plants require mineral nutrients in different amounts. They are therefore divided into macro nutrients (high require-

ments by the plant) and micro nutrients, often also called trace elements (low requirements).

Trace elements include:

- Fe — Iron (Fe)
- Cu — Copper (Cu)
- Mn — Manganese (Mn)
- Zn — Zinc (Zn)
- B — Boron (B)
- Mo — Molybdenum (Mo)
- V — Vanadium (V)

These trace elements are taken up only in very small amounts, but they are just as important as the macro nutrients. For instance, iron is part of an enzyme required for the synthesis of chlorophyll. Molybdenum makes the very important processing of nitrate possible. Manganese and vanadium are required for trouble free enzyme activity. No plant can grow without these substances.

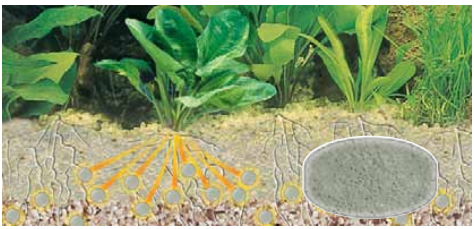
Active bottom ground

sera Professional floreground is a unique and innovative active bottom ground. In combination with micro organisms, e.g. from **sera filter biostart**, organic waste is actively converted to plant nutrients directly at the plant roots. Furthermore, it aerates the bottom ground due to its special pore structure and thus prevents the formation of toxic rot zones within the bottom ground – the ideal basis for a stable aquarium and magnificent plants.

sera fertilizers

sera bottom ground fertilizer

sera bottom ground fertilizers are distributed underneath the aquarium gravel or sand in the planted areas when setting up or re-designing an aquarium. This provides the conditions the plants require for growing on quickly and for forming strong roots. The plants are optimally supplied during the start phase while they are growing on (4 to 6 weeks).
The basic bottom ground **sera floredepot** consists of a blend of washed sand, peat, essential nutrients and trace elements. **sera floredepot** with long term effect continuously releases nutrients for the plants. The special structure of the bottom ground supports the formation of strong roots.



sera leaf fertilizer

sera florena provides a balanced nutrient supply consisting of iron, minerals and trace elements for aquatic plants that take up their nutrients through the leaves. Due to a special manufacturing procedure, **sera florena** ensures that sensitive nutrients such as iron remain active in the water until the plants take them up.

sera root fertilizer

sera florenette A serves as a nutrient depot that slowly releases the minerals and trace elements to the roots. One tablet is sufficient for 3 to 4 plants for approx. 4 weeks – directed growth support by **sera**.

Growth enhancer

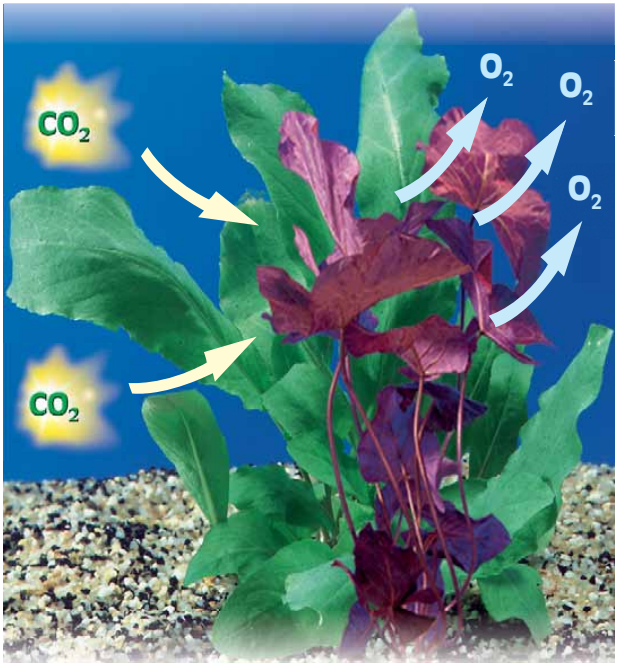
sera floreplus contains important macro elements that ensure healthy and robust growth of the plants. The effects of **sera florena** and **sera florenette A** are optimized. This directed growth improvement is recommended during the first weeks or when the plants have been receiving an insufficient nutrient supply for a while.

Daily sera nutrient addition

sera flore daydrops daily fertilizer provides the plants with sensitive vital substances that are consumed daily but must not be missing in order to achieve healthy plant growth, lush green or intensely red leaves.

sera flore NPKdrops daily fertilizer supplies magnificent plant aquariums (Dutch style aquariums) and aquariums with very low fish stock with the macro nutrients nitrogen, phosphorus and potassium, which are essential for plants.

CO_2 fertilization



Only carbon dioxide, or CO_2 for short, allows plants to build up organic compounds during photo synthesis (page 4) for their growth. Plants utilize the mere carbon (C) for this purpose, which they separate from CO_2 during photo synthesis. Oxygen (O_2) is released into the environment. Insufficient CO_2 leads to poor plant growth, puny appearance and pale colors. Using CO_2 and water, plants produce complex sugar molecules they require for their growth, and they produce oxygen for the other living beings in the aquarium at day. Plants can only grow healthily with sufficient CO_2 supply. Furthermore, the CO_2 level is an important stabilizer of the carbonate hardness and, correspondingly, the pH value.

Carbon is consumed by the plants

Oxygen is released

The CO_2 requirements of aquatic plants

The general rule is: the faster a plant grows, the higher its CO_2 requirements. Thus, especially the fast growing plants require additional CO_2, e.g. the very beautiful Green Cabomba (*Cabomba aquatica*) or the decorative Red Tiger Lotus (*Nymphaea lotus*). The better the plants grow, the more oxygen they produce and consume even more algae nutrients. You will thus hardly have any trouble with annoying algae.

How is CO_2 dissolved in water?

Generally, CO_2 is well soluble in water. However, the gas must be specially dissolved in water for optimal solubility. So-called CO_2 reactors are especially designed for this purpose. Their low capacity to dissolve CO_2 in water is the problem of many common reactors. The gas is not entirely dissolved, and CO_2 gets to the water surface as a bubble, where it is lost for the aquarium. **sera** provides different highly efficient reactors for installation inside or outside the aquarium.

sera CO_2 systems

Previously, using CO_2 systems was mainly available for professional users. With **sera** CO_2 systems it is possible also for aquarium hobbyists to provide their plants with CO_2 easily, quickly and safely. Depending on the size of the kept aquariums and the plant density, **sera** offers different CO_2 fertilizing systems.

The **sera CO_2-Start** set is ideally suited for small aquariums or few plants. It consists of the **sera CO_2 diffusion reactor** and the **sera CO_2-Tabs plus**. The tablet is put into the CO_2 reactor and releases CO_2 which is retained in the storage container of the reactor. CO_2 passes the reactor walls only slowly and dissolves in the water by and by without any losses.

The **sera flore CO_2 fertilization system** is recommended for larger aquariums and for densely planted aquariums. This fertilization system with extensive accessories can be installed quickly and easily.

Contents:

1) **sera CO_2 pressure gas bottle**
   500 g reusable bottle with external valve and bottle holder

2) **sera flore CO_2 pressure reducer**
   Adapter for one-way CO_2 bottles

3) **sera CO_2 safety non-return valve**

4) **sera CO_2 hose**, 5 m (16.5 ft.)

5) **sera flore CO_2 pressure diffuser**
   with integrated bubble counter

6) **sera CO_2 long-term indicator**

7) **sera florena**
   Plant fertilizer, 100 ml (3.38 fl.oz.) (page 9)

8) **sera flore daydrops**
   50 ml (1.7 fl.oz.) (page 9)

9) **Free**:
   Adapter for one-way bottle, made of massive brass

The components of the set are extensively explained on the following pages. They are also available separately in the specialized trade.

The **sera flore CO_2 pressure reducer** allows to reduce the CO_2 supply pressure from the CO_2 gas bottle precisely from approx. 60 bar (870 psi.) to 0 to 2.5 bar (0 to 36.25 psi.). Due to the professional quality of the **sera flore CO_2 pressure reducer**, even small CO_2 amounts (30 bubbles/min.) can be dosed permanently. This is not possible with standard quality pressure reducers. Two large manometers allow reading off both, the supply pressure and the reduced pressure. An optionally available special adapter allows connecting one-way bottles. High quality of the pressure reducer is indispensable for using a CO_2 system safely.

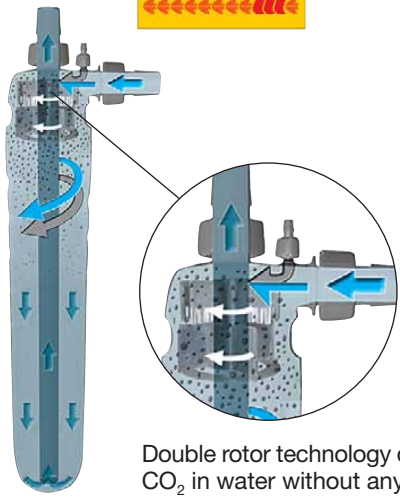
Accessories:
Precision fine-adjustment needle valve, bottle and working pressure manometer.

sera CO_2 pressure gas bottles with external valve. The high quality steel guarantees maximum safety. The **sera CO_2 pressure gas bottle** is available with 500 g and 2 kg contents. The bottles can be refilled.

Accessories:
Safety carrying handle, relief pressure valve, handwheel and wall holder bracket.

sera flore CO_2 pressure diffuser with integrated bubble counter for aquariums up to 300 liters (79 US gal.). The beautifully shaped device made of high quality acrylic dissolves CO_2 in water particularly well. The CO_2 is pressed into the water through a fine pored fritted ceramic disc under elevated pressure [approx. 2 bar (29 psi.)]. The fine bubbles dissolve immediately. No CO_2 is lost due to the high CO_2 dissolving rate. The diffuser can be dismantled entirely, and is therefore easy to clean. The fritted ceramic disc can be taken out and replaced.

sera flore CO_2 active reactors are available for aquariums ranging from 250 liters (66 US gal.) to 600 liters (159 US gal.), and for aquariums larger than 600 liters (159 US gal.). The **sera** active reactors provide extremely high performance due to their unique rotation principle. The double rotor technology dissolves CO_2 without any loss. Large aquariums can be supplied with large amounts of CO_2 economically and quickly. However, due to their excellent CO_2 dissolving performance, these **sera** reactors are advantageous also for smaller aquariums and in case of lower CO_2 requirements.



Double rotor technology dissolves CO_2 in water without any losses

The **sera flore CO_2 active reactors** can be installed both on the inside and the outside of an aquarium. An additional pump is required for installation inside an aquarium. It is connected to the reactor with a suitable hose. For a preferably external installation, e.g. in an aquarium cabinet, the reactor is simply integrated into an existing filter circuit. The **sera** active reactors can be dismantled entirely and therefore allow for easy maintenance and cleaning.

Installation inside an aquarium with separate pump

Installation underneath an aquarium with separate pump inside the aquarium

Integration into a filter circuit

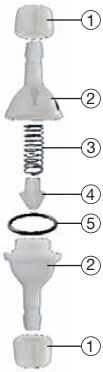
You can easily and precisely count the CO_2 bubbles inserted in the reactor with the **sera flore CO_2 bubble counter** made of high quality acrylic. A thin nozzle ensures clear separation of the CO_2 bubbles.

The **sera CO_2 solenoid valve** is used between the pressure reducer and the following CO_2 devices for interrupting the CO_2 supply automatically. The CO_2 should be switched off at night, as the plants do not take up CO_2 in the dark. They even produce CO_2. The **sera CO_2 solenoid valve** can be connected to every common timer.

The most comfortable method: **seramic pH Controller** for automatic CO_2 addition – micro processor controlled pH value adjustment by automatic CO_2 fertilization. The **sera pH measuring electrode** included with the kit, monitors the pH value in the aquarium water. Deviations from the adjusted value are balanced automatically by CO_2 additions. Among others, the kit includes the pH controller, the solenoid valve, test solutions and a non-return valve. The **seramic pH Controller** is easy to operate and can be integrated into every common CO_2 fertilization system. It is also suited for effectively controlling calcium reactors and dosage pumps.

The **sera high quality safety non-return valve** protects CO_2 fertilization systems and air pumps against entering aquarium water.

- Valve body made of high quality plastic material (2) with silicone conus (4), pressure spring (3), O-ring seal (5), can be dismantled for cleaning
- Connectors with union nuts (1) for hoses with 4/6 mm diameter
- Contains 2 pieces



The **sera CO_2 safety non-return valve** prevents aquarium water flowing back into the pressure reducer. The valve must be installed between pressure reducer and connected devices, e.g. a reactor.

The **sera CO_2 long-term indicator** permanently monitors the CO_2 level in the aquarium water. The kit consists of the test container, indicator liquid and a comparing chart.

How much and when must CO_2 be added to the aquarium?

A certain CO_2 amount is required, depending on the CO_2 consumption by the plants and the desired pH value. As a first approximation, it is advisable to add about one or two CO_2 bubbles per minute for every 10 liters (2.6 US gal.) of aquarium water into the diffuser or reactor. The optimal CO_2 dosage per minute may be considerably higher, depending on how strongly the plants react with increased growth and/or if the desired pH value is in the slightly acidic range (e.g. 6.5). The CO_2 level in the water is easy to monitor with the **sera CO_2 long-term indicator**. Alternatively, installing a **seramic pH Controller** is recommended.

sera Tip

Plants do not perform photo synthesis at night, but they take up oxygen while CO_2 is being formed. CO_2 addition therefore should be interrupted at night. A common timer in combination with the **sera CO_2 solenoid valve** is suitable for this purpose. The addition of CO_2 Tabs should preferably take place in the morning.

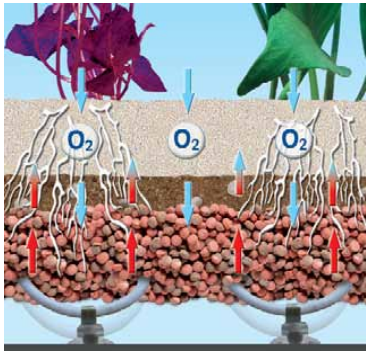
Planting correctly

You will make it easier for the plants to grow on and ensure a strong, healthy growth if you add the plants according to our suggestion:

Tools for gentle plant care

sera flore tool S plant scissors and **sera flore tool P** plant tweezers are made of stainless satined steel and allow directed and quick work on sensitive plants and in locations inside the aquarium which are difficult to access. This reduces aquarium maintenance measures and, correspondingly, stress for the animals.

Bottom heater

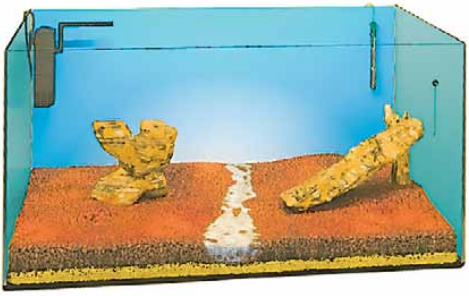


The **sera soil heating set** allows heating the aquarium bottom evenly over the entire area. The water in the bottom zone is slightly heated. Since warmer water has a lower density than cooler water, the heated water will slowly rise upwards from the bottom zone through the bottom ground and the gravel lying on top. At the same time, the slightly cooler water from the upper layers of the aquarium will sink down. This leads to a constant water circulation inside the aquarium, which brings many positive effects along:

- Nutrients from the water get into the bottom zone where they can be utilized by the plants and bacteria.
- End products of the bacterial and plant metabolisms are removed from the bottom.
- Accelerated biochemical processes within the bottom zone.
- Plant roots are continuously supplied with fresh water. The constant nutrient supply leads to stable plant growth.

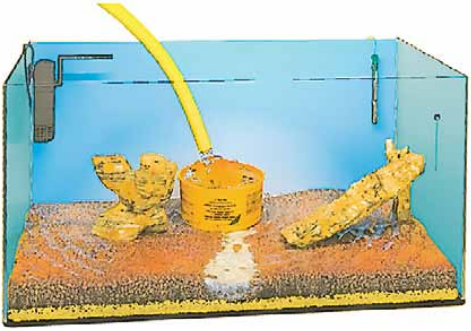
Bottom ground for plants

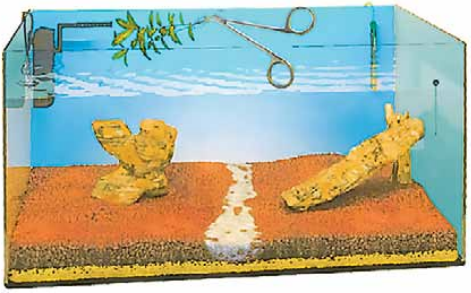
Fill a special bottom ground layer into the aquarium after you installed the **sera soil heating set**. **sera floredepot** with integrated fertilizer tablets and **sera Professional floreground** active bottom granulate (page 8) are available from **sera**. You can ideally combine both bottom ground types with each other. Place aquarium gravel and/or aquarium sand on top of the bottom ground according to your taste. Combinations allow creating interesting color effects.



Preparing plants

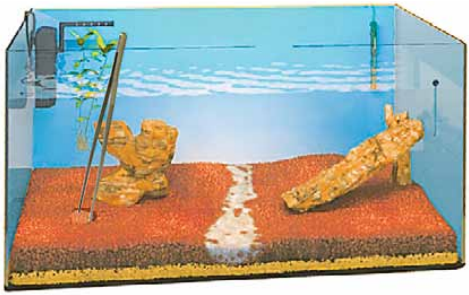
Purchased plants often come with a lead ring that prevents the plants from floating in the retailers' tanks. The roots are also often wrapped in rock wool. Remove lead and rock wool before putting the plants into the aquarium. First fill the aquarium with water for about two thirds. Then carefully shorten the roots to about 3 cm (1.2 in.) using the **sera flore tool S** plant scissors. This will support quick growth of new roots and thus will make the plants grow on faster.





Adding plants

Dig some holes into the bottom with your finger or with the **sera flore tool P** plant tweezers. Carefully put the plants in these holes. At first slightly deeper than scheduled. Slowly pull the plants out again until they are in their final position. By doing so, the roots will be in the correct position and will not stand out. One tablet **sera florenette A** per each 20 liters (5.3 US gal.) of aquarium water is pressed into the bottom ground near the roots.



Now the tank can be topped up entirely.

Extra: Aquarium plant = Aquatic plant?

Many well known aquarium plants are not real aquatic plants in the original meaning of the word (e.g. *Echinodorus*, *Anubias*). They are mainly found in the bank zones in their countries of origin, where they often stand fully in the dry during the dry season. Aquatic plants require less structural substance, as buoyancy in water supports them. The land form is accordingly stronger and more robust. Aquatic plant growers often make use of this circumstance and breed the plants emerged (= as a land form). However, this may lead to the land bred plants requiring an acclimation phase for adapting to the new surrounding conditions when they are submerged. In the worst case, they discard all their leaves and form new ones. A sufficient amount of nutrients (e.g. **sera florena**) should be available for the plants as to support them during this readjustment period. **sera floreplus** supports the plants with growth stimulators during their readjustment.

Aquatic plants and algae

Algae, except for the so-called blue-green algae, are also plants, although they are less popular in well-kept aquariums. However, algae are a natural part of any water body, as long as they do not take over. Algae and plants have similar, requirements considering their nutrient supply. This also means they are direct competitors for minerals and trace elements. You can give the higher plants an advantage over algae in fighting for nutrients by supporting healthy plant growth. Algae use their chance and multiply rapidly only when plants are weakened. The result: The aquatic plants are further affected, be it by lacking nutrients or by dense algae growth.

Since algae and aquatic plants are similar it is accordingly difficult to combat algae in a directed way. There is an important difference that **sera** uses for algae prevention. Algae require a slightly varied light spectrum for photo synthesis than higher plants. Algae will receive insufficient light by directed addition of light filtering substances, as they are included in **sera blackwater aquatan**. The light, however, is still sufficient for aquatic plants. The algae growth is thus considerably inhibited. Using UV-C systems as in the **sera fil bioactive external filter + UV** or the **sera UV-C System 5 W** has proven well, in particular against floating algae.

Problems and solutions

Symptom	Possible cause
Formation of extremely long shoots, the lowest leaves fall off or the distances between leaves become longer	The light is too weak or unsuitable
Leaves become pale or glassy transparent	No chlorophyll (green leaf colorant) can be formed anymore due to lacking iron
Newly purchased plants lose their leaves upon introduction into the tank	See “Extra: Aquarium plant = Aquatic plant?” (page 20)
The plants show deficiency symptoms in spite of being fertilized	Besides the possibility of unsuited fertilizers, it is in this case also possible that active carbon is permanently used as a filter material
The leaves turn pale green, while the leaf veins remain dark green	Manganese deficiencies cause this characteristic symptom
Coarse plant damages	Damages caused by snails and plant eating fish often cause severe trouble
The bottom ground/the roots are rotting	Rot zones have formed within the bottom ground under oxygen exclusion
A white layer deposits on the leaves	Lacking CO_2 makes the plants utilize bound CO_2 for their supply, this leads to lime precipitation

Solution
sera plant color provides the correct light composition for aquatic plants. Replace fluorescent tubes after 1 year at the maximum, as their intensity becomes lower
Regular fertilization with **sera florena** prevents iron deficiencies. Monitoring the iron level with the **sera Fe-Test** kit prevents insufficient supply (desired value: 0.2 mg/l)
sera floreplus supports the formation of new leaves
Active carbon should be used only briefly in acute cases, e.g. for removing treatment remainders or undesired water tints, and by no means permanently, as it also binds minerals, vitamins and trace elements
Besides the macro nutrients, **sera florena** also contains a balanced trace element blend including manganese
The animals should be offered alternative herbal food such as **sera flora** and **sera Spirulina Tabs**. A snail pest can be reduced quickly and easily with the **sera snail collect** snail trap
Regular siphoning with the **sera gravel washer** prevents the enrichment of waste products within the bottom ground. **sera Professional floreground** active bottom ground provides aeration of the bottom and thus prevents the formation of rot zones
Comfortable CO_2 fertilization with the **sera CO_2 system**

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For natural aquariums

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