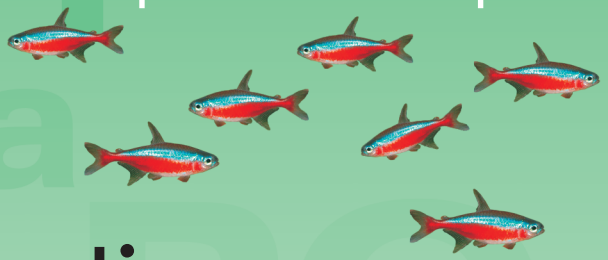
FLORA

Aquaset® 2

Set of 10 tests for measurement of water parameters in aquariums with plants



directions for use

ZOOLEK®

Aquaset 2 FLORA

Introduction

Aquaset 2 flora is a set of 10 tests for important water parameters in planted aquariums. The set allows the following tests:

- pH in two ranges: 4.5-9.0 and 6.0-8.0 (2x100 tests)
- general and carbonate hardness GH-KH (approximately 2x30 tests)
- nitrate NO_3^- content in the range of 0-150 mg/l (50 tests)
- phosphate PO_4^{3-} content in the range of 0-5 mg/l (30 tests)
- iron Fe^{2+} ions content in the range of 0-1.5 mg/l (30 tests)
- potassium K^+ ions content in the range of 0-125 mg/l (25 tests)
- calcium Ca^{2+} ions and magnesium Mg^{2+} ions content (25 tests)

The set contains reagents, three glass test tubes, directions for use and colour charts.

Measurement of water parameters allows to control its quality to ensure appropriate conditions for plants and animals in aquariums. Regardless of the way in which the water is prepared (reverse osmosis, tap water), it undergoes natural changes over time due to the chemical and biological transformations that take place in it. Most of these changes cannot be seen "with the naked eye". Uncontrolled deficiency and excess of bioelements may adversely affect plant growth conditions. Weakened plants are usually unable to compete with algae, which do not have high water quality requirements. Such a situation can result in a massive bloom of algae, which can quickly spread over the entire aquarium.

Regular measurement of water parameters also help to avoid a accumulation of substances that are food for plants and can become toxic to fish and other animals in the tank. Aquaset 2 flora is prepared especially for everyone interested in plant aquariums. Aquatest pH and KH allows to obtain water with proper pH and acid capacity (alkalinity). The value of total hardness - also a very important factor influencing plant growth, can be measured using Aquatest GH. Demanding aquarists thanks to **Aquaset 2 flora** can determine the relationship between calcium and magnesium ions. The set also includes reagents for the measurement of the most important macroelements - nitrogen (N), phosphorus (P) and potassium (K) and, indirectly, CO_2, as well as an element classified between micro- and macronutrients - iron.

Remarks

A spoon or a spatula is assigned to each test that contain a powder reagent.

test K - red spatula
test Ca-Mg - green and white spatula
test PO_4 - blue spatula
test NO_3 - yellow spatula
test Fe - white spoon

pH

pH test
for quick measurements
in the ranges of
4.5-9.0 and 6.0-8.0

General information

pH value is a measure of hydrogen ions (H^+) concentration:

pH=7 - water has a neutral pH

7<pH<14 - alkaline pH, the higher the pH value, the stronger the alkalinity

0<pH<7 - acidic pH, the lower the pH value, the stronger the acidity

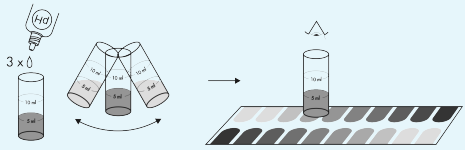
Water pH-value is one of the most important parameters determining possibility and conditions of biological life in aquariums and garden ponds. For water plants pH in aquarium should be similar to the pH value in their natural environment. Majority of water plants require pH value close to neutral (approximately pH 7), in conditions of pH under 5 or over 8.5 the growth become inhibited and plants die. Water pH value in aquarium or garden pond is influenced by the following factors: components of substrate that may react with carbon dioxide dissolved in water, substances from humus, products of biological decomposition, remains of organic food, droppings and CO_2 assimilation by plants. When reading the pH measurement results, it should be noted that we are dealing with a logarithmic scale, which means that a change in pH by one unit means a 10-fold change in the concentration of hydrogen ions in the water, while a change by two units means a 100-fold change in the concentration of hydrogen ions in the water! Since many aquatic organisms are much less tolerant to pH changes than those slightly different from natural conditions, it is important to ensure pH stabilization. To maintain stability of water pH value (buffering effect) some bicarbonate content is necessary, which means a carbonate hardness should be kept at the level of not less than 3 °dKH. In salt depleted waters, carbon dioxide assimilation by plants leads to increase in pH, and decomposition of organic matter by micro-organisms may cause both acidification and alkalization of water.

Measuring set

- 2 bottles containing indicator solutions for pH measuring in the range of: 4.5 – 9.0 with an accuracy of 0.5 and 6.0 – 8.0 with an accuracy of 0.2
- syringe for taking the water sample
- test tube
- doubled colour chart with pictorial instruction

Performing the measurement

1. Rinse the included test tube three times with the tested water, and then fill with the syringe to 5 ml.
2. Add 3 drops of the indicator solution and shake well to obtain uniform colour.
3. Match the obtained colour with a corresponding colour scale and read the result. The colour of the sample should be evaluated in daylight or artificial light similar to daylight.



Water pH correction

AQUACID is used for water pH lowering, and AQUALKAL for its raising. No violent pH changes should be made in aquarium with fish. If there is no biological balance in an aquarium there is an excessive quantity of organic matter decomposition products, pH correction will not increase water quality and water change is required.

GH KH

general and carbonate hardness test for quick measurements

General information

Water of natural inland basins contains various quantities of dissolved salts. Those are mainly sodium, calcium, magnesium and potassium salts. They significantly influence life of organisms - biological membranes permeability, osmotic pressure in cells and tissues or mediation in numerous life processes.

Total content of calcium and magnesium salts is defined by general hardness (GH). By definition, carbonate hardness is part of the total hardness and is made up of calcium and magnesium carbonates and bicarbonates. In natural waters, they usually give the ability to neutralize acidic compounds. Determination of carbonate hardness in aquarium tests consists in measuring the ability to neutralize mineral acid. The titration solution has such a concentration of acid that 1 drop corresponds to one German degree of hardness. The KH measurement carried out in this way determines the buffering capacity of water (alkalinity), which determines the pH stability. Therefore, KH should not be lower than 3 °d. Non-carbonate hardness is determined by other calcium and magnesium salts, mainly chlorides and sulphates. Maintaining hardness within a specific, optimal range is very important for fish and plant health.

The most frequently used unit of hardness is a German degree °d (dGH).

1°d corresponds to contents of 10 mg of calcium oxide in 1 litre of water

Hardness is also frequently expressed in milligram-equivalents in one litre of water (mval/l).

1 mval/l = 2,8 °d 1°d = 0,357 mval/l

Most frequently general hardness is higher than carbonate hardness, but in case of water containing sodium and potassium carbonates and bicarbonates carbonate hardness may be higher than the total one. This situation occurs frequently also in case of water softened with sodium cation exchanger (exchanging calcium and magnesium cations for sodium cations).

According to the general hardness the following types of water are distinguished:

- very soft - 0.5 °d
- soft - 5 - 10 °d
- medium hard - 10 - 15°d
- considerably hard - 15 - 20 °d
- hard - 20 - 30 °d
- very hard - over 30 °d

Measuring set

- bottle with the solution for carbonate hardness (KH) determination – contains titrant with alkacymetric indicator
- bottle with the solution for general hardness (GH) determination – contains titrant with complexometric indicator
- syringe
- test tube
- colour chart

Performing the measurement

1. Rinse the test tube and the syringe three times with the tested water.
2. Dry the test tube by turning it upside down.
3. Before use, bring the reagents and water to room temperature.
4. Take exactly 5 ml of the tested water with the syringe and pour into the test tube.
5. Tilt the bottle diagonally over the opening of the test tube, press the bottle slightly and add the solution drop by drop. The drops should be added directly to the tested water, not down the side of the test vial. After each drop, shake the test tube gently until the uniform colour is obtained. Avoid pouring water out of the test tube. The total number of drops required to obtain the colour change (see enclosed colour chart) is numerically equal to the hardness expressed in German degrees (°d). Only full not aerated drops guarantee accuracy of measurement (not full drops should be removed from the dropper by means of tissue paper).
6. The most reliable results, due to the easy observation of indicator colour change, are obtained from 5 to 20 drops in 5 ml of water. For very soft water (see 'General information'), a sample of 10 ml can be taken with one drop corresponding to 0.5 °d. For hard and very hard water, a sample of 2.5 ml can be taken with one drop corresponding to 2 °d.

7. For water with a pH below 6, measuring carbonate hardness is pointless, because in this case the result will always be close to zero. In case of very soft natural waters or waters softened with acidic cation exchangers, with pH below 6, before measuring the general hardness, the pH of the water sample should be increased to the value of 8-8.5 (e.g. with diluted Aqualkal).
8. Reading error is ±1 °d of the analysis result.

Carbonate hardness (KH) test

After adding the first drops of the KH titration solution to the water sample, a slightly bluish-purple colour appears (looking from above at the test tube opening against a white background). After further drops, the colour becomes more intense and easier to observe from the side of the test tube. The colour of the sample turns yellow-green or yellow as more drops are added. The number of drops causing the change of colour corresponds to carbonate hardness expressed in German degrees (°d).

General hardness (GH) test

After adding the first drops of the titration solution, a slightly pink colour appears, and after the next drops it becomes more intense and turns into red-pink (observe similarly to the measurement of carbonate hardness). Add drops of titration solution slowly, every 3 - 4 s. Expecting the end of the titration, slow down dosing to every 6 sec. and mix thoroughly. The colour changes to greenish as more drops are added. The number of drops causing the change of colour corresponds to general hardness expressed in German degrees (°d).

Remarks

Keep the test locked up in a cool, dark place, out of the reach of children.
Storage at 5 -10 °C extends the declared lifetime of the reagent.

CO_2 determination of carbon dioxide content based on **pH** and **KH** readings

General information

Carbon dioxide is a gas with good water solubility. Since carbon dioxide is used by plants in the process of photosynthesis, measuring its content in aquariums with vegetation is very important. Carbon dioxide content in aquarium water below acceptable levels may adversely affect plant growth, but on the other hand, its elevated concentration poses the danger to fish. To calculate the amount of CO_2 in the tank, the relationship between CO_2, pH and carbonate hardness can be used. For this purpose, the carbonate hardness (KH) and pH should be measured, and then, using the table, find the CO_2 content in the water corresponding to the measured parameters. Adding buffering agents other than carbonates to the water or using peat filters may affect the measurement result.

°d	pH of water					
	6,4	6,6	6,8	7,0	7,2	7,4
2	25	16	10	6	4	3
3	38	24	15	10	6	4
4	51	32	20	13	8	5
5	63	40	25	16	10	6
6	76	48	30	19	12	8
7	89	56	35	22	14	9
8	101	64	40	25	16	8
9	114	72	45	29	18	11
10	126	80	50	32	20	13
11	139	88	55	35	22	14
12	152	96	60	38	24	15
13	167	104	65	41	26	16
14	177	112	70	44	28	18

correct concentration *too low concentration*

too high concentration

NO_3^-

nitrate test
for quick measurements
in the range
of 0- 150 mg/l

Measuring set

- bottles with Reagent 1 and 3
- container with Reagent 2
- test tube
- yellow spatula
- colour chart with pictorial instruction

General information

Nitrates are the main source of nitrogen for aquarium plants. A sufficient concentration for most of them is 5 to 10 mg/l. In mature tanks with fish, supplementation is usually not needed, because nitrates accumulate in the water as a result of protein substances decomposition and constitute a final product of this transformation (the nitrogen cycle).

The following concentrations of nitrates:

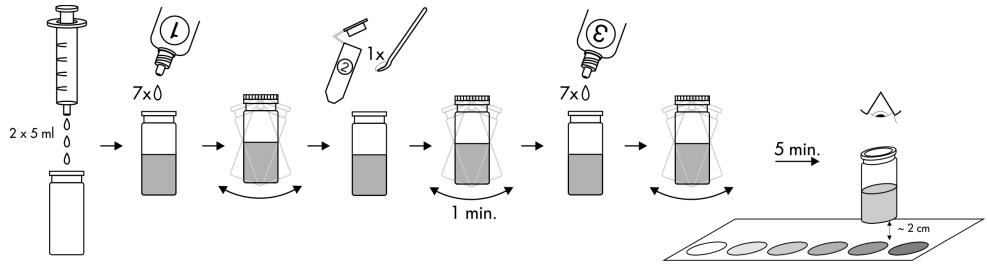
- up to 40 mg/l - are harmless for fish and improve plant growth
- from 40 to 80 mg/l - cause algae growth
- from 80 to 150 mg/l - inhibit plants growth and cause rapid algae growth. With this concentration, nitrates become harmful for fish - water replacement or using filtration flow bags Aquafix NO_3/Filtrax NO_3 is necessary.
- above 150 mg/l - are dangerous for fish and plants - immediate water replacement or using filtration flow bags Aquafix NO_3/Filtrax NO_3 is necessary. In newly set-up aquariums and in tanks with a small number of fish, nitrate deficiencies are possible, which initially inhibits plant growth, and then causes their death. To prevent nitrogen deficiencies, it is recommended to use the Aquaflora Complete fertilizer.

Performing the measurement

1. Rinse the test tube and the syringe three times with the tested water. Take exactly 10 ml of the tested water with the syringe and pour into the test tube.
2. Add 7 drops of Reagent 1, close the cap and mix by shaking. Leave for about 15 seconds.
3. Add 1 portion of powder Reagent 2 with the yellow spatula, close the cap and shake vigorously for 1 minute.
4. Add 7 drops of Reagent 3 and mix.
5. After adding Reagent 3 wait 5 minutes and compare the colour of the solution in the test tube with the colour chart and read the result corresponding to the concentration of nitrates expressed in mg/l. Compare the colour of the sample solution in daylight passing through the vial by holding the test tube over the colour chart.

Removing nitrate from water

To remove unwanted nitrate or nitrite ions partial or complete aquarium water replacement or using Aquafix / Filtrax NO_3 flow bags is recommended.



PO_4

phosphate test
for measurements
in the range of
0 - 5 mg/l

General information

Phosphorus is a vital macroelement forming part of organic compounds vital for life, such as proteins, amino acids and nucleic acids. In matured aquariums with fish, similarly to nitrogen, there is no need to supply phosphorus. More often, it is required to lower the phosphate level by changing the water. In aquariums with plants, the phosphate content should be kept at the level 0.25 – 1 mg/l. Above this level phosphate may cause rapid growth of algae. To supplement newly set-up tanks or plant aquariums with low fish density with phosphorus, it is recommended to use Aquaflora Complete fertilizer.

Measuring set

- bottle with Reagent 1
- container with Reagent 2
- syringe
- test tube (2 pcs.)
- comparator
- blue spatula
- colour chart with pictorial instruction

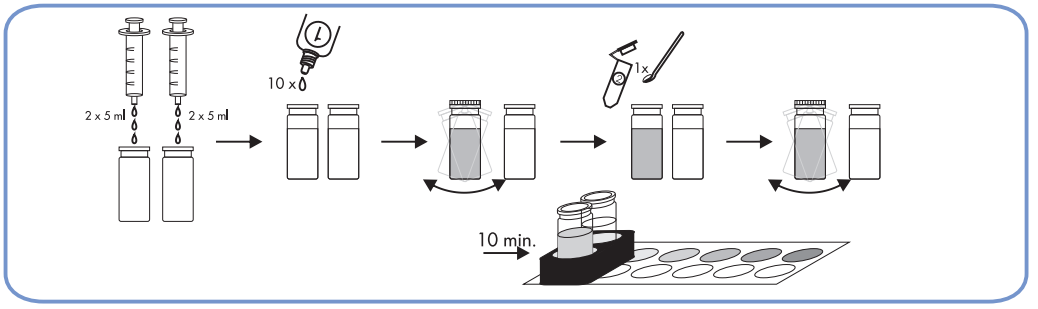
Performing the measurement

1. Rinse the test tubes and the syringe three times with the tested water.
2. Pour 10 ml of the tested water into both test tubes using a syringe (two times 5 ml).
3. Add 10 drops of Reagent 1 to one of the test tubes, close the cap and shake to mix.
4. Add 1 portion of powder Reagent 2 with the blue spatula to the test tube with Reagent 1 added, close the cap and shake until the powder has dissolved.
5. After 10 minutes place both open test tubes in the comparator. Move the comparator with the test tubes over the colour chart circles. The test tube with reagent added should be over white circles and the test tube with water only over the colour circles.
6. When the colour of the solution in the test tube with reagents is most similar to the colour of the tested water in the second test tube, read the result corresponding to the concentration of phosphate expressed in mg/l.
7. After measurement, thoroughly wash the test tubes and caps with tap water and dry.

Do not use cleaning agents to wash test tubes as they may contain phosphates.

Remarks

Keep the test locked up and out of the reach of children. Reagent 1 contains the solution of sulphuric acid. Avoid eye and skin contact. If in eyes: rinse cautiously with plenty of water and seek medical advice. If on skin: wash with plenty of water.



K

potassium test
for quick measurements
in the range of 0 -125 mg/l

General information

Potassium is one of the macroelements necessary for proper plant growth. As an activator of many enzymes, it is essential component of every plant organism. For plants, it has a dry matter content of about 1 %. Potassium has an influence on the osmotic balance and affects the work of stomata. Potassium belongs to the group of mobile nutrients, therefore its deficiency is visible first on the oldest parts of plants. Plants deficient in potassium turn yellow over time and holes appear in their leaves. Long-term deficiency may lead to leaf fall. For most plants, a suitable concentration of potassium in water is 10 – 20 ppm. Although a high level of potassium in water is not toxic, it may impair the absorption of other important elements such as magnesium and calcium. Potassium uptake depends mainly on the number of plants and their growth rate.

Aquaset K measurement method is based on quantification of the sample cloudiness. The higher potassium ions content in the sample, the higher cloudiness intensity. The measurement should be carried out in a well-lit room. However, high-intensity light directed onto the test tube should be avoided. The test result can be falsely high in the presence of ammonium compounds in water. Such a situation in a well-established aquarium is unlikely, but it can happen with ammonium supplementation. To avoid measuring errors, it is recommended to check the ammonia content with Aquatest NH_3 before the potassium test.

Measuring set

- two plastic test tubes with scales. The scale from 1 to 10 ml is used to measure the volume of water and its dilution. The scale from 3 to 25 mg/l is used to read the results
- container with Reagent K
- bottle with deionized water
- syringe for taking the sample
- red spatula
- plastic pipette
- pattern with pictoral instruction

Performing the measurement

Basic measurement:

1. Rinse the test tubes and the syringe three times with the tested water. Turn the test tubes upside down to dry. Make sure no water remains inside the test tubes.
2. Take 5 ml of the tested water from aquarium using the syringe and pour into one of the test tubes. Add 1 red spatula of reagent, close the cap and mix thoroughly - the resulting solution is the working solution.
3. After 1 minute place the second plastic test tube over the black circle and add the working solution with the pipette drop by drop. Continue dosing until the black circle viewed from the top of the test tube is no longer visible. Read the result in mg/l from the scale on the test tube.
4. Results interpretation:
   - result is expressed in ppm i.e. in mg K per 1 litre of water.
   - if the volume of the working solution is not sufficient to cover the black circle, the potassium concentration is assumed to be lower than 5 mg/l and the low concentration measuring procedure should be applied.
   - if result indicates the value higher than 25 mg/l the high concentration measuring procedure should be applied.

Low concentration measurement

1. Rinse the test tubes and the syringe three times with the tested water. Turn the test tubes upside down to dry. Make sure no water remains inside the test tubes.
2. Take 10 ml of the tested water from an aquarium using the syringe and pour into one of the test tubes. Add 2 red spatulas of reagent, close the cap and mix thoroughly - the resulting solution is the working solution.

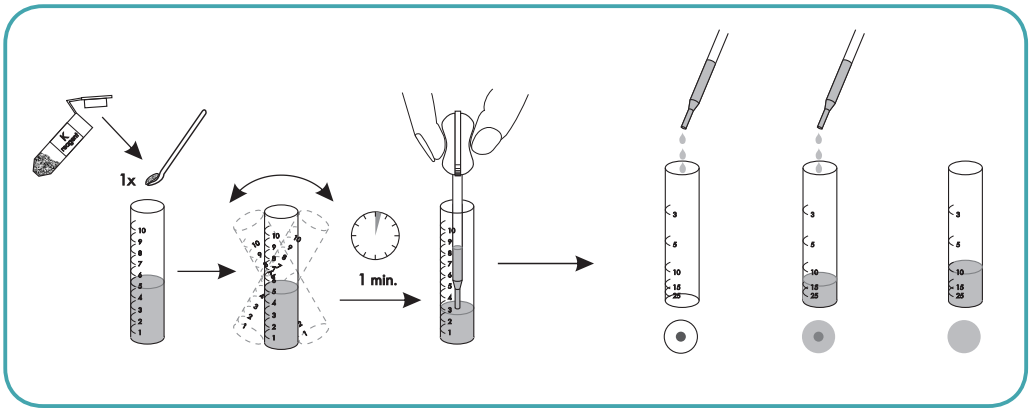
3. After 1 minute place the second plastic test tube over the black circle and add the working solution with the pipette drop by drop. Continue dosing until the black circle viewed from the top of the test tube is no longer visible. Read the result in mg/l from the scale on the test tube. If there is not enough working solution to cover the black circle, it means that the potassium concentration is less than 3 mg/l and it is recommended to supplement with this element with Aquaflora K.

High concentration measurement

1. Rinse the test tubes and the syringe three times with the tested water. Turn the test tubes upside down to dry. Make sure no water remains inside the test tubes.
2. Take 1 ml of the tested water from an aquarium using the syringe and pour into one of the test tubes. Fill with deionized water enclosed in the set to 5 ml, add 1 red spoon of reagent, close the cap and mix thoroughly - the resulting solution is the working solution.
3. After 1 minute place the second plastic test tube over the black circle and add the working solution with the pipette drop by drop. Continue dosing until the black circle viewed from the top of the test tube is no longer visible. Read the result in mg/l from the scale on the test tube and multiple by 5. If the result above 25 mg/l is obtained again, it means that actual concentration is above 125 mg/l.

Remarks

In the final phase of the measurement, when the black circle has almost completely disappeared, it is recommended to add the next portions of the solution slowly, in small portions in order to avoid measuring error.



Ca Mg

calcium-magnesium and general hardness test for quick measurements

General information

The test is intended for measurement of calcium and magnesium concentrations, as well as general hardness in fresh water. Especially useful for measurements of these values in planted aquariums.

Calcium is a vital element for proper growth of plants and plays an essential role in stabilisation of cell membranes. Magnesium is a component of many enzymes and it is vital for the synthesis of chlorophyll, i.e. green pigment essential in photosynthesis. Magnesium is involved in many processes including the activation of enzymes, synthesis of carbonates and proteins, phosphorus transport and energy production.

For the proper growth and health of most aquarium plants, it is usually sufficient to obtain appropriate water hardness, but for many other plants the relative proportion of calcium and magnesium concentrations is also important. Regular control of the concentration of these elements allows to supplement their content with the agents intended for planted aquariums.

Measuring set

– bottles with Reagents 1, 3, 4
– containers with Reagent 2, 5
– syringe
– test tube
– green spatula and white spatula
– colour chart with pictoral instruction

Performing the measurement

1. Rinse the test tube and the syringe three times with the tested water. Take exactly 5 ml of the tested water with the syringe and pour into the test tube. Make sure no air bubbles are present in the syringe.
2. Add 10 drops of Reagent 1 and shake well to mix.
3. Add 1 portion of Reagent 2 with the spatula (white colour) and mix by shaking until the powder has dissolved.
4. Add Reagent 3 drop by drop, shaking gently after each drop and counting carefully the drops until the colour changes from pink to blue (see enclosed colour chart). Only full not aerated drops guarantee accuracy of the measurement. Note the number of drops added – A.
5. Empty the test tube, rinse with water, dry and take a water sample as in step 1.
6. Add 10 drops of Reagent 4 and shake gently to mix.
7. Add 1 portion of Reagent 5 with the spatula (green colour) and shake gently until the powder has dissolved.
8. Add Reagent 3 drop by drop as in step 4 and count the drops carefully until the colour changes from pink to blue. To avoid measuring error make sure all drops are full and unaerated. Note the number of drops added – B.
9. Calculate the value of general hardness in °d:
   GH = A x 0,7 °d.
10. Calculate the content of calcium and magnesium:
    calcium concentration [Ca] = B x 5 mg/l
    magnesium concentration [Mg] = (A - B) x 3 mg/l

Remarks

Keep the test locked up and out of the reach of children. Reagent 1 contains the solution of ammonia. Irritaiting to respiratory system. Avoid eye and skin contact. Reagent 4 contains the solution of sodium hydroxide. Harmful, if swallowed. Avoid eye and skin contact. If in eyes: rinse cautiously with plenty of water and seek medical advice. If on skin: wash with plenty of water.

Fe

iron test
for measurements
in the range of
0 to 1.5 mg/l

General information

Aquarium with plants requires stable supply of supplements containing iron. This element has considerable influence on proper growth and beautiful appearance of plants in aquarium. Desired concentration of iron ions is in the range of 0.2 to 0.5 mg/l. Iron deficiency results in reduced plant growth and yellowed leaves whereas elevated levels - above 1.0 mg/l may be harmful for fish as well as for aquarium plants.

Not all iron compounds are assimilable by plants – fertilizers for aquarium plants contain water-soluble (II) complexes. Such a fertilizer is Aquaflora Fe. Content of iron added with soluble supplement decreases with time. The decrease rate depends on the quantity and kind of plants – its iron consumption, as well as on the water composition and the type of base of the aquarium.

That's why it is necessary to measure iron content on a regular basis. It is recommended to perform such a test using Aquatest Fe at least once a week.

Measuring set

– container with Reagent Fe
– syringe
– test tube (2 pcs.)
– white spoon
– comparator
– colour chart with pictorial instruction

Performing the measurement

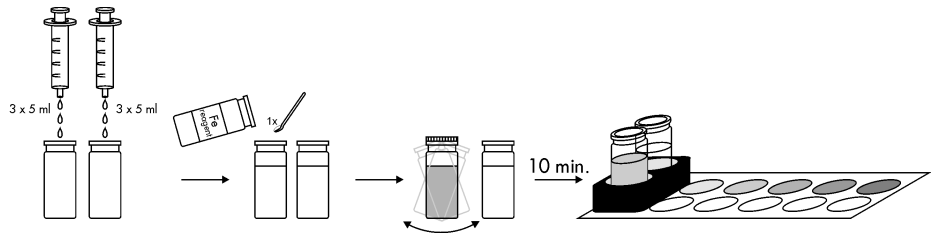
1. Rinse the test tubes and the syringe three times with the tested water.
2. Fill both vials with 15 ml of the tested water using the syringe (5 ml three times).
3. Add 1 flat white spoon of reagent to one of the vials. Close the cap and shake vigorously until the powder has dissolved.
4. After 10 minutes insert both vials into the plastic comparator.
5. Move the comparator with the test tubes over the colour chart circles. The test tube with reagent added should be over white circles and the test tube with water only over the colour circles.
6. Compare the colours appearing in the test tubes. When the colours are most similar, read the corresponding result in mg/l.

Remarks

Protect the powder reagent from moisture and keep the container tightly closed after use. Keep the reagent spoon always dry. After the measurement, empty the test vials, rinse thoroughly with water and dry.

Aqualora Fe

To supplement aquarium water with iron, the use of Aquaflora Fe is recommended. Aquaflora Fe is available as one of the fertilizers offered by ZOOLEK under Aquaflora system. To find out what volume of Aquaflora Fe should be added, enter your iron content obtained by use of Aquatest Fe into the calculator available on the Aquaflora Fe site.



pH x2

NO_3^-

K

GH

ZOOLEK®

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