

Nitrate: Do I need a Filter?



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autotrophic nitrate filter ("sulfur nitrate filter") versus heterotrophic nitrate filter ("alcohol filter"). Picture: AquaCare

. If it concerns the topic "nitrate filter", there - as for nearly all aquaristic topics - is a multiplicity of opinions and experiences. In principle well-known effects and side effects must be clear before the installation of a filter system. Only because a new development promises all possible or whether the filter system is "in", no reasons for the installation of the system should be.

Which nitrate value is correct?

"My aquarium should have exactly the nitrate value, to that in nature to find is!" This opinion reflects the will to copy the animals ideal conditions in nature, however often leads in aquaristic practice to problems. The aquarist must know, that is impossible to get the home aquarium in a natural equilibrium, and that measured values from nature are not the best for the aquarium at home.

Nitrate becomes lately - just as the phosphate - a pollutant. At high concentrations this statement is correct even. But in low concentrations the thing looks already differently. In or-

der to decide, whether nitrate is good or bad, it must be first of all recognized, which effects has nitrate on organisms.

Nitrate leads to alga growth

The more nitrate in the aquarium the more easily blue-green algae and green algae are growing faster than other benthic invertebrates, like corals. This growth will be stronger the more other nutrients like phosphate, carbon dioxide, iron and iodine are present in high concentrations.

Nitrate damages sensitive corals

Nitrate damages in particular in combination with phosphate directly corals. The sensitivity against these two substances contained in water varies from group to group of animals and from kind to kind. Also the ratio between the nutrients to each other seems to play a role.

So some soft corals can deal with nitrate concentrations over 100 mg/l - in opposites: they achieve extreme growth rates. Hard corals are generally more sensitive against nitrate. But in this group some corals (e.g. Fungia) can bear increased nitrate

values well, too. Because the sensitivity of the lime-producing systems of the animals differs, it is accordingly difficult to indicate generally accepted concentrations for nitrate.

Nitrate measuring problem

Nitrate with dripping or strip tests wet-chemically to determine is by the chemical side very much complicated, because the chemicals are easily perishable and causes very often wrong results. Each Aquarist must realize that the aquaristic tests supply only very rough results with partially over 100% deviation. Better are small photometers, which nevertheless exhibit more on laboratory conditions 10-20% deviations.

Nitrate value recommendation of AquaCare

From our experiences we recommend nitrate concentrations in the reef aquarium between 5 and 20 mg/l (ppm). Below these concentrations some animals can show deficiency symptoms, above it comes to damages.

When should a nitrate filter be used?



with *Artemia* fed *Tubastrea* spec. causes high nitrate concentrations. Picture: AquaCare

In principle it applies that each system before the use in the aquarium should be examined. The most important question is whether a nitrate filter is at all necessary. Even well know aquarists publishes test results, which were already not accomplished with this question correctly. Thus with an aquarium with a nitrate concentration of 20-30 mg/l nitrate a nitrate filter with sulfur substrate was installed. Within a few days the nitrate concentration is under the detection limit (0.1 mg/l). It is not amazing that with a lack of nitrate negative effects will occur. The corals were also not fed in this case with

plankton, in order to adjust this lack. It is simple to push the error to the nitrate filter. But in this case there was only an operating error by the aquarist.

A nitrate filter should be used only, if substantial nitrate concentrations are present in the aquarium water, and if simple methods like water changes, passive systems (e.g. living rocks), a better food brand will not lower the nitrate level. Likewise the nitrate filter should be adjusted in such a way that the nitrate concentration does not fall under 5 mg/l (except if it is possible to feed EACH day/night plankton). If the water flow of the filter should have not further to be throttled, a main part of the filter substrate from the reactor can be taken out. Also the installation of an dosing pump or operation in intervals are possible. In any case the filter should not be too large. In this case a small filter is usually better applicable than larger.

In normal reef aquariums with only a few fish and/or only little is fed (not to be recommend!) a passive nitrate filtering (soils like "deep sand filters", living stones, Jaubert System,

alga filter etc..) is usually enough. In aquariums, in which much is fed, a nitrate filter is meaningful, but only if the nitrate concentration with other means can not be reduced. In pure fish aquariums the nitrate value can be naturally lowered up to zero. Fish receive their nitrogen from the food.

Which system should be used?

. In the Aquaristik two systems for nitrate reduction are well-known: the autotrophic system with sulfur and the heterotrophic system with organic "substrate" (alcohol e.g.. "Wodka filters", starch, "Deni Balls" = biologically degradable filter materials, organic acids e.g.. "nitrate killers", etc.). Each system (autotrophic or heterotrophic) has its pro and cons. In the following table pro and cons of the aquaristic active nitrate filters are specified. Some disadvantages of technical versions (e.g.. RBR) are eliminated with the increase of technical expenditure: complex controls, accurate dosing pumps, nitrate analyzer, etc..

Autotrophic Filters		Heterotrophic Filters	
+	needs any even supply of a growth medium	-	needs an even supply of the nutritive solution (except "Deni Balls")
+	Overdosing not possible	-	Overdosing is possible and can lead to turbidity and oxygen lack in the aquarium
+	Risk to the sulfate reduction is low	-	Risk to the sulfate reduction (stinks like putrid eggs) is substantially more largely
-	long starting phases of several weeks possible	+	short starting phase of a few days
+	small bacteria growth and thus small blocking risk	-	high bacteria growth and thus high blocking risk
+	small running costs (a filter filling is enough for several years)	-	high running costs (growth medium)
-	relatively new system with small experiences	+	long well-known system