



WATER QUALITY IN AQUACULTURE

AMMONIA

- Ammonia occurs naturally in water bodies arising from the breakdown of nitrogenous organic and inorganic matter in soil and water, excretion by biota, reduction of the nitrogen gas in water by micro-organisms and from gas exchange with the atmosphere.
- It is also discharged into water bodies by some industrial processes and also as a component of municipal or community waste.

AMMONIA

- At certain pH levels, high concentrations of ammonia (NH_3) are toxic to aquatic life and, therefore, detrimental to the ecological balance of water bodies.
- In aqueous solution, un-ionised ammonia exists in equilibrium with the ammonium ion. Total ammonia is the sum of these two forms.

AMMONIA

- Ammonia also forms complexes with several metal ions and may be adsorbed onto colloidal particles, suspended sediments and bed sediments.
- It may also be exchanged between sediments and the overlying water.
- The concentration of un-ionised ammonia is dependent on the temperature, pH and total ammonia concentration.

AMMONIA

- Unpolluted waters contain small amounts of ammonia and ammonia compounds, usually $<0.1 \text{ mg l}^{-1}$ as nitrogen.
- Total ammonia concentrations measured in surface waters are typically less than $0.2 \text{ mg l}^{-1} \text{ N}$ but may reach $2\text{-}3 \text{ mg l}^{-1} \text{ N}$.
- Higher concentrations could be an indication of organic pollution such as from domestic sewage, industrial waste and fertiliser run-off. Ammonia is, therefore, a useful indicator of organic pollution

AMMONIA

- Natural seasonal fluctuations also occur as a result of the death and decay of aquatic organisms, particularly phytoplankton and bacteria in nutritionally rich waters.
- High ammonia concentrations may also be found in the bottom waters of lakes which have become anoxic.

NITRATE AND NITRITE

- The nitrate ion (NO_3^-) is the common form of combined nitrogen found in natural waters.
- It may be biochemically reduced to nitrite (NO_2^-) by denitrification processes, usually under anaerobic conditions.

NITRATE AND NITRITE

- The nitrite ion is rapidly oxidised to nitrate.
- Natural sources of nitrate to surface waters include igneous rocks, land drainage and plant and animal debris.
- Nitrate is an essential nutrient for aquatic plants and seasonal fluctuations can be caused by plant growth and decay.

NITRATE AND NITRITE

- Natural concentrations, which seldom exceed 0.1 mg l^{-1} $\text{NO}_3\text{-N}$, may be enhanced by municipal and industrial waste-waters, including leachates from waste disposal sites and sanitary landfills.
- In rural and suburban areas, the use of inorganic nitrate fertilisers can be a significant source.

NITRATE AND NITRITE

- Nitrate occurs naturally in ground waters as a result of soil leaching but in areas of high nitrogen fertiliser application it may reach very high concentrations.

NITRATE AND NITRITE

- Nitrate leaching from unfertilised grassland or natural vegetation is normally minimal, although soils in such areas contain sufficient organic matter to be a large potential source of nitrate.
- Sometimes the increased soil aeration that occurs enhances the action of nitrifying bacteria, and the production of soil nitrate.