

# ***WATER QUALITY IN AQUACULTURE***

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# ORGANIC MATTER

- Most freshwaters contain organic matter which can be measured as total organic carbon (TOC).
- For comparative purposes an indication of the amount of organic matter present can be obtained by measuring related properties, principally the biochemical oxygen demand (BOD) or the chemical oxygen demand (COD).

# ORGANIC MATTER

- The COD usually includes all, or most, of the BOD as well as some other chemical demands. In most samples,  $COD > BOD > TOC$ .
- However, in some situations this relationship may not be true, such as when the sample contains toxic substances

# TOTAL ORGANIC CARBON

- Organic carbon in freshwaters arises from living material (directly from plant photosynthesis or indirectly from terrestrial organic matter) and also as a constituent of many waste materials and effluents.

# TOTAL ORGANIC CARBON

- In surface waters, TOC concentrations are generally less than 10 mg l<sup>-1</sup>, and in groundwater less than 2 mg l<sup>-1</sup>, unless the water receives municipal or industrial wastes, or is highly coloured due to natural organic material, as in swamps.

# CHEMICAL OXYGEN DEMAND

- The chemical oxygen demand (COD) is a measure of the oxygen equivalent of the organic matter in a water sample that is susceptible to oxidation by a strong chemical oxidant, such as dichromate.

# CHEMICAL OXYGEN DEMAND

- The COD is widely used as a measure of the susceptibility to oxidation of the organic and inorganic materials present in water bodies and in the effluents from sewage and industrial plants.

# CHEMICAL OXYGEN DEMAND

- The concentrations of COD observed in surface waters range from 20 mg l<sup>-1</sup> O<sub>2</sub> or less in unpolluted waters to greater than 200 mg l<sup>-1</sup> O<sub>2</sub> in waters receiving effluents. Industrial wastewaters may have COD values ranging from 100 mg l<sup>-1</sup> O<sub>2</sub> to 60,000 mg l<sup>-1</sup> O<sub>2</sub>.

# BIOCHEMICAL OXYGEN DEMAND

- The biochemical oxygen demand (BOD) is an approximate measure of the amount of biochemically degradable organic matter present in a water sample.
- It is defined by the amount of oxygen required for the aerobic micro-organisms present in the sample to oxidise the organic matter to a stable inorganic form.
- Standardised laboratory procedures are used to determine BOD by measuring the amount of oxygen consumed after incubating the sample in the dark at a specified temperature, which is usually  $20^{\circ}\text{C}$ , for a specific period of time, usually five days. This gives rise to the commonly used term “BOD5”.

# BIOCHEMICAL OXYGEN DEMAND

- BOD measurements are usually lower than COD measurements.
- Unpolluted waters typically have BOD values of  $2 \text{ mg l}^{-1} \text{ O}_2$  or less, whereas those receiving wastewaters may have values up to  $10 \text{ mg l}^{-1} \text{ O}_2$  or more, particularly near to the point of wastewater discharge.
- Raw sewage has a BOD of about  $600 \text{ mg l}^{-1} \text{ O}_2$ , whereas treated sewage effluents have BOD values ranging from 20 to  $100 \text{ mg l}^{-1} \text{ O}_2$  depending on the level of treatment applied.
- Industrial wastes may have BOD values up to  $25,000 \text{ mg l}^{-1} \text{ O}_2$ .