Chapter 6
Bacteria and Fungi

6.1. SAPROTROPHISM

The aquatic bacteria, flagellates, and fungi are distributed throughout water bodies, but they are especially abundant in the mud-water interface along the bottom where bodies of plants and animals accumulate. While a few of the bacteria and fungi are pathogenetic in that they will attack living organisms and cause disease, the great majority begin attack only after the organism dies. When temperature conditions are favorable, decomposition occurs rapidly in a body of water; dead organisms do not retain their identification for very long but are soon broken up into pieces, consumed by the combined action of detritus-feeding animals and microorganisms, and their nutrient released for reuse (Odum 1971).

Heterotrophy is the sole source of energy for most bacteria in lakes and some evidence suggests that large proportions of organic matter produced by the algae may be used by the bacterioplankton. The bacterioplankters are about the size of lentils, though with shapes varying from the familiar rods and cocci to filaments and branched prosthecate forms. They are suspended freely in the water as single cells or small colonies and commonly are studded onto a nucleus of dead organic detritus or other organisms. It is difficult to know at what population densities they occur because methods of study are in their infancy (Moss 1988).

The numbers or biomass of bacteria are not good measures of their activity for the turnover of the populations may be very rapid. Moreover there is probably much specialization among the strains present. Some may metabolize mucose sugar polymers or one or more of the many carbohydrate polymers

found in algal cell walls; others may break down the chitins of crustacean exoskeletons and yet others may dissolve organic compounds secreted by phytoplankton (Moss 1988).

6.2. SEDIMENT AND THE OXIDIZED MICROZONE

In lakes, ponds and other standing waters, the many bacteria use organic detritus in the surface sediments as their energy source, and absorb much oxygen which is replaced by diffusion. Below this surface layer, called the oxidized microzone, bacterial activity uses up oxygen faster than it can be replaced and the sediment becomes anaerobic only a few mm below the surface. The oxidized microzone is usually brown-red in colour because it includes a large quantity of oxidized iron compounds: (largely oxide and hydroxide). Other substances are also present, especially ions like phosphate which are adsorbed and immobilized within the layer and largely prevented from diffusion into the overlying water. Below the oxidized microzone there is a great deal of bacterial activity for some centimeters. It is largely anaerobic, as different groups of bacteria, lacking access to oxygen and often unable to use it, use other electron accepters to oxidize organic matter (Moss 1988).

6.3. ACTINOMYCETES IN LAKE BURULLUS

Studies on the aquatic bacteria and fungi in Lake Burullus are too limited. Only three studies are available to the authors (Mahmoud & abou Zeid 2002, Abou-Elela *et al*. 2004, and El-Hissy *et al*. 2004). Actinomycetes can easily be isolated from fresh water and especially sediments of rivers and lakes (Al-Diwany and Cross, as quoted by Abou-Elela *et al*. 2004). The occurrence of these organisms in aquatic habitats means that they survive at these sites because most of them are endowed with spores or cells which show higher resistance toward unfavorable conditions than most bacteria.

The distribution of some groups of actinomycetes in Lake Burullus was investigated seasonally during the year 2003 by Abou-Elela *et al*. (2004). The diversity and counts of Streptomycetaceae, Actinoplanaceae and Nocardiopsaceae varied with the seasonal variation. Streptomycetaceae was the dominant group where its highest counts were detected in El-Znaka station in summer and spring (dry warm seasons). Stepwise multiple regression analysis revealed that the distribution of these groups was affected by some environmental factors such as temperature, organic matter and sediment nature, but there was no significant difference in the actinomycetales count along the studied area in the lake during different seasons.

6.4. ZOOSPORIC FUNGI IN LAKE BURULLUS

Mahmoud & Abou Zeid (2002) recorded 11 zoosporic fungal species in the surface water of Lake Burullus, in comparison with 15 species in Lake Manzala, 14 in Qaron and 10 in Edku. El-Hissy *et al*. (2004) studied the diversity of zoosporic fungi from the surface water of four Egyptian lakes: Burullus and Manzala in the north, Qaron in the mid and Nasser in the south. They identified 36 species in addition to 4 unidentified species and only one variety belonging to 11 genera of zoosporic fungi. Lake Burullus was the second most diverse lake (after Manzala), where 14 identified species, in addition to 3 unidentified species and one variety, were recorded. These taxa belong to 9 genera. Four genera: *Pythium*, *Phytophthora*, *Saprolegnia* and *Aphanomyces* were the commonest zoosporic fungi isolated from the surface water of Lake Burullus. *Phytophthera* is represented by the highest number of species (4 species and one variety), while *Allomyces*, *Aqualinderella*, *Blastocladia* and *Dictyuchus* were represented by only one species (Table 6.1).

Table 6.1. **Actual (Ac: out of 19 samples) and relative (Re: %) number of cases of isolation (NCI) of zoosporic fungal genera and species recoded from 19 surface water samples randomly collected from Lake Burullus (adapted from El-Hissy *et al*. 2004).**

Taxa	NCI		Taxa	NCI	
	Ac	Re		Ac	Re
Achlya	**4**	**21.1**	***Phytophthora***	**7**	**36.8**
A. conspicua	3	15.8	*P. cactorum var. applanata*	1	5.3
A. flagellata	2	10.5	*P. cambivora*	1	5.3
Allomyces	**3**	**15.8**	*P. cinnamomi*	3	15.8
A. macrogynus	3	15.8	*P. omnivora*	1	5.3
Aphanomyces	**6**	**31.6**	*P. primulae*	1	5.3
A. laevis	5	26.3	***Pythium***	**9**	**47.4**
A. species	1	5.3	*P. pulchrum*	1	5.3
Aqualinderella	**3**	**15.8**	*P. thalassium*	3	15.8
A. fermentans	3	15.8	*P.* species	6	31.6
Blastocladia	**1**	**5.3**	***Saprolegnia***	**6**	**31.6**
B. bringsheim	1	5.3	*S. diclina*	2	10.5
Dictyuchus	**1**	**5.3**	*S.* species	5	26.3
D.monosporus	1	5.3			

6.5. SUMMARY

The studies on the aquatic bacteria and fungi in Lake Burullus are limited. The distribution of some groups of actinomycetes in Lake Burullus was investigated seasonally during the year 2003. The diversity and counts of

Streptomycetaceae, Actinoplanaceae and Nocardiopsaceae varied with the seasonal variation. Streptomycetaceae was the dominant group. The distribution of these groups was affected by some environmental factors such as temperature, organic matter and sediment nature. The diversity of zoosporic fungi from the surface water of four Egyptian lakes: Burullus and Manzala in the north, Qaron in the mid and Nasser in the south was studied in 2004. 36 species in addition to 4 unidentified species and only one variety belonging to 11 genera of zoosporic fungi were identified. Lake Burullus was the second most diverse lake (after Manzala), where 14 identified species, in addition to 3 unidentified species and one variety, were recorded.

6.6. REFERENCES

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