SUMMARY

One of the major environmental problems in our surface water is the disposal of untreated or partially treated effluent and sewage. There is a need to study, evaluate and understand the effects of effluent and sewage on aquatic microflora. Their effect may range from inhibitory or stimulatory. Of the variety of organisms inhabiting water bodies, algae are one of the most suitable organisms for water quality assessment due to their small size, easy to culture and quick response to different environmental stress. They grow well under normal condition, but addition of organic, inorganic and toxic substances in the form of pollutants trigger off their growth abnormally and selectively. The species-specific toxicity of effluents may produce deleterious effects by favouring the growth of resistant forms and eliminating the susceptible ones affecting the structure and function of aquatic ecosystems.

The present investigation deals with the survey of algal flora and chemical characteristics of BRPL effluents and the water of Tunia river at six(6) different sampling stations to have some ideas about the changes in algal community along the gradient of decreasing pollution load due to the course of the river. An attempt was also made to use a few algal species of said waterbody for assessment, evaluation and abatement of such effluents.

The result of physico-chemical parameters reflect the polluted nature of the effluents as well as of the water of Tunia river specially at
S-1, S-2 and S-3 sampling stations. The nature of effluents was found to be alkaline (pH 8.54) and contained objectionable amount of DO, BOD, COD, OAG, ammoniacal nitrogen, nitrate nitrogen, sulphate, chloride, hardness and total alkalinity. From the result it is clearly evident that the physico-chemical status of Tunia river specially at station S-1 was being greatly affected by the effluents discharged from the BRPL complex. A highly significant positive correlation was found between the Refinery outlet (E) and station S-1 for some of the important parameters such as conductivity, total dissolved solid, pH, DO, BOD, COD, OAG, nitrate nitrogen, chloride, total hardness etc., responsible for pollution. The decreasing trend in the pollution load along the river course may be attributed partly to the dilution factor and partly to the effective utilization of the effluents by microorganisms including some tolerant algae harboring the stream. The seasonal variations in data clearly indicates that during monsoon season the river shows minimum pollution load in comparison to other three seasons. This was due to high water level during this season.

The algal flora of Tunia river which are subjected to these influencing physico-chemical factors also exhibited distinct zonation during the period of investigation. The effluent exhibited characteristic algal flora. Cyanophyceae, particularly members of the family Oscillatoriaceae was found to be most dominant group in the effluent. The species like Nitzschia palea, Navicula sp., Chlamydomonas sp., Chlorella vulgaris, Scenedesmus quadricauda, Ankistrodesmus falcatus and Euglena acus were also found to be in dominating state. Horizontal variations of algal forms under different classes were observed at different sampling
stations of Tunis river depending upon the pollution load. The high pollution load at S-1 and S-2 sampling stations did not permit large number of algal species to thrive and only a few species were encountered which obviously had profound tolerance to oil pollution. Cyanophyceae also dominated in these stations. The station S-3 showed slight improvement in certain physico-chemical and phycological characters. It contained more diverse forms which included both pollution tolerant and pollution preferred algae. Chlorophyceae was dominated in this station. There was gradual increase in diversity towards downstream with decreasing pollution load. A healthy portion of the river specially S-4, S-5, and S-6 sampling stations represented by higher percentage of diatoms.

To assess the pollution status palmer’s pollution index (Palmer, 1969) was used. The total score of the stations S-1, S-2 and S-3 were greater than 20 indicating high organic pollution. The trend of decreasing organic pollution towards downstream (S-4, S-5 and S-6) was observed and supported by physico-chemical findings.

Laboratory based bioassay experiments were conducted using Oscillatoria chlorina, Anabaena variabilis (Blue green algae), Chlorella vulgaris, Scenedesmus quadricauda and Schizomeris leibleinii (green algae) as test organisms. The study revealed that the blue green algae was more tolerant to the BRPL effluents than green algae. This findings are again in conformity with the availability of blue green algae specially at S-1 and S-2 sampling stations. The higher concentration of the effluent was stimulatory for the growth of blue green algae while inhibiting the
growth of green algae. The lower concentration of effluents stimulating the growth of green algae. *Oscillatoria chlorina*, the most tolerant species observed in this experiment was further used in our abatement programme. It was observed that it can significantly reduce the level of pollution in term of COD.

Thus, by selection of particular algal species, it may be possible to bring about biological changes in the effluents, which may otherwise be toxic or unsuitable for release into a waterbody.

All these studies revealed that algae can be best employed for assessment, evaluation and abatement of pollution load.