SUMMARY AND CONCLUSION:
One year limnological study (October-1994 to September 1995) was carried out on 3 freshwater ponds situated in Kalghatgi Taluk of Dharwad district. A total of 24 physico-chemical parameters were studied on monthly basis. The waters of these ponds are being used for irrigation purpose and are subjected to biotic disturbances such as bathing, cattle bathing, washing of cloths etc. In addition Kalghatgi pond had sewage inflow from the surrounding localities. The study is oriented towards the comparison of biotic and abiotic factors in these ponds, distribution and seasonality of phytoplankton and evaluation of irrigation qualities of waters.

Further, it was intended to know the role of source water on the growth and establishment of algae. In view of this study on algal growth in paddy fields irrigated by bore well water was conducted. For this, 4 rice fields were selected for the study. Chemistry of source water, algal growth and possible changes taking place in the paddy fields during the rice growing period were studied. A total of 23 physico-chemical parameters and various algae, chiefly phytoplankton, were studied on fortnightly basis.

Present work also involves the isolation and culturing of algae such as *Cosmarium laeve* Rabenh. and *Pediastrum simplex* Meyen and the effect of various effluents such as paper mill effluent, dairy effluent and sewage on the growth of these algae.

Of the 23 factors studied for 3 ponds, the average values of EC, hardness, calcium, chloride, sodium, potassium, magnesium and salinity were significantly high in Kalghatgi pond and the nitrate was significantly high in Madakihonnalli pond. Remaining factors studied showed non-significant difference.

The significant higher values of EC, hardness, calcium, chloride, sodium, potassium, magnesium and salinity in Kalghatgi pond can be attributed to the sewage inflow, as this pond was subjected to sewage contamination. On the
other hand, Tamboor and Madakihonnalli ponds which were free from these contaminations had lowest values of these factors. In Madakihonnalli pond possibly the autochthonous origin by death and decay of macrophytes during the fag end of summer was the main source of nitrate.

The seasonal fluctuation studied revealed significantly higher values of hardness, calcium and magnesium during summer in Tamboor pond and during monsoon values of dissolved organic matter and iron were significantly high. pH value was significantly high during winter.

In Kalghatgi pond the values of EC, organic nitrogen and iron were significantly higher during monsoon and during summer values of hardness and magnesium were high.

In Madakihonnalli pond, during summer, values of EC and hardness were high while during monsoon iron value was high.

The summer higher values of hardness, calcium, magnesium can be attributed to the lower water renewal capacity and high evaporation rate resulting in retention of more salts.

Monsoon higher values of carbon dioxide, organic nitrogen, iron, EC can be attributed to the allochthonous addition by run off water from surrounding rice fields. Significant winter higher pH of Tamboor pond can be attributed to the lower value of dissolved organic matter during this season. Lower winter temperature with low bacterial activity resulting in lower consumption of oxygen may be the reason for higher pH value of this season.

The Sodium Adsorption Ratio (SAR) in all the 3 ponds was less than 10 showing S1 category in all the seasons and thus the water can be used for irrigation of almost all types of soils and it poses negligible salinity problem.
The EC values revealed that Kalghatgi pond water was of C4 type indicating high salinity concentration due to sewage inflow, while Tamboor and Madakihonnalli pond waters, free from sewage inflow, were of C2 type indicating moderate salinity concentrations.

Biotic factors studied revealed that, in general, Cyanophyceae, Bacillariophyceae, Euglenophyceae, Chlorococcales, Desmidials and Dinophyceae constituted the phytoplankton group. A total of 169 phytoplankton species were recorded. Among the 3 ponds highest number of phytoplankton species was recorded in Tamboor pond (100 species) and this was followed by Kalghatgi pond (87 species). Madakihonnalli pond showed the lowest number (63 species). Thus the diversity was more in Tamboor pond.

Highest abundance of Cyanophyceae was recorded in Kalghatgi pond and lowest in Tamboor and Madakihonnalli pond. This can be attributed to the higher salinity and EC values due to sewage inflow in Kalghatgi pond. Seasonality of BGA in Kalghatgi and Tamboor ponds showed higher population during summer and lowest during winter and monsoon, while in Madakihonnalli pond they were not recorded during summer and monsoon, with very lower number during winter. Higher summer population in Tamboor and Kalghatgi may be attributed to the higher values of water temperature, calcium, magnesium, and phosphate.

The average abundance of Bacillariophyceae was high in Kalghatgi pond and low in Tamboor and Madakihonnalli ponds. Higher values in Kalghatgi pond can be attributed to the higher values of calcium, magnesium, chloride, EC and salinity and lower values of organic nitrogen. Seasonality of diatoms in Tamboor and Kalghatgi ponds showed higher abundance during monsoon and in Madakihonnalli during winter. Monsoon higher population may be due to the higher values of water temperature and dissolved organic matter while
winter maxima was due to the lower water temperature and higher value of dissolved oxygen.

Average population of Chlorococcales was high in Kalghatgi pond and low in Tamboor and Madakihonnalli ponds. The higher population of Chlorococcales in Kalghatgi can be attributed to the higher values of EC, calcium, magnesium, sodium and potassium. Seasonal fluctuation revealed that in Kalghatgi and Tamboor ponds higher population of Chlorococcales was during monsoon, while in Madakihonnalli pond it was higher during winter. The monsoon higher population may be due to the monsoon showers which might have resulted in increased concentration of nutrients. Winter maxima of Madakihonnalli pond can be attributed to the higher concentration of dissolved oxygen.

Highest average population of desmids was recorded in Tamboor and lowest in Kalghatgi and Madakihonnalli ponds. Higher population of desmids in Tamboor can be attributed to the lower nutrient contents. Seasonality of desmids showed higher population during monsoon in Tamboor and lowest during winter. In Kalghatgi and Madakihonnalli ponds their abundance was very low. Monsoon higher values of desmids can be attributed to the lower value of pH, free ammonia and phosphate.

Euglenoid population was higher in Madakihonnalli pond and low in Tamboor pond. Higher population in Madakihonnalli pond can be attributed to the higher mean concentrations of carbon-di-oxide and nitrate which might have favoured the growth of euglenoids. Seasonality of euglenoids revealed that in Tamboor and Madakihonnalli ponds euglenoid population was high during summer and in Kalghatgi pond their abundance was high during monsoon. Summer higher population may be due to the higher values of dissolved organic matter, carbon-di-oxide, phosphate and iron and decrease in pH.
Monsoon higher population of euglenoids in Kalghatgi could be attributed to the higher values carbon-di-oxide and iron followed by decrease in pH value.

Ecological study on the quality of source water and its influence on the algal growth in paddy fields indicated that bore-well water in the rice fields shows significant increase in pH, dissolved oxygen, sodium, magnesium and phosphate and decrease in EC, carbon-di-oxide, bicarbonate, calcium, potassium, sulphate, nitrate and salinity.

The pH value of bore well water was around neutrality and was always significantly lower than rice field water indicating that when flown into the fields the pH increases. The results also depicted that bore well water was with significantly lower oxygen but higher value of carbon-di-oxide and bicarbonate. Increase in oxygen content of water in the rice fields could be due to dissolution from atmosphere and photosynthetic activity. Simultaneous decrease in carbon-di-oxide and bicarbonate was due to their utilisation by autotrophs like Mougeotia spp., which formed floating mats and other algae. Thus removal of carbon-di-oxide by algae increased the pH in rice fields.

The EC of bore well water was high and when it was fed to rice fields it decreased in all the rice fields. Utilisation of mineral salts dissolved in water, by the organisms in the rice fields may be the reason for decrease in EC of rice fields. Similarly lower values of calcium in rice fields could be attributed to the consumption by algae.

In rice fields sodium value was slightly higher as compared to the bore well water, may be due to the better growth and subsequent decomposition of phytoplankton.
A total of 143 phytoplankton belonging to Bacillariophyceae (79), Desmids (27), Chlorococcales (18), Euglenoids (14), Cyanophyceae (6) were recorded which indicated the dominance of diatoms.

Diatom population was more in rice field I, II and III while in rice field IV it was low, may be due to the slight increased population of BGA in this rice field.

Higher diatom population in remaining rice fields can be attributed to the utilisation of carbon-di-oxide, and bicarbonate which resulted in increased pH and dissolved oxygen level. Decreased values of nitrate and calcium indicated their possible utilisation by growing diatoms. Rise in the levels of organic matter, chloride and consequently sodium has been found to be more favourable for diatoms. Thus the study reveals that ground water is more favourable for diatom growth in the rice fields. However, slight increase in BGA can reduce the abundance of diatoms. Growth of diatoms, along with other algae, brings out change in quality of water like rise in pH and decrease in some nutrients such as calcium and nitrate. Uneven dominance of different species is an indication of varied nutritional requirements of diatom species.

In general this study proved the suitability of bore well water for the growth of algae. At the same time growth of algae in stagnant water reduces certain nutrients such as calcium, nitrate, potassium and sulphate. But the simultaneous growth of micro organisms like bacteria possibly lead to the increase in certain factors like sodium, magnesium, and phosphate. Although very heavy nutrient load is inhibiting the algal growth, algae are interesting groups which would grow in adverse conditions. If the environment is made suitable, may be by reducing the nutrient level, they would grow and further bring down the nutrient level.
In view of this an attempt has been made to see the effect of various effluents on the growth of two phytoplankton species. The two algae *Cosmarium laeve* Rabenh. and *Pediastrum simplex* Meyen were grown in the laboratory in pure state in Chu 10 (modified) medium. Further, the growth of these algae in different waste waters such as Paper mill effluent, Dairy effluent and sewage were studied. From the study it can be concluded that none of the waste waters was toxic to the level of killing the algae. However, the growth response was different. Various dilutions made with bore well water showed that growth of these algae enhanced with dilutions. These experiments prove that *C. laeve* is the best organism favoured by all the effluents. Growth of *P. simplex* was retarded by all the three waste waters in higher concentrations. It is thus concluded that *C. laeve* is most suitable for the treatment of waste water.