Review of literature

Phytoplankton is the most important plant for the survival of marine lives and maintenance of Oxygen level in the atmosphere. Phytoplankton form the basis of the marine food web and are responsible for approximately half of global carbon dioxide (CO_2) fixation (~ 50 Peta grams of carbon per year). Thus, these microscopic, photosynthetic organisms are vital in controlling the atmospheric CO_2 concentration and Earth's climate. (Laura A Bristow, Wiebke Mohr, Soeren Ahmerkamp, Marcel M M Kuypers, 2017). Besides playing an important role in maintaining the oxygen level in the atmosphere, Phytoplankton also play a very important role in the growth of fish in fish pond. Many studies have shown direct correlation between the growth of fish and presence of phytoplankton in the pond. Phytoplankton (as a primary producer) constitutes the basic nutritional source in diets of fish owing to high amounts of phytonutrients and biologically active ingredients it provides, e.g. fatty acids, amino acids, sterols, organic minerals, enzymes, carotenoids, chlorophyll, trace elements, vitamins. The larval fish fed with phytoplankton gain many benefits, e.g. significant improvement of growth, feed ingestion, health and survival. By enhancing the nutritional value of all components in an aquatic food web, phytoplankton is a crucial source of oil lipids, primarily omega-3 (n-3) and omega-6 (n-6) PUFA Polysunsaturated Fatty Acid), sterols and essential amino acids. (Agnieszka Napiórkowska-Krzebietke, 2017). Phytoplankton, elementary

producers in ponds take in all essential inorganic materials from the water and conduct phytosynthesis with sunlight, producing organic nourishment needed for their own growth and reproduction.

Fertilization of ponds is done to supply phytoplankton with nutrients for the growth of phytoplankton. Zooplankton and other aquatic animals feed on phytoplankton for their growth and propagation. Fish feed on plankton and other hydrobios. So fish pond fertilization is done for cultivation of various food organisms and their propagation in large quantities so as to provide fish with abundant natural feeds so that they can grow faster. The yield of fish pond oes up thereby. (Regional Lead Centre in China Asian-Pacific Regional Research and Training Centre for Integrated Fish Farming Wuxi, China, 1985)

In view of this it is very important to find out the factors which are responsible for growth of phytoplankton in fish pond so that the fish production can be increased. There are various factors involved including sunlight, fertilisers, pH level etc. Phosphorous is considered as important nutrient for plankton production, as it has been found to result in producing a higher abundance of phytoplankton than nitrogen alone (Daniels and Boyed 1993). Several studies have been carried out to identify the organic and inorganic fertilisers which can stimulate higher growth in phytoplankton. pH level of water also plays a role in the growth of phytoplankton in a limited manner. At high pH levels, the availability of CO_2 decreases and may become limiting to photosynthesis and growth of marine phytoplankton. At high pH levels, the availability of CO_2

decreases and may become limiting to photosynthesis and growth of marine phytoplankton. Therefore, pH mediated through [CO_2] may be an important abiotic factor affecting the ecology of marine phytoplankton (Celia Y. Chenl, Edward G. Durbin, 1994).

Natural sunlight has got direct impact on phytoplankton. The presence of sunlight is crucial to the life of phytoplankton as sunlight is essential for photosynthesis.

Various studies have been carried out on the effect of organic and inorganic fertilisers on growth of planktons in fish ponds. The importance has grown recently as more and more people are going for organic food. So it is important to know the effect of organic fertilisers on plankton growth. Treatment with poultry manure is better than treatment with cow manure alone and in combination with or without the treatment of mineral fertilizers in combination. Therefore, fish culturists in general, particularly rural fish farmers, may be encouraged to use poultry manure. (Md. Yeamin Hossain, Momtaz Begum, Zoarder Faruque Ahmed, Md. Ashabul Hoque, Md. Abdul Karim and Md. Abdul Wahab, 2006). Another study was carried out to find out the effect of agroliser and inorganic NPK on phytoplankton growth. The use of agrolyser (micronutrient fertilizer) with NPK (Macronutrient fertilizer) increased the phytoplankton population by providing more nutrients. Phytoplankton are main food organisms for intermediate consumers. Both types of fertilizers are recommended for use in ponds especially those that are used for raising

herbivorous fishes, and to achieve maximum plankton production in the ponds for maximum fish production and hence high profitability. (Davies, O. A., Alfred-Ockiya, J. F. and Asele, A., 2006).

Phytoplankton growth also depends on the season. This can be attributed mainly due to the variation of temperature. Total phytoplankton population were significantly higher in the month of February followed by March, October, November, December and January. The study was conducted from October to March. (Md Yeamin Hossain et al, 2007).

Phytoplankton biomass estimates are of major concern in aquatic ecological studies (Harris, 1986). Algal carbon content is extremely difficult to determine directly and is therefore usually estimated from other parameters, which require many calculations and/or the use of imprecise conversion factors (Geider *et al.*, 1997). Counting and volume assessment of cells, and measurement of pigment concentration, are widely used to estimate algal biomass (Smayda, 1978; Jeffrey *et al.*, 1997).