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RELATIONSHIPS BETWEEN FERTILIZATION AND PHYTOPLANKTON COMPOSITION AND PRODUCTION IN SERW FISH FARM

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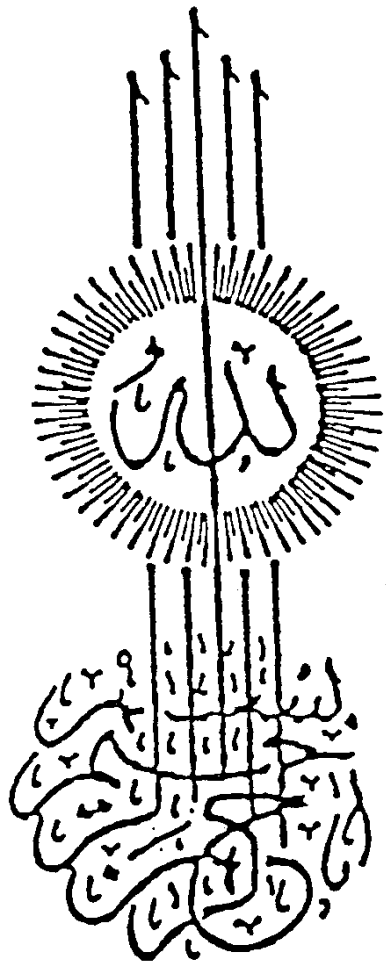

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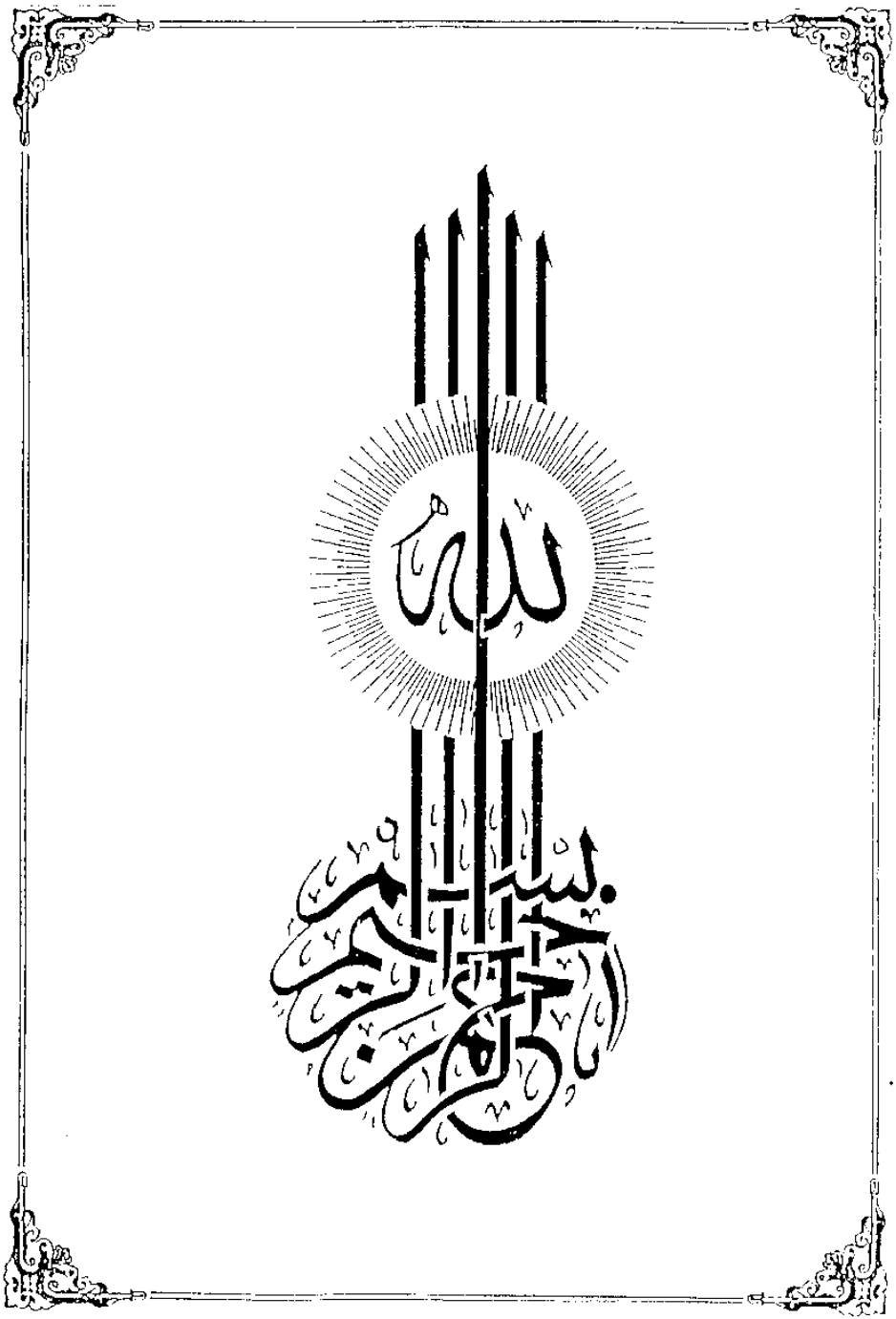

This is to certify that this thesis has not already been previously submitted for any degree and is not being concurrently submitted in candidature for any other degree at this or at any other university.

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COURSES OF PRE-MASTER

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CHAPTER I
INTRODUCTION & HISTORICAL REVIEW

INTRODUCTION

In Egypt, the need for increasing fish production is necessary in view of the high demand for fish as a relatively cheap source of animal protein. During the last 15 years, aquaculture began to play a significant role in total fish yields in our country. Additions of fertilizers or supplemental feeds to fish ponds are beneficial by increasing fish production. However, in some ponds, the nutrients contained in feeds and fertilizers cause excessive phytoplankton production. Unmanaged phytoplankton growth poses major constraints to profitability of aquaculture. The commonly used system of fertilization of fish ponds in Egypt depends on the addition of half ton of cattle manure /feddan addition to 10 Kg superphosphate, 10 Kg ammonium nitrate and 5 Kg urea/feddan/month.

The present study was initiated to evaluate the intensely used fertilization system and express a new fertilization technique for managing phytoplankton. The impact of the two systems on water quality biological character and fish production was evaluated.

HISTORICAL REVIEW

The addition of nitrogenous fertilizers and organic manure in brackish water fish ponds and their effects on microscopic algae had been investigated by **Mandal (1962)**. The application of organic and inorganic fertilizers seperately and in combination in Minnesota Fish Rearing Ponds was carried out by **Doble (1966)**. **Golterman (1966)** studied the effect of fertilizers on soil and water chemistry as well as primary productivity. The stimulatory effect of organic and inorganic fertilizers on aquatic productivity was investigated by **Gooch (1966)**. The limiting factors affecting the fertilizer dose, chemical, biological and economic conditions were discussed by **Hepher (1966)**. **Lin and Chen (1966)** who reported an increase in fish production by using inorganic fertilizer. **Liang (1966)** studied the benthic organisms as indicator of productivity in fertilized and unfertilized fish ponds. **Rabanal (1966)** studied the impact of application of inorganic fertilizer in freshwater fish ponds on water quality and fish production. **Wolny (1966)** concluded that organic fertilizers are more suitable for fertilization of fish ponds under European climatic condition. The changes in environmental and biotic characters of natural lakes after fertilization by nitrogen, phosphorus and potassium were investigated by **Smith (1969)**. The relationship between primary productivity and phytoplankton abundance and nutrient concentration was reported

by Kabanova (1970). Caperon and Mayer (1972) studied nitrogen as limiting factor for growth of phytoplankton. The effect of inorganic fertilizers as ammonium nitrate and triplephosphate on phytoplankton productivity was investigated by Boyd (1973). The changes in species compostion of phytoplanktonunder the influence of nitrogen and phosphorus were studied by Glooschenko and Alvis (1973). The increment of natural productivity in fish ponds as a result of addition organic manures was reported by Schroeder and Hepher (1979). The relationships between primary productivity and fish yield in intensely manured fish ponds was investigated by Noriega-Curtis (1979).

Wohlfarth and Schroeder (1979) studies the advantages of application of organic manures in fish ponds. They reported that manure may enter the feeding regime as a food consumed directly by fish, as a source of minerals required for photosynthetic production of phytoplankton and as a source of organic matters for heterotrophic organisms. Boyd (1981) investigated the fish production in ponds fertilized by triplephosphate, diammonium phosphate and liquied fertilizers. Davidson and Boyd (1981) studied the response of phytoplankton to liquid fertilizers in fish ponds. Chang and Bradford (1979) studied the application of fermented cow manure for fertilization of polyculture fish ponds and its impact on levels of chlorophyll and primary production of phytoplankton. Currie (1986) investigated the minimum dose of orthophosphate required

to sustain the maximum growth of phytoplankton in natural waters. Smith and Piedrahite (1988) reported the relation between phytoplankton density and level of dissolved oxygen in fish ponds.

Several author reported the effect of inorganic fertilizers on phytoplankton density and species composition on fresh and brackish water. In this connection, Imboden (1974) provided a biological model for eutrophication1) in lakes considering phosphorus is the limiting factor. He also found that, the increasing of nitrogen and phosphorus concentrations in natural waters usually stimulates their biological productivity. Welch et al. (1978) investigated the relation between nitrate and the growth of phytoplankton assemblages in laboratory cultures using natural waters as basic medium. Fee (1980) reported the effect of fertilization with both phosphorus and nitrogen versus and phosphorus alone on eutrophication of some experimental lakes. Gardon et al. (1981) concluded that the nutrient and phytoplankton can be used to assess the trophic status of shallow fresh water. Gillespie and Mackenzie (1986) studied the relation between plankton productivity and nutrient chemistry of Tasman Bay in New Zealand.

Mitamura (1986) investigated the influence of cell size on response of urea, ammonium and nitrate nitrogen assimilation by natural phytoplankton in water regions having different trophic characters in lake Biwa in New Zealand. Mitamura and Saijo (1986)

studied the regeneration of urea and ammonium and status of dynamic balance with the nitrogen consumption by phytoplankton assimilation. D'Elia et al. (1986) discussed the relationship between nutrients input and phytoplankton productivity. Reinertson et al. (1986) studied algal competition for phosphorus and the effect of zooplankton and fish. Sakshaug and Olsen (1986) investigated the nutrient status of phytoplankton blooms and algal strategies for nutrient comptition in Nerwegian waters. Suttle and Harrison (1986) examined the maximum uptake rates of phosphate by natural phytoplankton assemblages grown at different nutrient supply rates, in phosphorus limited semicontinuous cultures. White et al. (1986) reported the nutrient demand and availability related to growth of phytoplankton natural assemblages. Campbell and Bate (1987) concluded that the main factors influencing phytoplankton primary production in natural waters are physical (temperature, light and salinity), biological (cell concentration and chlorophyll content). Palehemio and Fulthorpe (1987) studied the relationships between biomasses and levels of production of phytoplankton, as well as their dependence on environmental parameters. Vilic'ic (1989) studied phytoplankton population density as indicator of eutrophication. He found the development of plankton depends upon the concentration of nutrients and ecological factors as light, temperature, salinity, composition and quantity of organic matter.

In marine fish ponds, nutrient uptake by phytoplankton occurred throughout the day and night. Also, phytoplankton took up Ammonia-N until it was depleted and only then took up nitrate (Krom et al., 1989).

In Egypt, organic manure as well as inorganic fertilizers (N & P) are usually used for fertilization of fish farms. Most of investigations reported the impact of these fertilizers on chemistry and on growth rate of the fish. In this connection, Wahby (1974) studied the effect of fertilizers on water quality of rearing ponds in Max Fish Farm. The impact of fertilizer on growth of Mugil capito, Mugil cephalus and Tilapia spp. was investigated by Bishara (1978 b, 1979).