INTRODUCTION

In Egypt the demand for fish as a source of food protein has progressively increased due to the rapid increase of the Egyptian population.

Owing to the apparent deficiency in animal protein, increasing fish production has been considered in the last few years as one of the main goals of the food security program in developing countries including Egypt. This can be achieved by rearing fish in fish farms. Fish culture allover the world has been improved in order to increase the quality and quantity of different types of fish **(Haggag *et al.*, 1977).** Therefore, **Hepher and Pruginin (1981)** showed that aquaculture is based on exiting water bodies rather than on ponds constructed especially for fish culture.

The interest of aquaculture potential in Egypt has been directed mainly towards the development of ponds culture either in shallow or deep ponds **(Ishak, 1985).** The potentialty of fish farming in Egyptian freshwater ponds is so great due to the suitable climate, availability of cultured fish seed, availability of water and fertility of the lands **(Hassanen, 1986).** Also, aquaculture or the farming of aquatic organisms is achieved through the manipulation of an organism for life cycle and control of the environmental factor which influence it **(Beveridge, 1987).**

The method of raising fish in ponds was described for the first time by Lafont and Saveium in 1951 in Cambodia **(Hickling, 1962).** This method of fish culture has been expanded to other countries of the Far East **(Ling, 1967 ; Bardach *et al.* 1972 and Coche, 1976).**

Fish culture method was introduced in Albama, United States of America in 1964 **(Trotter, 1970).** Many other countries such as Soviet Republic **(Gribanov *et al.*, 1968),** Canada **(Seguin, 1970),** United kingdom **(Milne, 1972)** and Chile **(Arroyo, 1973)** became interested in culturing fish in ponds. While the aquaculture practices in Taiwan was reported latter by **Chen (1976).** The freshwater fisheries and aquaculture in China was studied by **Tapiador *et al.* (1977).**

Polyculture of silver carp, ***Hypophthalmichthys molitrix;*** bighead carp, ***Aristichthys nobilis,*** grass carp, ***Ctenopharyngodon idella*** and common carp, ***Cyprinus carpio*** in ponds was reported by **Buck *et al.* (1978).** The influence of the silver carp ***(H. molitrix)*** on eutrophication of the environment of carp ponds was mentioned by **Grygierek (1978).**

Carp polyculture with grass carp, ***C. idella*** and silver carp, ***H. molitrix*** was investigated by **Opuszynski (1968).** While, **Yashouv (1971)** studied the interaction between the common carp, ***C. carpio*** and the silver carp, ***H. molitrix*** in rearing ponds.

A polyculture system of silver carp, ***H. molitrix*** ; bighead carp, ***A. noblis*** and Nile tilapia, ***Oreochromis niloticus*** in Albama, U.S.A. was carried out by **Maddox *et al.* (1978).** Therefore, **Opuszynski (1981)** made a comparison of the usefulness of the silver carp and bighead carp as additional fish in polyculture system and found that, the latter species is less useful for intensive rearing in ponds. Also, an intensive polyculture of common carp, ***C. carpio;*** silver carp, ***H. molitrix*** and grass carp, ***C. idella*** in earthen ponds was mentioned by **Dimitrov (1984).**

Experimental studies on the different forms of composite fish culture of Indian and exotic carps were reported by several authors among them ; **Lakshmanan *et al.* (1971), Singh *et al.* (1972), Chakrabarty *et al.* (1972a** and **b), Sinha *et al.* (1973)** and **Chaudhuri & Chakraparty (1974)** in Indian earthen ponds. Also, **Chaudhuri *et al.* (1975)** observed that composite fish culture or polyculture of indogenous carp together with the chinese carp (silver carp and grass carp) and common carp resulted in high fish production in freshwater ponds in India.

Fishes of the family Cichlidae play an important role in the Egyptian fishiers. Three species namely ***Oreochromis niloticus, Tilapia zillii*** and ***Sarotherodon galilaus*** provide 70% of the total fish production in Egypt **(Ishak *et al.*, 1985).**

1970, 1971 and **Fenderson & Carpenter, 1971).** While, **Das (1972)** studied the effect of density on survival rate of Indian freshwater carp.

Rearing at different densities is one of the most important factor influencing the fish production **(Papoutsoglou *et al.*, 1987).** This had been described for almost all cultivable fish species, and also for all types of production system **(Haskell, 1955 ; Kilambi *et al.*, 1977 ; Refstie, 1977 ; Papoutsoglou *et al.*, 1979, 1980** and **Carr & Aldrich, 1982).** Also, the effects of stocking density and mixed culture with Nile tilapia ***(O. niloticus)*** under extensive field conditions was mentioned by **Hogendoorn and Koops (1983).** While, **Natarajan (1985)** determined the effects of stocking density on the production of Tilapia speices.

Al - Zahaby *et al.* (1987) investigated the prelminary observations on the relative growth and production of Tilapia species ***(T. nilotica*** and ***T. galilaea)*** cultured in cages at three stocking densities and indicated that, Tilapia species are able withstand a certain degree of crowding (fish density) which is an important characteristic in the intensive culture of the fish. Other observations on the growth of ***Clarias lazera*** reared in cages at three stocking rates was made by **El-Agamy *et al.* (1992)** and noticed that, fish stocked at low density showed maximum size for individual fish and fish stocked at high density give maximum production.

Food is the most potent exogenous factor affecting growth of the fishes **(Brown, 1957).** In the Endopacific area, **Hora and Pillay (1962)** indicated that, the carp species can be fed on variety of artificial feeds. In Israel, pelleted protein rich diets have been used successfully for feeding carp **(Hepher & Chervinski, 1965 ; Chervinski *et al.*, 1968** and **Hepher *et al.*, 1971).** In Egypt, rice bran and cotton seed cake were given as supplementary food for carp culture **(El - Bolok & Labib, 1968 and Bishai *et al.*, 1972),** while **Eissawy *et al.* (1974)** fed cotton seed cake and rice bran to mullet species at the ratio of 1 : 4 respectively.

A review of supplementary feeding tables for fish ponds was made by **Marek (1975).** Also, **Wohlfarth *et al.* (1976)** studied a polyculture of common carp, silver carp, grass carp and tilapia feeding on artificial food. **Huisman (1976)** indicated that, the growth of carp species can be regarded as a positive result of a process tending to increase the body mass due to food intake and another tending to decrease the body mass due to metabolic expenditure. While, **Thia - Eng** and **Seng - Keh (1978)** observed that, growth of grouper fish, ***Epinephelus tauvina*** was affected by biotic and abiotic factor, among them supplementary food was probably the most potent one. **Sampath (1984)** noticed that, artificial feeding was practised to increase the production of some Indian fish, ***Channa striatus.*** Also, **Magbenka and Lovell (1986)** mentioned that, the grass carp, ***C. idella,*** will grow

rapidly beyond fingerling size in earthen ponds when fed concentrated supplementary food.

On the other hand, **Jauncey and Ross (1982)** reported that, Tilapia species prefer smaller artificial food pellets than carp and salmonids of comparable sizes.

Fish characteristically require much higher protein levels in the diet than are necessary for birds and mammals **(Cowey and Sargent, 1972).** Therefore, **Mazid *et al.* (1979)** studied the growth response of ***Tilapia zillii*** fed artificial diets with variable protein levels. Also, **Austreng & Refsties (1979)** and **Alexis *et al.* (1986)** stated the effect of varying dietary protein level on growth rate and production of different families of rainbow trout.

Effects of dietary protein, lipid and energy content on the growth of turbot fish was investigated by **Bromley (1980).** While, **Winfree** and **Stickney (1984)** reported the effects of dietary protein level on growth of channel caffish. The effects of dietary protein level and energy content on growth rate and feed utilization of African catfish were studied by **Machiels & Henken (1985), Henken *et al.* (1986)** in the Netherlands, **Degani *et al.* (1989)** in Israel.

Some observations on the effects of varying dietary protein level and energy content on the growth, food conversion and protein

utilization of different Tilapia species were investigated by **Winfree & Stickney (1981)** and **Jauncey (1982).** While, **Siddiqui *et al.* (1988)** mentioned the influences of dietary protein levels on growth, food conversion and protein utilization of Nile tilapia, ***O. niloticus*** in Riyadh (Saudi Arabia).

The growth and production of fish in rearing ponds are dependent on regulating the quantity of feeds required to yield the best growth, this can be determined by the different ration of the food **(Chua and Teng, 1982).** Therefore, they reported the effects of food ration on growth, condition factor, food conversion and net yield of estuary grouper fish cultured in floating net-cages. Also, the effects of feeding rate on production of common carp *(C. carpio)* were investigated by **Huisman (1976)** and **Ghosh *et al.* (1984).** While, **Goolish** and **Adelman (1984)** mentioned the effects of ration size on the growth of juvenile common carp in Minnesota (U.S.A.).

The influence of food ration on survival and growth of Tilapia speices in Serilanka was reported by **Macintosh and De Silva (1984).** Also, **Santiago *et al.* (1982, 1987)** determined the effects of feeding rate on growth and survival of Nile tilapia ***(O. niloticus)*** in the Philippines. While, **Merola and De Souza (1988)** mentioned the influences of feeding rate on growth of the pacu fish, ***Colossoma mitrei*** in Brazil.

The association between growth rate and different initial size was investigated for several fish species i.e, brook trout (**Haskell** and **Griffiths, 1956**), brown trout (**Haskell *et al.*, 1960 ; Thiemeier & Deyoe, 1968** and **Albaugh, 1969**) and carp (**Zernecki, 1964** and **Stegman, 1965**). Also, **Wohlfarth (1972)** determined the regression of weight gain on initial weight in carp species. Therefore, **Dabrowski (1984)** reported the influences of initial weight on the survival and growth rate of four Cyprinids.

The variations of protein efficiency ratio, specific growth rate, food convesion, protein retention and other growth characters of carp species studied by many authors among of them ; **Huisman & Valentijn (1981), Viola *et al.* (1982), Lone & Matty (1983), Abel *et al.* (1984)** and **Hassanen (1986)**. While in tilapia it were investigated by **Jauncey (1982), Anderson *et al.* (1984), Ofojekwu & Ejike (1984), Viola & Zohar (1984), Santiago *et al.* (1987), Hassanen(1988), Siddiqui *et al.* (1988)** and **Dabrowska *et al.* (1989).**

Feeding habits of carp species were studied by different investigators working at various localities ; India (**Gerking, 1950**), U.S.A. (**Sigeler, 1958**), Indopacific region (**Hora** and **Pillay, 1962**), Western Germany (**Saadi, 1965**), Missouri River, U.S.A. (**Walburg** and **Nelson, 1966**) and Serow fish farm, Egypt (**Bishai *et al.*, 1973**).