

Effect of some treatments used in fish farming on soil properties and fish production

R. A. M. Nashy

The current investigation was carried out to study the effect of organic manure, mineral fertilizers and artificial feed on both different soil properties and fish production. Moreover the effect of different stocking rates on the fish production was also studied. (A) To achieve the first purpose, five ponds in El-Shrow Fish Farm Dakahlia Governorate were chosen to carry out the following treatments: 1. The first pond was fertilized with organic manure only. 2. The second pond was fertilized with two mineral fertilizers, i.e. ammonium sulphate and superphosphate. 3. The third pond was fertilized with organic manure together with mineral fertilizers. 4. Artificial feed was used in the 4th pond alone. 5. The fifth pond was control, i.e. no fertilizers or artificial feeds were used. All these ponds were stocked with *Tilapia* spp., *Cyprinus carpio* and *Mugil cephalus* at the rate of 1800 fish per feddan for a growth period of 160 days. To study the effect of different treatments on some soil physical and chemical properties, soil samples were taken from 0-10, 10-25 and 25-60 cm soil depths at the beginning of the study, after three months and at the end of the study, i.e. after harvesting the fish and drying ponds of the farm. Also, water samples were taken monthly for analyses from the five ponds and from the source and drainage water. In the same time, random samples from all reared fish species were taken and weighted every month from June 1989 to November 1989. The obtained results can be summarized as follows: (I) The effect of different treatments on some soil physical properties: 1. Particle size distribution was not affected by the used treatments. 2. The values of soil bulk density were decreased in all fertilized ponds, except in the pond received mineral fertilizers. So bulk density increased with increasing soil depth. The values of soil bulk density were significantly and negatively correlated with OM%, AS% and EMgP. While they significantly and positively correlated with both of Sol-Na ESP. Moreover, the addition of organic manure with or without mineral fertilizers significantly increased total soil porosity. 3. No clear trend was observed, concerning the effect of different treatments on the values of soil hydraulic conductivity (K). They decreased on most ponds and increased in few ones. 4. The values of DSA% of 4.8-2.5 mm in diameter were increased by the addition of organic manure with or without mineral fertilizers. While, both mineral fertilizers and artificial feed did not significantly affect DSA%. On the other hand, a significant and negative correlations were found between DSA% and both of AU and ESP, while the opposite was true for 5. WSA% of 1.6-0.8 mm and 0.8-0.4 mm in diameter were increased by manuring in the surface soil layer, also the WSA% of 0.8-0.4 mm and 0.4-0.2 mm in diameter were increased in the deepest one. It was also found that, the addition of organic manure plus mineral fertilizers raised the values of WSA% of 0.8-0.4 mm and 0.4-0.2 mm in diameter in the surface and subsurface soil layers. The opposite trend was found in the case of mineral fertilizers and artificial feed where, their additions lowered the WSA% of 0.8-0.4 and 0.4-0.2 mm in diameter in all soil depths. The values of WSA% were significantly and positively correlated with OM%, EMgP and ECaP. While, they significantly and negatively correlated with rc, Bd and ESP. 3. Soluble cations and anions: a) Soluble Na was decreased in most experimental ponds especially in the surface layer and in the presence of organic manure. The concentration of Sol-Na at the end of the study was between one to four fifth of the original levels. b) Soluble-K followed nearly the same trend of Sol-Na. c) The changes of Sol-Ca were unlimited, and there was no clear trend concerning the effect of different treatments at the end of study. d) Soluble-Mg was decreased by about 10% to

68.64% at the end of study and as a result of different treatments. e) Soluble-Cl was decreased rapidly in the ponds initially contained high concentration of Cl-. f) There was no measurable amounts of CO₃. The values of HCO₃ were decreased in the fertilized ponds while they increased in the pond treated with artificial feed in the surface layer. The opposite was true for the deep layers. g) Soluble-SO₄ decreased in all experimental ponds in all soil depths. 4. OM% was considerably increased in most ponds. The percentages of increase were 10.31% and 12.22 in the ponds fertilized with organic manure only or organic manure plus mineral fertilizers, respectively. OM% was significantly and positively correlated with AS%, while it negatively correlated with soil pH. 5. The values of soil CEC increased in most investigated ponds, but this increase was not significant. As a general trend, soil CEC increased with increasing soil depth. 6. Soil ESP slightly increased (0.42-15.69%) at the end of study in the pond fertilized with organic manure, while, it decreased by about 4.99 and 50.19% in the other ponds. Similar trend was also noticed for EKP. 7. The values of both EC_aP and EMgP were increased in most investigated ponds at the end of experiment. The observed increases of both EC_aP and EMgP were correlated with the increases of soluble calcium and magnesium in the pond's water.

176 - (I I I) Effect of different treatments on fish production: Results of the first experiment showed that: 1. The growth rates of different fish species reared in the pond fed with artificial feed were higher than that reared in the fertilized ponds. 2. The addition of organic manure to the fish pond gave best production of *Mugil cephalus* as compared with mineral fertilizers which were not useful. 3. Total fish production of fish reared in the pond fertilized with organic manure plus mineral fertilizers was less than that of the pond treated with artificial feed. But it was higher than the production of the ponds fertilized with either organic manure or mineral fertilizers alone. 4. Statistical analysis showed that, there was no significant difference between the fish production in the pond fertilized with organic manure alone and that fertilized with organic manure together with mineral fertilizers. The lowest production was obtained in the pond fertilized with mineral fertilizers alone. So it can be said that, the addition of mineral fertilizers to the fish farms is not important. While, it can be recommended the use of organic manure - with care - in the fish farms instead of the artificial feed to reduce the cost of production. (B) In order to realize the second purpose of the study, i.e. the effect of different stocking rates on fish production, three ponds were chosen. These ponds were stocked with *Tilapia* spp., *Cyprinus carpio* and *Mugil cephalus* in polyculture system with three different stocking rates i.e., 2100, 3150 and 4200 fish/feddan. The ratios between the three fish species were 75 : 18.3 and 6.7% for *Tilapia*, *Cyprinus carpio* and *M. cephalus*, respectively. The reared fishes were fed with a mixture of organic manure, mineral fertilizers and artificial feed. The experiment lasted 160 days. The obtained results can be summarized as follows: 1. Growth rates of *Tilapia* spp. decreased with increasing the stocking rate, while the total production was increased. Statistical analysis showed that, although the final weight of *tilapias* in the lowest stocking rate was higher than the other two rates, the difference between their final weights were not significant. It can be recommended the use of organic manure - with care - in the fish farms instead of the artificial feed to reduce the cost of production. (B) In order to realize the second purpose of the study, i.e. the effect of different stocking rates on fish production, three ponds were chosen. These ponds were stocked with *Tilapia* spp., *Cyprinus carpio* and *Mugil cephalus* in polyculture system with three different stocking rates i.e., 2100, 3150 and 4200 fish/feddan. The ratios between the three fish species were 75 : 18.3 and 6.7% for *Tilapia*, *Cyprinus carpio* and *M. cephalus*, respectively. The reared fishes were fed with a mixture of organic manure, mineral fertilizers and artificial feed. The experiment lasted 160 days. The obtained results can be summarized as follows: 1. Growth rates of *Tilapia* ~ decreased with increasing the stocking rate, while the total production was increased. Statistical analysis showed that, although the final weight of *tilapias* in the lowest stocking rate was higher than the other two rates, the difference between their final weights were not significant.