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EFFECT OF TWO MANURING SYSTEMS ON WATER QUALITY AND PLANKTON COMMUNITIES IN FISH PONDS

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ABSTRACT

An experiment was carried out at the Central Laboratory for Aquaculture Research at Abbassa, Sharkia governorate, Egypt during one growing season for100 days in earthen ponds. The objective of the study was to identify the prevailing water quality parameters and plankton communities in the fish–duck and buffalo manured ponds. The different treatments tested in the present study were buffalo manure (BM), buffalo manure with artificial feed (BM+F), duck manure (DM) and duck manure with artificial feed (DM+F). Each treatment was performed in triplicate. Three species, Nile tilapia *Oreochromis niloticus*, blue tilapia *O. aureus* and common carp *Cyrinus carpio* were used in this study. Results obtained can be summarized as follows:

- Water temperature in treatment ponds receiving artificial feeds was found to be higher than treatments without artificial feeds.
- Pond received artificial feeds showed decreases in pH and alkalinity values in water compared to the other ponds.
- The total phytoplankton counts for treatments BM; BM+F; DM+F and DM were found to be 3570; 5850; 7500 and 10010 organism/L, respectively on the average and Chlorophyta dominated to the other species.
- The total zooplankton counts for treatments DM+F; BM+F; BM and DM were found to be 1906.7; 950; 903.3 and 738.3 organism/ L, respectively on the average and Rotifera dominated to the other species. Other results are discussed in the study. Based on the results obtained it could be recommended the use of duck manure in extensive fish production, thus it increased the phytoplankton counts in the water. In semi intensive production applying the artificial feeds beside duck manure caused a pronounced increase in the zooplankton counts.

INTRODUCTION

Organic manure has traditionally been used as source of nutrients in Asian Aquaculture. The manure can be used from a direct or indirect integration of fish and livestock. In the direct integration system fresh manure is added continuously to the ponds, while in the indirect integration the manure is transported to the ponds and used in fresh or treated forms in different manure regimes (Peker, 1994).

Schroeder (1974) found that animal manures beside their nitrogen and phosphorus contents stimulate heterotrophic production, which increase tilapia production in ponds. He also found that the feasibility of using organic fertilizers in ponds culture needs to be investigated because they are relatively low priced and readily available on the local market. Asian Institute of Technology, AIT (1986) reported that the integrated farming of fish and livestock is widely practiced for maximizing protein production. In this system the land animals are raised on supplemental feeds and their wastes (manure and feed wastage) are used directly or indirectly for fish production in pond culture. These wastes used to stimulate growth of planktonic organisms of ponds, providing natural feeds for fish.

Colman and Edward (1987), Jhingran and Sharma (1980) reported that livestock, such as ducks or other poultry, were raised on pond embankment, so that the fish could utilize the wastes of animal feeds and excreta. Fish production could be greatly enhanced by the increase in the biological productivity of the water.

In fish ponds the physico-chemical characteristics of water and flora as primary production and nutritive fauna as secondary productive are well known in their relationship to fish production. These characteristics vary according to certain conditions prevailing in such ponds, which depend largely on the nature of soil and water. Furthermore, these properties might vary from a pond to another within the same farm, even if they have the same surface area and the water column as well. These variations are mostly due to the management technique, feeding and fertilization regimes, aeration, fish species and number of stock. The community composition of phytoplankton was studied in fresh water habitats, (Salah, 1959,in the Nouzha Hydrodrome; EL-Ayouty and Awwad, 1976, in the River Nile and Borhan, 1978, in Abbasa ponds). Meanwhile, Hutchinson (1957), EL-Hawary (1960), Elster and Jensen (1960), Borhan (1978) and Saleh (1986) studied the zooplankton community composition in different water habitats.

The present investigation was performed to study the effect of two manuring systems (buffalo or duck) with or without supplementary feeding on the development of the planktonic communities and water quality parameters in ponds stocked with different fish species (Nile tilapia; blue tilapia and common carp).

MATERIALS AND METHODS

The work was conducted during one growing season (100 days) in 12 rectangular (about 2000 M^2) freshwater earthen ponds with a depth of 120 cm each. Fish used in this study and their stocking rates are shown in Table (1)

Table (1): Fish species and stocking rates of the experimental ponds.

Fish	Stocking rate Individ./pond	Initial body weight (g)
Nile tilapia, *Oreochromis niloticus*	3000	2
Blue tilapia, *O. aureus*	940	2
Common carp, *Cyprinus carpio*	60	25

Fish and experimental ponds

Ponds were stocked in a polyculture system with tilapia species representing the detritophagic species (fed on zooplankton; plant detritus and zoobenthos) and common carp, which is, considered as a benthophagic species. Twelve earthen pond each of 2000m² representing four treatments with three replicates were used in the present study. The first three ponds of the first treatment were fertilized with 5kg /pond/ day of buffalo manure. The second groups of ponds received 5 kg /pond/day of buffalo manure plus 3% of the fish biomass supplementary feed (17% crude protein). The ponds of third treatment were fertilized with manure released by 125 duck raised in a house built on a pond dike without additional feed. Ponds of the fourth treatment received also the manure released by 125 duck raised in a house on a pond dike beside 3% of the fish biomass supplementary feed (17% crude protein).

A total number of 250 ducks were used in the experiment. They were Peking ducklings 21 days of age (200 g each) were divided between two laying houses each laying house served 3 ponds. Ducklings were grown for 60 days. During the experimental period ducks gave artificial feed (25% crude protein) at a ratio of 5 to 10% of body weight per day. Table (2) Show the chemical analysis of buffalo manure, duck manure and duck and fish supplementary feed. The chemical analysis of buffalo manure, duck manure and supplementary feed of fish and ducks were carried out according to the AOAC (1990) methods.

Table (2): Chemical analysis of buffalo manure, duck manure and supplementary feed of fish and ducks.

A. Buffalo and duck manure						
	Crude protein%	Organic carbon%	Nitrogen %	Phosphorus %	C:N ratio	N:P ratio
Buffalo manure	9.83	38.39	1.64	0.29	23.41	5.66
Duck manure	23.8	41.58	3.81	1.23	10.91	3.10

B. fish and duck supplementary feed				
	Crude protein %	Crude fat %	Crude Fiber %	ME (KCal/kg)
Fish supplementary feed	17.0	8.1	8.0	2500
Duck feed	25.0	6.5	7.0	2400

Samples and measurements:

Water temperature, dissolved oxygen and pH were measured daily at 6°°a.m. and 12°° p.m. using temperature and dissolved oxygen meter (YSI model 57) and pH meter (model Corning 345). Transparency and Turbidity were measured every two weeks by sicchi disk and (Hack) spectrophotometer (model 41700) using Hack kits respectively. Determinations of water quality parameters (salinity, alkalinity, total hardiness, phosphorus and ammonia were carried out every two weeks according to the methods of Boyd (1979). Phytoplankton and zooplankton communities in pond water were determined every two weeks according to the methods described by Boyd (1990). Samples were collected from different sites of the experimental ponds randomly to represent the water of the whole pond.

RESULTS AND DISCUSSION

The prevailing water quality parameters:

Physical characteristics:

Averages water quality parameters as affected by manuring source are presented in Table (3). Results revealed that, transparency (Sicchi disk reading in cm) ranged between 14.1 cm (DM treatment) and 15 cm (BM+F). These values are beneficial to fish cultivation. In this connection, Mahmoud (1997) and EL-Gendy (1998) reported that poultry or duck manure, as organic fertilizers had no influence on Sicchi disk reading. Turbidity is one of the physical properties that are greatly affected by fish species used. It has been determined in FTU had ranged between 124.5 (BM treatment) and 126.6 (DM+F treatment) which show a similar trend. The same trend was observed in water temperature when the average was found to be between 23.8°C and 28.8°C (Table 3). The higher difference values of water temperature in ponds fertilized and received feeds in all treatments may be attribute to the increase in organic matter contents of these ponds that may lead to temperature increases. These are in agreement with results of Mahmoud (1997) who reported a slight increase in water temperature with increasing manure. Transparency, turbidity and temperature values are in the range recommended for the fish species cultured in the four treatments.

Chemical characteristics:

Averages of pH values for treatments BM, DM, DM+F and BM+F were 8.8; 8.4; 8.1 and 8.0 respectively. The lower values of pH in ponds fertilized and received feeds may be attributed to the increase in organic matter contents of these ponds, which may lead to pH decreases. Averages of dissolved oxygen (DO) have ranged between 6.2 to 7.6 mg/L. These values are beneficial to fish cultivation and indicate that water dissolved oxygen slight decreased in ponds fertilized and received feeds compared to the other ponds. This attributed to the increase in organic matter contents of these ponds, which may lead to DO decreases.

Table (3): Water quality parameters of ponds during the experimental period.

Treatment	Months	day	Water depth/cm	Sicchi disk /cm	Turbidity FTU	pH		DO mg/L		Alkalinity mg/l (ca co_3)		Salinity g/l	Hardness g/l	P_2O_5 mg/l	NH_3 mg/l	Temperature (°C)	
						6°°	12°°	6°°	12°°	6°°	12°°					6°°	12°°
T1 (BM)	15 Sep.	15		15	112	8.4	9.0	7.1	8.4	230	270	1.2	350	1.18	0.12	23	25
	30 Sep.	30		15	115	8.9	8.9	7.2	8.4	240	280	1.00	290	1.21	0.11	24	26
	15 Oct.	45		16	135	9.0	9.1	7.3	8.6	210	250	1.03	280	1.26	0.20	22	25
	30 Oct.	60		15	120	8.9	8.9	7.0	7.9	190	230	1.00	250	1.08	0.21	22	25
	15 Nov.	75		13	130	9.0	9.2	7.1	7.9	192	222	1.3	310	1.21	0.30	23	25
	30 Nov.	90-100		14	135	9.0	9.3	6.5	7.7	175	220	1.2	290	1.18	0.30	22	24
Average			120	14.6	124.5	8.8		7.6		226		1.12	295	1.19	0.2	23.8	
T2 (BM+F)	15 Sep.	15		15	113	7..8	8.6	6.1	6.5	155	195	1.3	290	1.20	0.11	28	33
	30 Sep.	30		16	115	7.1	7.4	5.8	6.0	183	223	1.2	310	1.18	0.21	26	32
	15 Oct.	45		16	120	6.9	7.4	5.5	6.0	155	195	1.00	280	1.22	0.13	26	32
	30 Oct.	60		15	120	7.4	7.8	6.2	6.5	165	205	1.2	280	1.26	0.20	25	31
	15 Nov.	75		14	140	8.9	9.3	6.1	7.0	175	215	1.00	350	1.20	0.30	25	30
	30 Nov.	90-100		14	140	8.9	9.3	6.0	7.2	225	265	1.00	250	1.21	0.30	24	28
Average			120	15	124.6	8		6.2		186		1.1	293	1.21	0.2	28.8	
T3 (DM)	15 Sep.	15		15	112	7.4	8.3	7.2	7.8	207	247	1.4	289	1.54	0.10	25	31
	30 Sep.	30		15	113	8.3	8.8	7.1	7.5	190	230	1.00	325	1.50	0.11	24	31
	15 Oct.	45		14	120	8.7	9.2	7.0	7.3	170	210	1.2	260	1.39	0.12	24	30
	30 Oct.	60		15	125	8.3	8.6	6.7	7.4	157	197	1.2	310	1.4	0.20	24	28
	15 Nov.	75		13	140	8.4	7.8	7.3	7.4	281	321	1.00	260	1.38	0.25	23	26
	30 Nov.	90-100		13	140	8.5	8.7	7.4	7.9	197	237	1.00	290	1.46	0.30	22	24
Average			120	14.1	125	8.4		7.3		220		1.1	289	1.44	0.18	26	
T4 (DM+F)	15 Sep.	15		16	112	7.5	8.2	6.0	6.3	200	240	1.2	280	1.51	0.22	29	33
	30 Sep.	30		15	113	7.0	8.0	6.5	6.9	205	245	1.2	280	1.53	0.23	26	35
	15 Oct.	45		15	125	7.6	8.0	6.5	7.0	170	210	1.2	320	1.56	0.23	26	33
	30 Oct.	60		14	130	7.7	8.2	6.2	7.0	165	205	1.3	290	1.51	0.21	25	28
	15 Nov.	75		14	140	8.9	9.2	5.5	7.0	150	190	1.2	280	1.48	0.35	24	33
	30 Nov.	90-100		13	140	8.0	8.5	6.7	7.2	198	228	1.2	315	1.52	0.45	24.5	27
Average			120	14.5	126.6	8.1		6.5		200		1.2	294	1.50	0.28	28.6	

Phosphorus ranged between 1.19 mg/L and 1.5 mg/L, which represent the normal range of phosphorus in fish ponds. In this connection Fortes et al., (1986) showed that the available phosphorus was significantly ($P<0.01$) highest in the chicken manure feed combination. They added that there are indications that phosphorus content of chicken manure increased that in the soil, although total phosphorus in the soil contributed only about 0.8 % of that in water.

Averages of ammonia concentration (NH_3), as affected by treatments ranged between 0.18 to 0.28 mg/L and lay in the normal range. These values are beneficial to fish cultivation and agreed with the findings of Robinette (1976) who concluded that the toxic levels for unionized ammonia for short time exposure usually lie between 0.6 to 2.0 mg/L for pond fish.

Averages of Total alkalinity ranged between 186 to 226 mg/L. The slight differences in values of total alkalinity in ponds fertilized and received feeds may be attributed to the increase in organic matter contents of these ponds.

Averages of salinity and total hardness had ranged between 1.1g/L to 1.2 g/L and 289 mg/L to 295 mg /L, respectively. These values showed no great variations and they lay in the range recommended for the fish species cultured in the four treatments. In this connection, Clay (1977) showed that the highest concentration of salinity which permits normal survival and growth for *Oreochromis niloticus, O. aureus* and *S. mossampicus* lay between 24.0, 18.0, and 30 g/L for the three species, respectively.

Table (4): The phytoplankton organisms in the water of experiment.

Groups→	Green algae (Chlorophyta)	Blue-green algae (Cyanophyta)	Diatoms (Bacillariophyta)
Species↓	*Closterinm leblenii*	*Merismopedia elegans*	*Melosira granulata*
	Ankistrodesmus falcatus	*Anabaena spiroides*	*Cyclotella meneghiniana*
	Pediastrum simplex	*Nostoc pruniforme*	*Asterionella furmosa*
	Chara canescens	*Oscillatoria rubescens*	*Navicula viridula*
	Scenedesmus quadricauda	*Spirulina princeps*	*Synedra ulna*
	Spirogyra sp	*Microcysdie aeroginosa*	*Nitzchia bilobata*
	Stanrastrum tetraocrum		

HYDRO-BIOLOGICAL FEATURES:

Plankton communities:

Phytoplankton:

Results presented in Table (5) illustrate the effect of manuring of fish ponds with buffalo or duck manures with or without artificial feeding on phytoplankton communities. The total phytoplankton counts for treatments BM, BM+F, DM+F and DM were fond to be 3570; 5850; 7500 and 10010 organism/ L, respectively on the average. Results presented in this table indicated that the total counts of phytoplankton increased from September to November which may indicate the accumulation of the plankton throughout the experimented months. The results of Table (5) indicate that the highest phytoplankton values were obtained by the DM treatment followed in a decreasing order by DM +F and BM+F and BM treatments respectively. These results could be explained by the fact that duck manure has more fertilization potential compared with other treatments. In this hence Table (2) revealed that duck manure contain 3.81% nitrogen and 1.23 % phosphorus while buffalo manure contain 1.64 and 0.29 % respectively. This may reflect the better fertilization potential of duck manure compared to buffalo manure. Results presented in Table (5) show that the average counts of Cyanophyta for treatments BM; BM+F; DM+F and DM were 893.3; 1733.3; 1950 and 2423.3 organisms/L, respectively. Results of this table revealed that Cyanophyta counts as a percentage from the lowest treatment (BM), which is considered as (100%) was found to be the highest (271.3%) in DM treatment followed by DM+F and BM+F treatments, respectively. Results presented in Table (5) revealed that Chlorophyta behaved similar to the Cyanophyto where the highest count (relatives BM group 100%) was reported by the DM group followed in a decreasing order by DM+F and BM+F groups respectively. The same trend was also observed in the Baccillariophyta where the highest counts were recorded by the DM treatment followed in a decreasing order by DM+F; BM+F and BM groups respectively.

The present study indicates that Chlorophyta is the dominant group followed by Cyanophyta and Bacillariophyta in the all treatment ponds. This community composition of phytoplankton reported in this study is in confirmation with observations of EL-Serafy and AL-Zahaby (1991), who pointed out that Chlorophyta predominated all the other groups followed by Cyanophyta and Bacillariophyta. On the other hand Salah (1959 & 1960), El-Ayouty and Awwad (1976) and Borhan (1978) gave different community compositions of phytoplankton in fish ponds compared to results of Table (5) of the present study which may due to the differences in the ecological conditions of the ecosystems studied.

Zooplankton :

Results presented in Table (6) illustrate the effect of manuring of fish ponds with buffalo or duck manures with or without artificial feeding on zooplankton communities in fishponds. The total zooplankton counts for treatments DM+F; BM+F; BM and DM were fond to be 1906.7; 950; 903.3 and 738.3 organism/ L, respectively on the average. Results revealed that the lowest total zooplankton counts were obtained by the treatment DM followed in an increasing order by BM, BM+F and DM+F treatments, respectively. Results of Table (6) revealed that the highest counts of Rotifera for treatments DM+F, BM+F, BM and DM were 933.3; 640; 480 and 453.3 organisms/L, respectively on the average. Counts as a percentage from the lowest treatment (DM), which is considered as (100%) was found to be the highest 205.9%; 141.2%; 105.9%

Table (5): Phytoplankton abundance in the water of experimental ponds (organisms/ L).

Treatment	Months	Total phytoplankton Org./L	phytoplankton (organism / L)		
			Cyanophyta	Chlorophyta	Bacillariophyta
T1 BM	Sep.	2530	700	1280	550
	Oct.	3230	880	1500	850
	Nov.	4950	1100	3100	750
	Average	3570	893.3	1960	716.7
	% of the smallest value	100%	100%	100%	100%
T2 BM+F	Sep.	4900	1400	2400	1100
	Oct.	6050	1800	3150	1400
	Nov.	6600	2000	3200	1400
	Average	5850	1733.3	2916.6	1300
	% of the smallest value	163.9%	194.03%	148.8%	181.4%
T3 DM	Sep.	8400	1850	5150	1400
	Oct.	9400	2620	4580	2200
	Nov.	12230	2800	8230	1200
	Average	10010	2423.3	5986.7	1600
	% of the smallest value	280.4%	271.3%	305.4%	223.2%
T4 DM+F	Sep.	6850	1950	3400	1500
	Oct.	6550	1800	3350	1400
	Nov.	9100	2100	5200	1800
	Average	7500	1950	3983.3	1566.7
	% of the smallest value	210.1%	218.3%	203.2%	218.6%

Table (6): Zooplankton abundance in the water of experimental ponds (organisms/ L).

Treatment	Months	Total zoo-plankton Org./L	Zooplankton (organism / L)		
			Rotifera	Copepoda	Cladocera
T1 BM	Sep.	630	330	180	120
	Oct.	970	510	280	180
	Nov.	1110	600	310	200
	Average	903.3	480	256.7	166.7
	% of the smallest value	122.3%	105.9%	202.6%	133.4%
T2 BM+F	Sep.	620	410	120	90
	Oct.	870	650	120	100
	Nov.	1360	860	300	200
	Average	950	640	180	130
	% of the smallest value	128.7%	141.2%	145.1%	104%
T3 DM	Sep.	380	240	80	60
	Oct.	860	530	180	150
	Nov.	975	590	220	165
	Average	738.3	453.3	126.7	125
	% of the smallest value	100%	100%	100%	100%
T4 DM+F	Sep.	1340	850	390	100
	Oct.	1720	900	500	320
	Nov.	2660	1230	800	630
	Average	1906.7	933.3	563.3	350
	% of the smallest value	258.2%	205.9%	444.6%	280%

and (100%) in respectively. Results of this table revealed that the highest counts of Copepoda for treatments DM+F; BM; BM+F and DM were 563.3; 256.7; 180 and 126.7 organisms/L, respectively. Counts as a percentage from the lowest treatment (DM), which is considered as (100%) was found to be the highest 444.6%; 202.6%; 145.1% and 100%, respectively. Results presented in Table (6) revealed that Cladocera behaved similar to the Copepoda where the highest count (relatives DM group 100%) was found to be 280%; 133.4%; 104% and 100% organisms/L, respectively.

The present study indicates that Rotifera is the dominant group followed by Copepoda and Cladocera in the all treatment ponds. This community composition of zooplankton is not in conformity with observations of EL-Serafy and AL-Zahaby (1991), where he pointed out that Copepoda predominated all the other groups.

These results may due to differences in the nature of the environmental conditions and feeding habits of the different fish species. These results indicate that the community composition of phytoplankton and zooplankton in the all treatments ponds fluctuated greatly with temperature, fertilization and feeding habits of the different fish species whether phytoplanktophagic or zooplanktophagic.

Based on the results obtained it could be recommended the use of duck manure in extensive fish production, thus it increased the phytoplankton counts in the water. In semi intensive production applying the artificial feeds beside duck manure caused a pronounced increase in the zooplankton counts.

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تأثير استخدام نظامين للتسميد الطبيعى على جودة المياه ومجموعات البلانكتون في أحواض الاستزراع السمكي

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** المعمل المركزى لبحوث الثروة السمكيه بالعباسه – مركز البحوث الزراعيه – وزارة الزراعة

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أجريت هذه الدراسة بالمعمل المركزي لبحوث الثروة السمكية بالعباسة–أبو حماد– محافظة الشرقية وكانت فترة الدراسة ١٠٠ يوم بهدف دراسة تأثير استخدام نظامين للتسميد الطبيعى على جودة المياه وكذلك دراسة مجموعات البلانكتون النباتية والحيوانية. وتم استخدام ٣ أنواع من زريعة الأسماك بمعدل ٣٠٠٠ سمكة بلطى نيلي+٩٤٠سمكة بلطى أوريا+٦٠سمكة مبروك عادى لتصل الكثافة الكلية في الحوض إلي ٤٠٠٠ سمكة/حوض وقد أستخدم في هذه التجربة ١٢ حوض من الأحواض الترابية مساحة الحوض ٢٠٠٠م^{٢} قسمت إلي ٤مجموعات (معاملات) و تحتوى كل مجموعة على ٣ أحواض (مكررات) . وقد سمدت الأحواض الثلاثة للمعاملة الأولى باستخدام سماد الماشية فقط أما المعاملة الثانية فقد سمدت كذلك باستخدام سماد الماشية بالإضافة إلى إمداد الأسماك بعليقه اضافيه. أما أحواض المعاملة الثالثة فقد سمدت باستخدام زرق البط فقط أما المجموعة الرابعة فقد غذيت الأسماك باستخدام زرق البط بالإضافة إلى إمداد الأسماك بعليقه إضافية. وكان من أهم النتائج المتحصل عليها ما يلي :

- أعطت المعاملة الرابعة التي أستخدم فيها زرق البط +الأعلاف الإضافية متوسطات أكبر في درجات الحرارة يليها المعاملة الثانية ثم المعاملة الثالثة وكانت المعاملة الأولى أقل المتوسطات في درجة الحرارة.
- أعطت كذلك المعاملة الثانية التي أستخدم فيها سماد الماشية +الأعلاف الإضافية والمعاملة الرابعة متوسطات منخفضة نسبيا في درجة ال pH والقلوية عنها في أحواض المعاملة الأولى والثالثة.
- أظهرت التحاليل أن متوسط أعداد الكائنات الحية الدقيقة النباتية (الفيتوبلانكتون) كانت أكبر ما يمكن في المعاملة الثالثة التي أستخدم فيها زرق البط فقط يليها المعاملة الرابعة ثم المعاملة الثانية وأعطت المعاملة الأولى أقل المتوسطات. وكانت مجموعة الطحالب الخضراء (الكلورفيتية) هي المجموعة السائدة في جميع الأحواض يليها الطحالب الخضراء المزرقة (السيانوفوتية) ثم الطحالب الخيطية (الباسيلاريوفتيه).
- أظهرت التحاليل أن متوسط أعداد الكائنات الحية الدقيقة الحيوانية (الزوبلانكتون) كانت أكبر ما يمكن في المعاملة الرابعة التى أستخدم فيها + الأعلاف الإضافية يليها المعاملة الثانية ثم المعاملة الأولى وأعطت المعاملة الثالثة أقل المتوسطات. وكانت مجموعة الروتيفر هي المجموعة السائدة في جميع الأحواض للمعاملات المختلفة يليها القشريات الصغيرة من فصيلة مفصليات الأرجل الكوبيبودا و الكلادوسرا.

التوصيات

وتوصى الدراسة باستخدام زرق البط كسماد عضوي في أحواض الاستزراع السمكي في النظام الأنتشارى لما له من أثر فعال في زيادة الفيتوبلانكتون وأن استخدام الأعلاف المكملة مع زرق البط يعمل على زيادة محتوى المياه من الزوبلانكتون في حالة تكثيف الإنتاج.