RESULTS

RESULTS
CHAPTER 1
ECOLOGICAL ANALYSIS OF POND'S WATER

1- Physico - chemical properties :

1-1- Temperature :

Temperature, plays an important role in the physical and chemical properties of the water. The present study (Table 5 and Figure 3) reveals that, both air and surface water temperature reached its maximum values (33.5 ± 3.6 C° and 30.8 ± 2.8 C°) respectively in August. While its minimum values (21.3 ± 1.4C° and 18.5 ± 1.2C°) respectively were recorded in November.

1-2- Depth of water :

The maximum level of water (1.8 ± 0.2m.) was recorded in May while the minimum value (1.4 ± 0.2m.) was observed in July.

1-3- Transparency :

From table (5) and figure (3), it can be observed that, the highest limit of transparency (0.9 ± 0.3m.) was recorded in June but its lowest value (0.6 ± 0.2 m.) in April.

1-4-Dissolved oxygen :

As shown in table (5) and figure (4), the maximum value of oxygen content (9.3 ± 1.0 mg /L) was recorded in April and the minimum value (4.9 ± 1.8 mg/L) in August.

1-5- Total alkalinity :

In the present work, the total alkalinity of pond water was measured twice monthly in each rearing pond. The maximum alkalinity (142.0 ± 7.5 mg/L) was recorded in August, while the minimum value (112.5 ± 1.8 mg/L) was observed in November.

1-6- Nitrites :

Table (5) and figure (4) show the detailed results for nitrites in the rearing ponds for all rearing period (eight months). The value of nitrites reached its maximum value (0.5 ± 0.2 mg/L) in May and minimum value (0.2 ± 0.1 mg / L) in November.

1-7- Phosphates :

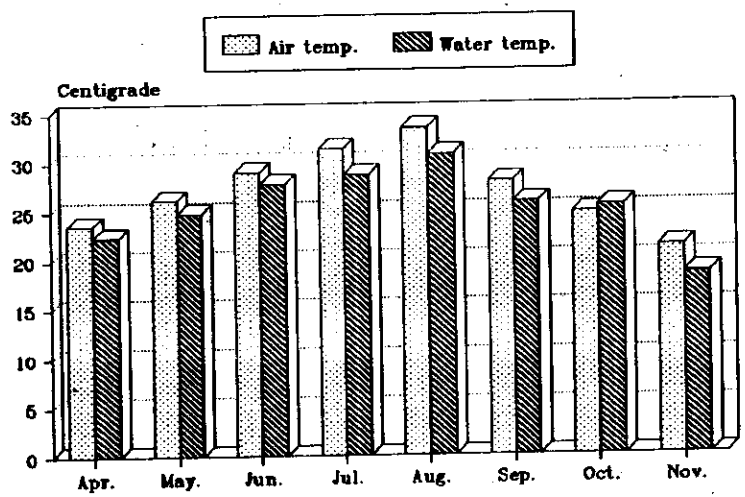
Phosphates showed obvious variations from month to another as described in table (5) and figure (4). The maximum value of phosphates (0.9 ± 0.3 mg/L) was recorded in July, while the minimum value (0.3 ± 0.1 mg/L) was observed in November.

Table (5) : Monthly variations of average values of physico-chemical properties of water in rearing ponds, during the period from 1 April to 30 November, 1991.

Physico - chemical Properties	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.
	M ± SD	M ± SD	M ± SD	M ± SD	M ± SD	M ± SD	M ± SD	M ± SD
Air temp. (C^O)	23.6 ± 1.3	26.2 ± 0.9	29.0 ± 1.1	31.4 ± 2.9	33.5 ± 3.6	28.0 ± 2.1	24.8 ± 1.8	21.3 ± 1.4
Water temp. (C^O)	22.4 ± 1.6	24.8 ± 0.7	27.8 ± 1.8	28.7 ± 2.3	30.8 ± 2.8	25.9 ± 1.8	25.5 ± 1.6	18.5 ± 1.2
Depth (m)	1.8 ± 0.3	1.8 ± 0.2	1.5 ± 0.1	1.4 ± 0.2	1.5 ± 0.2	1.5 ± 0.2	1.6 ± 0.3	1.7 ± 0.6
Transparency (m)	0.6 ± 0.2	0.6 ± 0.2	0.9 ± 0.3	0.8 ± 0.3	0.6 ± 0.2	0.7 ± 0.3	0.8 ± 0.3	0.9 ± 0.4
Dis. oxygen (mg/L)	9.3 ± 1.0	8.2 ± 1.2	6.9 ± 1.1	5.6 ± 1.4	4.9 ± 1.8	8.0 ± 1.3	8.2 ± 1.5	8.9 ± 1.2
Alkalinity (mg/L)	142.0 ± 7.5	136.4 ± 5.7	127.2 ± 3.3	133.2 ± 4.1	137.2 ± 5.7	122.3 ± 2.8	117.4 ± 2.5	112.5 ± 1.8
Nitrites (mg/L)	0.2 ± 0.1	0.5 ± 0.2	0.3 ± 0.1	0.2 ± 0.1	0.4 ± 0.2	0.3 ± 0.1	0.2 ± 0.1	0.2 ± 0.1
Phosphates (mg/L)	0.8 ± 0.2	0.7 ± 0.3	0.6 ± 0.2	0.9 ± 0.3	0.8 ± 0.3	0.5 ± 0.2	0.4 ± 0.1	0.3 ± 0.1
Silicates (mg/L)	1.6 ± 0.1	2.1 ± 0.2	1.8 ± 0.1	1.9 ± 0.2	2.3 ± 0.2	1.0 ± 0.3	1.0 ± 0.3	1.0 ± 0.2
pH value.	7.7 ± 0.3	7.0 ± 0.3	8.6 ± 0.4	7.8 ± 0.4	7.5 ± 0.4	8.5 ± 0.3	8.5 ± 0.4	8.5 ± 0.5

M = Mean value.
SD = Standard deviation.

Fig.(3):Physical properties of water of earthen rearing ponds during the period from 1 April to 30 November, 1991.



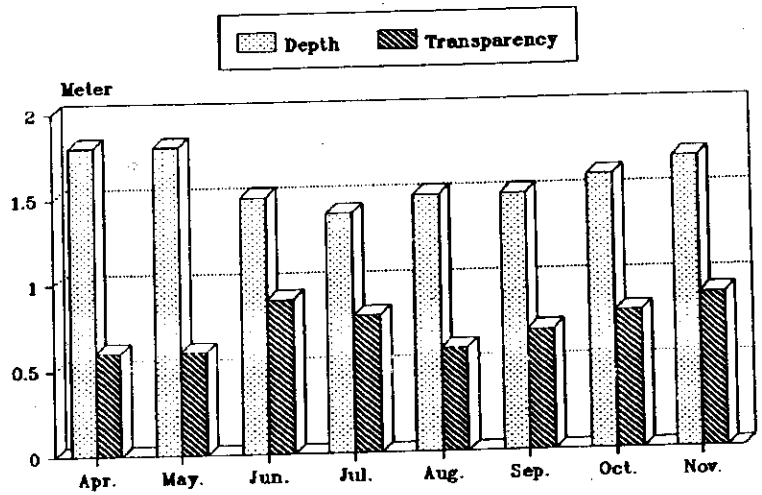
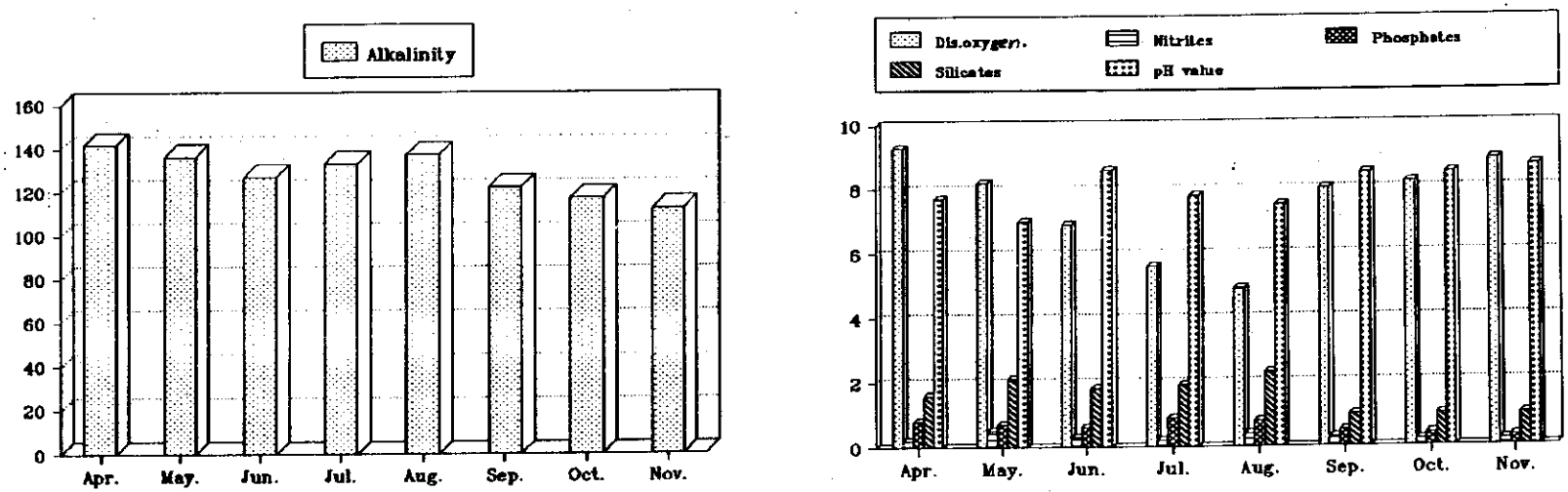


Fig.(4): Chemical properties (mg/l)of water of earthen rearing ponds during the period from 1 April to 30 November, 1991.



1-8- Silicates :

Table (5) and figure (4) also show that, the silicate values in pond water is high (2.3 ± 0.2 mg/L) in August, but the lowest value (1.0 ± 0.2 mg/L) is observed in November.

1-9- pH value :

The hydrogen ion concentration reaches its maximum value (8.6 ± 0.4) in June, while the minimum value (7.0 ± 0.3) was recorded in May.

2-Hydrobiological studies of ponds water :

2-1- Phytoplankton :

The phytoplankton organisms recorded in the samples collected from the earthen ponds are represented in the following list :

Chrysophyta :	***Navicula sp.***	***Melosira sp.***
	Nitzschia sp.	***Gyrosigma sp.***
	Cyclotella sp.	
Chlorophyta :	***Coelastrum sp.***	***Pediastrum sp.***
	Scenedesmus sp.	***Staurastrum sp.***
	Spyrogyra sp.	***Ankisterodesmus sp.***
	Euglinomorpha sp.	
Cyanophyta :	***Merismopedia sp.***	***Oscillatoria sp.***
	Nostoc sp.	

From table (6) and figure (5), an intensive increase of these organisms in July and August was recorded. The average total number of chrysophyta ranged from 1058/L in November to 2692/L in May, chlorophyta from 1382/L in November to 7826/L in April and cyanophyta from 418/L in November to 1100/L in April. The maximum values of percentage composition of chrysophyta species (33.18%) was observed in November, chlorophyta (68.85%) in August and cyanophyta (13.11%) in November. Generally the phytoplankton community of the earthen freshwater ponds was characterized by algae population of chlorophyta representing in ***Pediastrum sp.*** which had average number ranged form 241/L in November to 2217/L in April 1991.

2-2- Zooplankton :

The following list represents the zooplankton organisms collected from the rearing ponds.

Protozoa : ***Ciliophora spp.***

Rotifera : ***Brachionus sp.***

Crustacea : ***Daphnia sp.*** ***Cyclops sp.***

From the results given in table (7) and represented graphically in figure (6), it was noticed that, April and May were considered to be the

richest in zooplankton organisms throughout the experimental period. The maximum total number of zooplankton organisms (568/L) was observed in April. While in November the number of these organisms decreased, where its average total number was 256/L.

2-3- Bottom fauna :

The bottom fauna of earthen freshwater ponds were dominated by chironomed larvae and tubifex warm. They were found nearly in the all rearing months. Their maximum abundance (102/m^2 and 70/m^2 respectively) were recorded in July, while the minimum number (44/m^2 and 28/m^2 respectively) was observed in November (Table 7 & Figure 6).

Table (6) : Monthly variations of average number and percentage composition of phytoplankton (No /L) of water in rearing ponds, during the period from 1 April to 30 November, 1991.

Species		April		May		June		July		August		September		October		November	
		No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
chrysophyta :																	
Navicula	sp.	580	4.90	736	6.49	421	6.37	611	6.84	517	5.29	411	6.77	317	6.54	251	7.87
Melosira	sp.	383	3.23	533	4.70	125	1.89	210	2.35	316	3.24	212	3.49	205	4.23	200	6.27
Nitzschia	sp.	418	3.52	337	2.97	122	1.85	312	3.49	325	3.33	311	5.15	217	4.48	197	6.18
Gyrosigma	sp.	329	2.78	541	4.77	423	6.41	313	3.51	219	2.24	312	5.14	215	4.44	206	6.46
cyclotella	sp.	500	4.22	545	4.81	124	1.88	210	2.35	222	2.27	214	3.53	213	4.40	204	6.40
Total		2210	18.65	2692	23.74	1215	18.40	1656	18.54	1599	16.37	1460	24.06	1167	24.09	1058	33.18
Chlorophyta :																	
Coelastrum	sp.	1475	12.45	2060	18.17	803	12.16	1126	12.61	1168	11.96	737	12.14	658	13.58	322	10.10
Pediastrum	sp.	2217	18.71	1960	17.29	556	8.42	1800	20.15	1755	17.97	682	11.24	514	10.61	241	7.56
Scenedesmus	sp.	805	6.79	307	2.71	808	12.24	514	5.75	544	5.57	520	8.57	432	8.92	175	5.49
Staurastrum	sp.	667	5.64	335	2.95	312	4.72	301	3.37	380	3.89	266	4.38	215	4.44	108	3.93
Spyrogyra	sp.	832	7.02	383	3.38	306	4.63	285	3.19	562	5.75	260	4.28	206	4.25	102	3.20
Ankisterodesmus	sp.	520	4.39	584	5.15	310	4.69	518	5.80	543	5.56	287	4.73	223	4.60	119	3.73
Euglinomorpha	sp.	1310	11.06	1595	14.07	1059	16.04	1265	14.16	1771	18.14	810	13.35	602	12.42	315	9.88
Total		7826	66.06	7224	63.71	4154	62.90	5809	65.06	6723	68.85	3562	58.69	2850	58.82	1382	43.35
Cyanophyta :																	
Merismopedia	sp.	475	4.01	340	3.00	322	4.88	378	4.23	270	2.76	314	5.17	208	4.29	185	5.80
Oscillatoria	sp.	372	3.14	215	1.90	123	1.86	163	1.82	223	2.28	124	2.04	120	2.48	111	3.48
Nostoc	sp.	253	2.13	203	1.79	200	3.04	214	2.40	231	2.37	118	1.94	130	2.68	122	3.83
Total		1100	9.28	758	6.69	645	9.78	755	8.45	724	7.41	556	9.16	485	9.45	418	13.11

Table (7) : Monthly variations of average number and percentage composition of Zooplankton (No /L) and bottom fauna (No /m^2) of water in rearing ponds, during the period from 1 April to 30 November, 1991.

Species	April		May		June		July		August		September		October		November	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Zooplankton :																
Cilliata spp.	201	1.70	191	1.68	160	2.42	171	1.91	188	1.92	132	2.17	103	2.12	94	2.95
Brachionus sp.	180	1.52	137	1.21	118	1.79	137	1.53	142	1.45	103	1.70	74	1.53	66	2.07
Daphnia sp.	115	0.97	116	1.02	102	1.54	106	1.19	110	1.13	94	1.55	62	1.28	55	1.72
Cyclops sp.	72	0.61	105	0.93	65	0.98	125	1.40	124	1.27	55	0.91	48	0.99	41	1.29
Total	568	4.80	549	4.84	445	6.73	539	6.03	564	5.78	384	6.33	287	5.92	256	8.03
Bottom fauna :																
Chironomid larvae	81	0.68	70	0.62	90	1.36	102	1.14	88	0.90	65	1.07	50	1.03	44	1.38
Tubifex warm	63	0.53	45	0.40	55	0.83	70	0.78	67	0.69	42	0.69	33	0.68	28	0.88
Total	144	1.21	115	1.02	145	2.19	172	1.92	155	1.59	107	1.76	83	1.71	72	2.26

Fig (5) : Monthly variatons of number of phytoplankton of water in rearing ponds, during the period from 1 April to 30 November,1991.

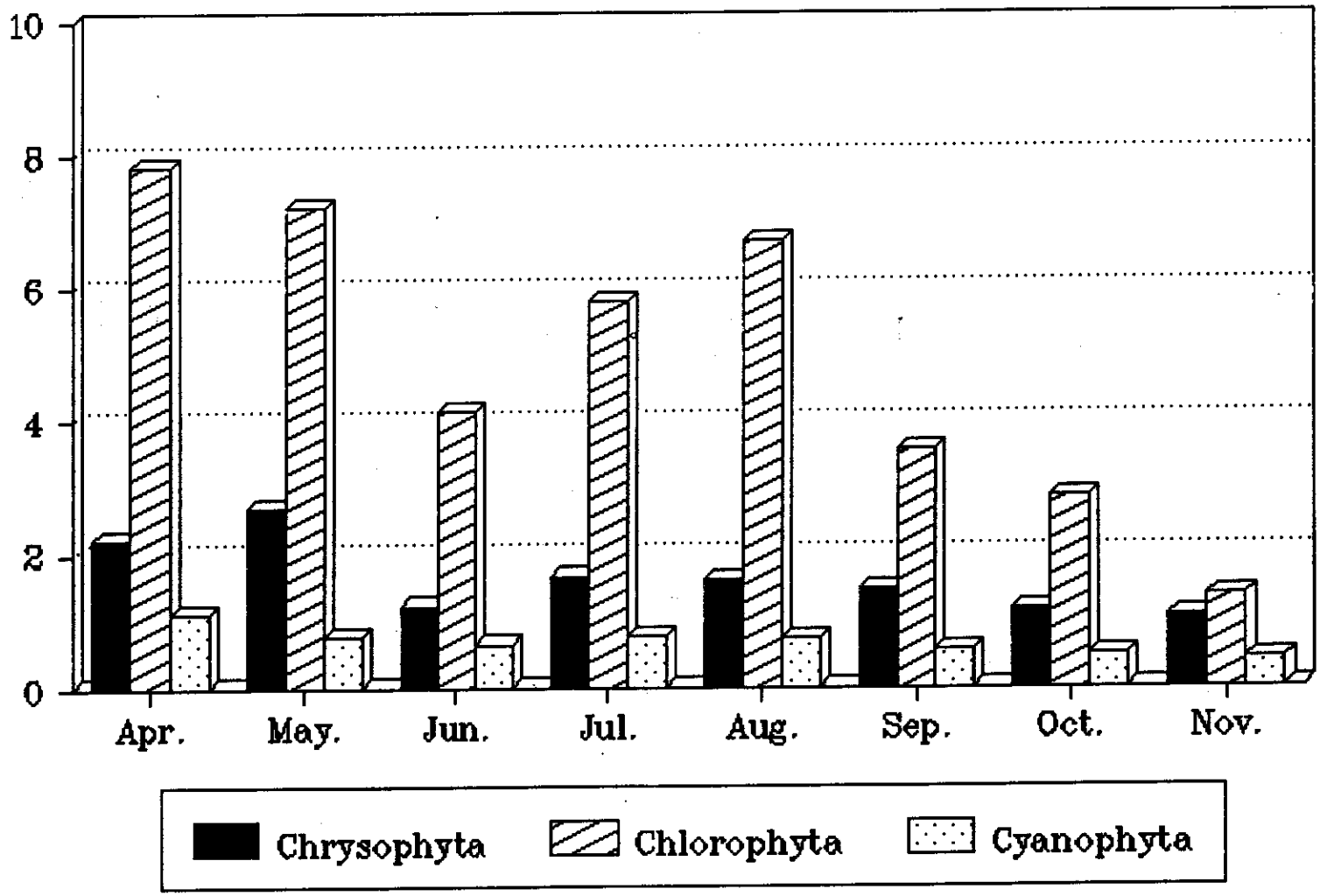
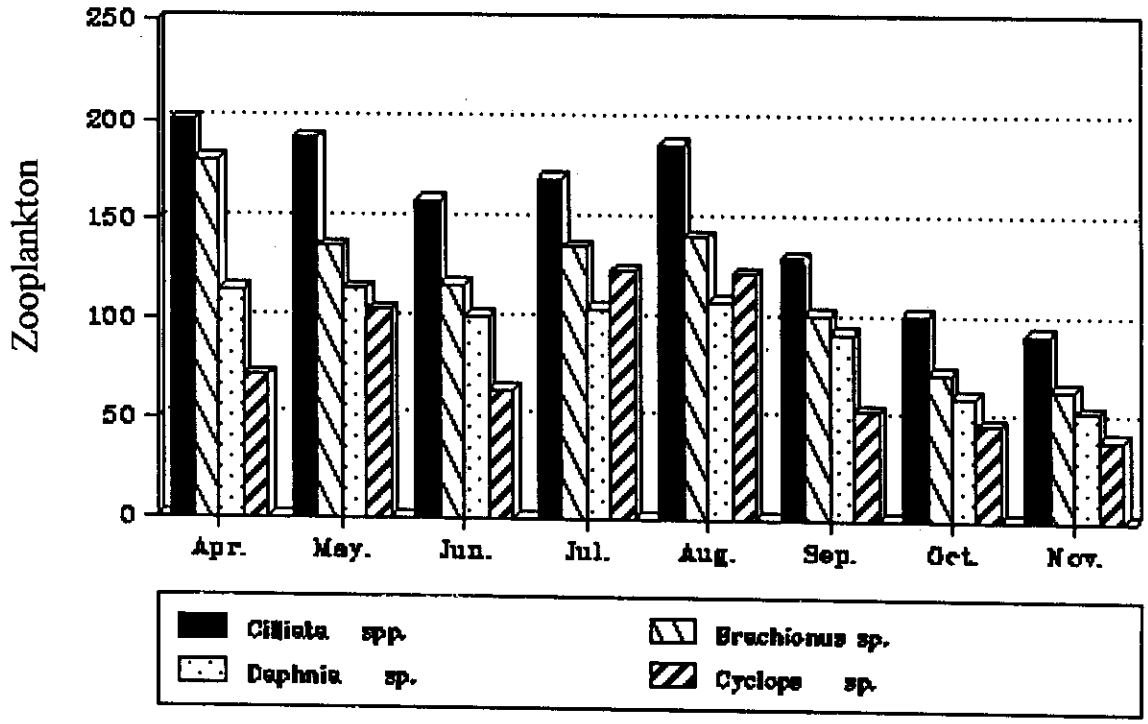
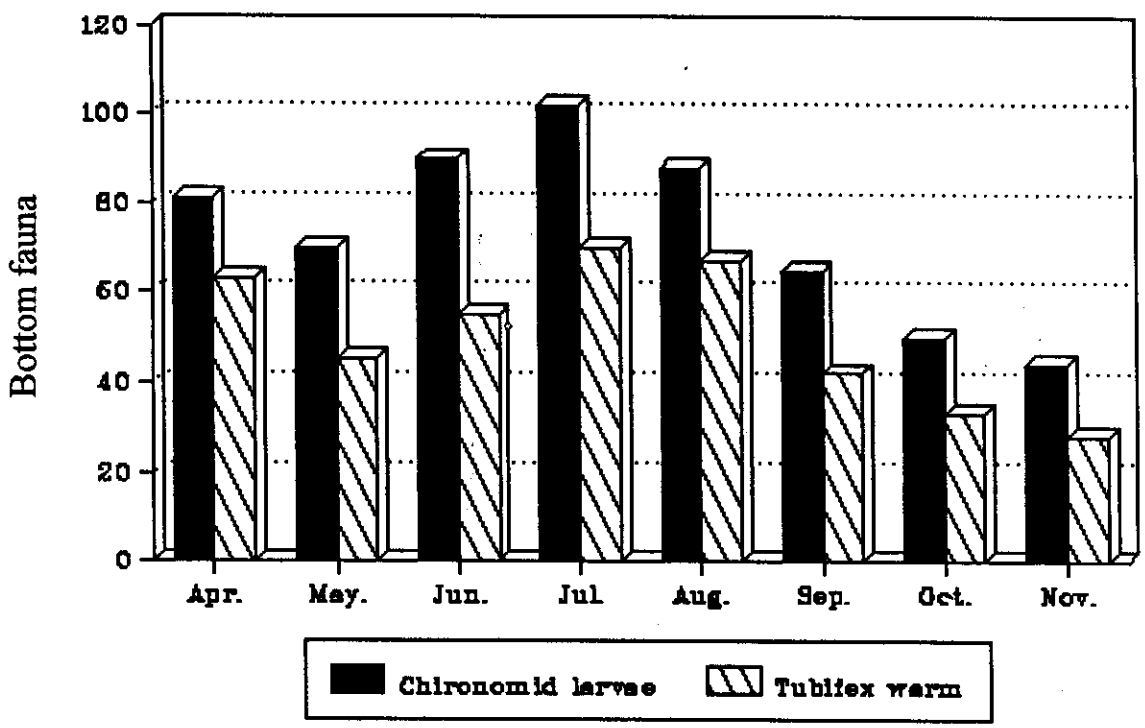


Fig (6) : Monthly variatons of number of zooplankton and Bottom fauna of water in rearing ponds form 1 April to 30 November, 1991.





CHAPTER 2

GROWTH RATES OF REARING FISHES

1-Chemical analysis of artificial food used :-

Table (2) shows the main ingridients of artificial food used and their chemical analysis, these ingridients include ; fish meal, soybean meal, cotton seed meal, rice bran, wheat bran, oil and vitamin. The fish meal showed the highest values of crude protein and fat (60.00 ± 0.21% and 9.22 ± 0.17% respectively), while the lowest value of protein (12.00 ± 0.15%) was observed in wheat bran and that of fat (1.83 ± 0.50%) was in soybean matter. The maximum values of ash and water contents (12.20 ± 0.05% and 9.56 ± 0.40% repectively) were noticed in rice bran, while its minimum values (2.02 ± 0.16% and 6.50 ± 0.23% respectively) were recorded in fish meal.

The maximum values of gross (total) and metabolizable energy (4322 ± 94 and 3074 ± 45 kcal/kg respectively) were found in fish meal, while wheat bran matter has minimum values of energy (3327 ± 50 and 1635 ± 20 kcal/kg respectively). The protein energy ratio showed a maximum value (136.25 ± 2.88) in wheat bran than that in other food ingridients.

2- Formulation of diets with different protein levels :

Three diets were formulated with different protein levles ; 20%, 30% and 40% crude protein. Table (3) showes the weight and quality of ingridients used in the preparation of the three diets.

The diet with 40% protein contain 40.16 ± 0.11% crude protein, 7.71 ± 0.16% crude fat, 10.32 ± 0.85 ash content and 7.37 ± 0.18% water content. The diet with 30% protein composed of 29.95 ± 0.05% crude protein, 7.10 ± 0.12% crude fat, 9.26 ± 0.22% ash content and 7.58 ± 0.21% water content. While the diet with 20% protein contain 20.04 ± 0.02% crude protein, 6.58 ± 0.06% crude fat, 8.56 ± 1.10 ash content and 7.86 ± 0.24% water content (Table 4).

3- Growth in length :

From the present study it was found that, at stocking density of one fish/m² (100 fish/pond ; 50 carp + 50 tilapia), the length of silver carp ***(H. molitrix)*** and Nile tilapia ***(O. niloticus)*** reared in polyculture system and fed on diet contain 30% protein in earthen freshwater ponds, increased from initial average length of 12.16 ± 1.52 cm and 9.00 ± 1.75 cm to 42.00 ± 2.15 cm and 27.50 ± 1.33 cm respectively. While at stocking density of two fish/m² (200 fish/pond ; 100 carp + 100 tilapia), the total length increased from the same initial length to 35.30 ± 0.88 cm and 26.70 ± 0.89 cm respectively. However, at the stocking density of three fish/m² (300 fish/pond ; 150 carp and 150 tilapia), the rearing fishes reached a length of 33.00 ± 1.04 cm and

22.00 ± 0.93 cm respectively after 244 days (Tables 8,9). It was found also that, the final length increment for the both fish was higher in the ponds of lower stocking density than the higher ones and declined gradually with the increase of stocking density.

The rearing carp and tilapia stocked at two fish/m² and fed on diet with 20% protein, its length increased from 12.16 ± 1.52 cm and 9.00 ± 1.75 cm to 30.00 ± 0.98 cm and 20.60 ± 0.93 cm for carp and tilapia respectively. While at diets with 30% and 40% protein level the length of 35.30 ±0.88 cm and 26.70 ± 0.89 cm as well as 41.20 ± 1.50 cm and 24.30 ± 0.85 cm were finally obtained for carp and tilapia at the both protein levels respectively (Tables 10,11).

It is worthily to noted that, the final length increament for carp increased with the protein level, it gave increment of 29. 04 cm at the higher protein level. Whereas, for Nile tilapia the higher value of length increment was recorded at 30% protein level (17.70cm). Then decreased at 40% protein level.

On the other hand, rearing ***H. molitrix*** and ***O. niloticus*** at stocking density of two fish/m² and 30% protein level with 3% food ration, but with different initial size, cleared that, at lowest initial size (6.20 ± 1.65cm and 4.30 ± 1.07 respectively), the fish length increased to 25.80 ± 1.54 cm and 19.30 ± 0.91 cm. Otherwise,at initial size of 12.16 ± 1.52 cm and 9.00 ± 1.75 cm for carp and tilapia respectively,

Table (8) : Growth in length (cm) of silver carp ***(H. molitrix)*** reared in earthen freshwater ponds at three different **stocking densities,** during the period from 1 April to 30 November, 1991.

Month	Days after stocking	Control (100 fish/pond)		100 fish/pond		200 fish/pond		300 fish/pond	
		Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
	0	8.40-14.60	12.16±1.52	8.40-14.60	12.16±1.52	8.40-14.60	12.16±1.52	8.40-14.60	12.16±1.52
Apr.	15	9.20-15.30	12.30±2.04	9.60-15.80	14.00±1.83	10.50-15.50	13.80±2.13	9.00-15.00	12.50±2.12
	30	10.22-16.00	12.50±1.98	10.40-17.11	16.00±2.03	11.50-17.60	14.50±2.21	10.00-17.00	13.00±2.52
May.	45	11.41-16.50	13.50±1.86	11.80-17.00	19.00±2.51	13.60-21.80	16.00±2.45	12.00-18.00	15.00±2.88
	60	11.80-17.50	14.30±1.52	12.30-18.20	20.00±2.11	14.85-22.00	17.50±1.75	13.00-20.00	16.50±2.26
Jun.	75	12.00-18.00	14.50±2.00	13.00-19.10	22.00±2.00	16.70-23.80	19.60±2.03	13.00-20.40	17.00±1.55
	90	13.00-19.00	15.00±1.03	14.80-21.20	24.00±1.88	17.43-25.00	21.50±2.00	15.00-22.00	18.00±2.11
Jul.	105	13.68-20.00	16.10±2.00	15.60-22.10	25.00±2.04	20.60-27.80	23.70±1.87	16.50-23.00	19.00±1.79
	120	14.00-21.00	17.00±2.15	16.80-23.10	28.00±2.01	22.50-29.00	25.66±2.00	17.00-24.00	20.00±1.05
Aug.	135	14.50-21.00	17.80±2.75	17.60-24.30	29.00±2.00	23.44-30.60	26.80±2.02	17.50-25.00	21.00±2.15
	150	15.00-22.00	18.50±1.53	18.20-25.60	32.00±1.76	24.60-31.70	27.80±2.15	19.00-26.00	22.50±2.03
Sep.	165	15.60-22.00	19.18±1.55	19.30-26.70	34.00±2.13	24.80-32.33	28.60±1.86	20.00-26.00	23.00±1.06
	180	16.00-22.00	20.31±1.41	20.20-27.50	35.00±1.85	26.80-33.60	29.75±1.72	21.00-28.00	24.00±2.00
Oct.	195	16.50-22.00	21.22±1.55	21.30-28.60	36.50±2.15	26.60-34.50	31.40±2.10	22.00-29.00	26.00±1.73
	210	17.50-22.50	22.15±1.25	23.41-30.80	39.00±2.11	29.88-36.70	32.60±1.85	24.00-31.00	29.00±1.94
Nov.	225	19.00-24.00	23.10±1.55	37.00-44.00	40.00±1.87	30.60-37.80	33.70±2.05	27.00-34.00	31.00±1.92
	240	23.30-27.80	24.20±1.43	39.00-46.00	42.00±2.15	32.30-37.00	35.30±0.88	30.00-35.00	33.00±1.04
Final increm.		-	12.04	-	29.84	-	23.14	-	20.84

Table (9) : Growth in length (cm) of Nile tilapia ***(O.niloticus)*** reared in earthen freshwater ponds at three different **stocking densities,** during the period from 1 April to 30 November, 1991.

Month	Days after stocking	Control (100 fish/pond)		100 fish/pond		200 fish/pond		300 fish/pond	
		Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
	0	7.30-12.50	9.00±1.75	7.30-12.50	9.00±1.75	7.30-12.50	9.00±1.75	7.30-12.50	9.00±1.75
Apr.	15	7.50-12.50	9.50±1.29	8.00-13.50	11.00±1.80	8.50-12.50	10.50±1.55	7.60-12.50	10.00±1.69
	30	7.70-12.50	10.00±1.33	9.50-14.50	11.50±1.86	9.00-12.80	10.50±1.62	8.00-12.60	10.00±1.71
May.	45	8.00-12.60	10.40±1.42	10.50-15.00	12.50±2.17	9.60-13.00	11.30±1.74	9.00-12.80	10.50±1.80
	60	8.60-12.80	11.30±0.62	11.00-17.00	14.00±1.52	10.00-14.50	12.50±1.02	9.00-13.00	11.00±1.05
Jun.	75	9.30-13.20	12.00±1.03	13.00-19.00	16.00±1.50	11.80-17.00	14.70±1.55	9.00-14.00	12.00±1.08
	90	10.00-14.00	12.60±1.05	15.00-21.00	18.00±1.55	13.60-19.50	16.00±1.43	10.50-15.00	13.00±1.02
Jul.	105	10.40-14.50	13.00±1.25	16.00-22.00	19.00±1.42	15.30-21.00	17.80±2.06	10.00-15.50	13.00±1.25
	120	10.90-15.50	13.30±1.18	18.00-23.00	21.00±1.02	16.10-22.30	18.30±2.52	11.00-17.00	14.00±1.51
Aug.	135	11.00-15.80	13.80±0.75	19.00-25.00	22.00±1.55	17.00-23.00	19.00±2.01	12.00-17.00	15.00±1.06
	150	11.20-16.00	14.00±1.52	19.00-26.00	24.00±1.62	18.00-23.50	20.60±1.55	12.00-18.00	15.00±1.55
Sep.	165	11.50-16.50	14.50±1.23	21.00-26.50	24.00±1.55	18.60-24.00	21.40±1.42	13.00-19.00	16.00±1.44
	180	12.00-17.00	15.00±1.25	22.00-28.00	25.00±1.47	19.00-25.00	22.00±1.55	14.00-19.50	17.00±1.26
Oct.	195	12.50-18.10	15.80±1.48	23.50-26.00	25.00±1.56	20.10-26.00	23.00±1.63	15.00-21.50	18.00±1.75
	210	13.60-19.30	16.60±1.61	24.00-29.50	26.00±1.62	21.80-27.00	23.50±1.86	16.00-22.00	19.00±1.48
Nov.	225	15.00-20.10	17.50±1.00	25.00-31.00	26.00±1.50	23.60-28.00	25.00±1.48	17.00-22.00	20.00±1.05
	240	16.20-21.80	18.30±1.52	26.00-32.00	27.50±1.33	24.10-28.20	26.70±0.89	20.00-24.00	22.00±0.93
Final increm.		-	9.30	-	18.50	-	17.70	-	13.00

Table (10) : Growth in length (cm) of silver carp ***(H. molitrix)*** reared in earthen freshwater ponds at three different **dietary protein levels**, during the period from 1 April to 30 November, 1991.

Month	Days after stocking	Control (0% protien)		20 % protein		30%protein		40 % protein	
		Range cm	M ± SD cm	Range cm	M ± SD cm	Range cm	M ± SD cm	Range cm	M ± SD cm
	0	8.40-14.60	12.16±1.52	8.40-14.60	12.16±1.52	8.40-14.60	12.16±1.52	8.40-14.60	12.16±1.52
Apr.	15	9.20-15.30	12.30±2.04	9.60-15.80	12.50±1.88	10.50-15.50	13.80±2.13	11.50-17.00	14.50±1.99
	30	10.22-16.00	12.50±1.98	10.40-17.11	13.20±1.96	11.50-17.60	14.50±2.21	14.25-19.60	17.10±1.88
May.	45	11.41-16.60	13.50±1.86	11.80-17.00	14.60±2.04	13.60-21.80	16.00±2.45	18.60-22.80	20.70±1.73
	60	11.80-17.50	14.30±1.52	12.30-18.20	15.50±1.52	14.85-22.00	17.50±1.75	19.30-24.50	22.41±1.08
Jun.	75	12.00-18.00	14.50±2.00	13.00-19.10	16.60±1.51	16.70-23.80	19.60±2.03	21.60-27.80	24.80±1.56
	90	13.00-19.00	15.00±1.03	14.80-21.20	17.80±2.50	17.43-25.00	21.50±2.00	23.30-30.70	26.00±2.03
Jul.	105	13.68-20.00	16.10±2.00	15.60-22.10	18.60±1.55	20.60-27.80	23.70±1.87	25.70-32.00	28.50±2.03
	120	14.00-21.00	17.00±2.15	16.80-23.10	19.80±1.56	22.50-29.00	25.66±2.00	27.60-34.80	30.60±2.00
Aug.	135	14.50-21.00	17.80±2.75	17.60-24.30	20.70±2.04	23.44-30.60	26.80±2.02	29.40-36.50	32.10±2.02
	150	15.00-22.00	18.50±1.53	18.20-25.60	21.80±2.05	24.60-31.70	27.80±2.15	31.80-38.60	34.50±2.06
Sep.	165	15.60-22.00	19.18±1.55	19.30-26.70	22.77±2.15	24.80-32.33	28.60±1.86	33.20-40.50	36.00±2.16
	180	16.00-22.00	20.31±1.41	20.20-27.50	23.70±2.11	26.80-33.60	29.75±1.72	34.30-41.20	37.10±2.05
Oct.	195	16.50-22.00	21.22±1.55	21.30-28.60	24.80±2.04	27.60-34.50	31.40±2.10	35.60-42.70	38.20±2.34
	210	17.50-22.50	22.15±1.25	23.41-30.80	26.70±1.88	29.88-36.70	32.60±1.85	37.30-44.00	40.00±2.15
Nov.	225	19.00-24.00	23.10±1.50	25.80-32.00	28.60±2.12	30.60-37.80	33.70±2.05	39.20-47.60	40.80±3.50
	240	23.30-27.80	24.20±1.43	27.20-32.10	30.00±0.98	32.30-37.00	35.30±0.88	40.00-44.30	41.20±1.50
Final increm.		-	12.14	-	17.84	-	23.14	-	29.04

Table (11) : Growth in length (cm) of Nile tilapia ***(O. niloticus)*** reared in earthen freshwater ponds at three different **dietary protein levels**, during the period from 1 April to 30 November, 1991.

Month	Days after stocking	Control (0% protien)		20 % protein		30%protein		40 % protein	
		Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
	0	7.30-12.50	9.00±1.75	7.30-12.50	9.00±1.75	7.30-12.50	9.00±1.75	7.30-12.50	9.00±1.75
Apr.	15	7.50-12.50	9.50±1.29	7.50-12.50	9.50±1.49	8.50-12.50	10.50±1.55	8.20-12.50	10.00±1.69
	30	7.70-12.50	10.00±1.33	7.50-12.60	10.50±1.52	9.00-12.90	10.50±1.62	8.60-12.60	10.50±1.70
May.	45	8.00-12.60	10.40±1.42	8.00-12.60	10.50±1.74	9.60-13.00	11.30±1.74	9.50-12.80	10.70±1.98
	60	8.60-12.80	11.30±0.62	8.30-12.80	11.50±0.75	9.80-13.00	12.50±1.02	9.80-13.00	11.10±1.03
Jun.	75	9.30-13.20	12.00±1.03	9.00-13.00	12.00±1.06	11.80-17.00	14.70±1.55	10.00-13.50	12.20±0.75
	90	10.00-14.00	12.60±1.05	9.30-14.50	12.60±1.25	13.60-19.50	16.00±1.43	10.20-16.00	13.00±1.56
Jul.	105	10.40-14.50	13.00±1.25	9.62-14.50	13.00±1.25	15.30-11.00	17.80±2.06	10.50-16.40	13.30±1.55
	120	10.90-15.50	13.30±1.18	10.20-16.00	13.60±1.50	16.10-22.30	18.30±2.52	10.00-16.50	14.00±1.25
Aug.	135	11.00-15.80	13.80±0.75	11.00-16.50	14.00±1.25	17.00-23.00	19.00±2.01	12.30-18.00	15.20±1.50
	150	11.20-16.00	14.00±1.52	11.50-17.00	14.70±1.53	18.00-23.50	20.60±1.55	13.00-19.10	16.00±1.60
Sep.	165	11.50-16.50	14.50±1.23	12.00-18.10	15.30±1.64	18.60-24.00	21.40±1.42	14.20-20.32	17.00±1.50
	180	12.00-17.00	15.00±1.25	13.50-19.00	16.00±1.50	19.00-25.00	22.00±1.55	15.00-20.50	18.30±1.36
Oct.	195	12.50-18.10	15.18±1.48	14.00-12.30	17.20±1.55	20.10-26.00	23.00±1.63	15.50-21.00	19.00±1.10
	210	13.60-19.30	16.60±1.61	15.80-20.50	18.00±1.25	11.80-27.00	23.50±1.86	17.60-23.00	20.30±1.50
Nov.	225	15.00-20.10	17.50±1.00	17.00-21.00	19.20±1.51	23.60-28.00	25.00±1.48	19.80-24.70	22.00±1.02
	240	16.20-21.80	18.30±1.02	18.00-22.80	20.60±0.93	24.10-28.20	26.70±0.89	22.20-26.00	24.30±0.85
Final increm.		-	9.30	-	11.60	-	17.70	-	15.30

the lengths of 35.30 ± 0.88 cm and 26.70 ± 0.89 cm were obtained. However, at the highest initial size (17.56 ± 1.68 cm for carp and 12.00 ± 1.41 cm for tilapia) the fishes reached a length of 43.60 ± 1.95 cm and 27.20 ± 0.87 cm at the end of rearing period (Tables 12,13). The final increment of silver carp increased with the increase of initial size from 19.60cm at the lowest initial size to 26.04 cm at the highest one. But for Nile tilapia the higher length increment (17.70 cm) was observed at the middle initial size (9.0 cm), then decreased at the higher one (12.0 cm) to 15.20 cm.

As shown in tables (14,15) the rearing fish stocked at two fish/m^2 and fed on diet contain 30% protein with 1% food ration, the length of silver carp and Nile tilapia increased from initial average length of 12.16 ± 1.52 cm and 9.00 ± 1.75 cm to 31.30 ± 1.07 cm and 22.40 ± 1.06 cm respectively. While at 3% food ration the total length of 35.30 ± 0.88 cm and 26.70 ± 0.89 cm was obtained at the end of experimental period. However, at the highest food ration (5%) the fishes reached a length of 40.80 ± 1.55 cm and 27.50 ± 1.55 cm for carp and tilapia respectively at the end of rearing period. From the tables it was noted also that, in length increment for the both species increased with the increase of food ration from 1% to 3% and 5% to gave 19.14, 23.14 and 28.64cm for silver carp respectively and 13.40, 17.70 and 18.50 cm for Nile tilapia respectively.

Table (12) : Growth in length (cm) of silver carp ***(H. molitrix)*** reared in earthen freshwater ponds at three different **initial sizes**, during the period from 1 April to 30 November, 1991.

Month	Days after stocking	Cont.(12.16cm,21.75gm)		6.20 cm, 7.40 gm		12.16 cm, 21.75 gm		17.56 cm, 61.05 gm	
		Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
	0	8.40-14.60	12.16±1.52	4.00-9.500	6.20±1.65	8.40-14.60	12.16±1.52	14.00-20.50	17.56±1.52
Apr.	15	9.20-15.30	12.30±2.04	5.50-9.50	6.50±1.16	10.50-15.50	13.80±2.13	16.00 23.00	19.00±2.13
	30	10.22-16.00	12.50±1.98	6.50-10.50	7.20±1.25	11.50-17.60	14.50±2.21	18.70-25.00	21.20±2.15
May.	45	11.41-16.60	13.50±1.86	7.50-11.50	8.00±1.30	13.60-21.80	16.00±2.45	20.60-25.80	23.00±2.21
	60	11.80-17.50	14.30±1.52	7.70-12.00	9.80±1.52	14.85-22.00	17.50±1.75	21.80-27.30	24.50±1.58
Jun.	75	13.00-18.00	14.50±2.00	9.00-12.80	10.60±1.02	16.70-23.80	19.60±2.03	23.60-30.20	26.70±2.03
	90	13.00-19.00	15.00±1.03	10.00-13.60	12.00±1.03	17.43-25.00	21.50±2.00	25.86-32.00	28.80±2.00
Jul.	105	13.68-20.00	16.10±2.00	11.20-14.80	13.20±1.00	20.60-27.80	23.70±1.87	27.80-34.00	30.60±2.13
	120	14.00-21.00	17.00±2.15	12.00-16.70	15.00±1.07	22.50-29.00	25.66±2.00	29.00-36.20	32.40±2.01
Aug.	135	14.50-21.00	17.80±2.75	12.50-17.60	17.00±1.05	23.44-30.60	26.80±2.02	30.80-37.70	33.60±2.13
	150	15.00-22.00	18.50±1.53	13.50-18.50	20.30±1.25	24.60-31.70	27.80±2.15	32.10-39.00	35.20±2.03
Sep.	165	15.60-22.00	19.18±1.55	14.50-19.70	21.00±1.08	24.80-32.33	28.60±1.86	33.40-41.60	36.80±2.53
	180	16.00-22.00	20.31±1.41	15.00-22.80	21.60±1.52	26.80-33.60	29.75±1.72	35.40-42.00	38.30±2.17
Oct.	195	16.50-22.00	21.22±1.75	17.50-23.50	22.00±1.75	27.60-34.50	31.40±2.10	36.00-43.30	39.60±2.21
	210	17.50-22.50	22.15±1.25	21.00-24.60	22.70±1.55	29.88-36-70	32.60±1.85	38.30-45.00	41.30±1.87
Nov.	225	19.00-24.00	23.10±1.50	23.00-26.70	24.60±1.01	30.60-37.80	33.70±2.05	39.80-46.20	42.00±3.04
	240	23.30-27.80	24.20±1.43	24.30-28.00	25.80±1.54	32.30-37.00	35.30±0.88	41.20-47.00	43.60±1.95
Final increm.		-	12.04	-	19.60	-	23.14	-	26.04

Table (13) : Growth in length (cm) of Nile tilapia *(O. niloticus)* reared in earthen freshwater ponds at three different **initial size,** during the period from 1 April to 30 November, 1991.

Month	Days after stocking	Cont.(9.00cm, 15.24gm)		4.30 cm, 6.85 gm		9.00 cm, 15.24 gm		12.00 cm, 35.79 gm	
		Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
	0	7.30-12.50	9.00±1.75	2.70- 6.45	4.30±1.07	7.30-12.50	9.00±1.75	9.40-14.80	12.00±1.41
Apr.	15	7.50-12.50	9.50±1.29	3.50- 6.50	4.50±0.77	8.50-12.50	10.50±1.55	10.00-15.00	12.59±1.66
	30	7.70-12.50	10.00±1.33	4.00- 7.00	5.50±0.84	9.00.12.80	10.50±1.62	11.30-16.20	13.00±1.72
May.	45	8.00-12.60	10.40±1.42	5.00- 8.00	6.50±0.91	9.60-13.00	11.30±1.74	12.00-17.00	14.50±1.88
	60	8.60-12.80	10.30±0.62	6.00- 9.00	7.50±0.76	10.00-14.50	12.50±1.02	12.60-17.80	15.00±1.52
Jun.	75	9.30-13.10	12.00±1.03	7.00-10.00	8.80±1.02	11.80-17.00	14.70±1.55	13.20-19.00	16.00±1.61
	90	10.00-14.00	12.60±1.05	8.20-11.50	10.00±1.25	13.60-19.50	16.00-1.43	14.60-20.30	17.50±1.55
Jul.	105	10.40-14.50	13.00±1.25	8.60-13.00	12.00±1.55	15.30-11.00	17.80±2.06	15.80-21.60	18.00±1.55
	120	10.90-15.50	13.30±1.18	9.20-14.00	12.40±1.05	16.10-22.30	18.30±2.52	16.60-22.00	19.00±1.52
Aug.	135	11.00-15.80	13.80±0.75	10.60-15.00	13.60±1.05	17.00-23.00	19.00±2.01	17.30-22.50	19.50±1.08
	150	11.20-16.00	14.00±1.52	11.50-15.80	14.50±1.26	18.00-23.50	20.60±1.55	18.00-24.00	20.00±1.72
Sep.	165	11.50-16.50	14.50±1.23	12.80-16.50	15.00±1.25	18.60-24.00	21.40±1.42	18.50-24.30	22.60±1.54
	180	12.00-17.00	15.00±1.25	13.50-17.50	16.20±1.75	19.00-25.00	22.00±1.55	19.00-25.00	24.00±1.55
Oct.	195	12.50-18.10	15.80±1.48	14.80-18.20	17.00±1.52	20.10-26.00	23.00±1.63	19.66-25.70	24.88±1.18
	210	13.60-19.30	16.80±1.61	15.50-19.00	17.80±1.02	11.80-27.00	23.50±1.56	20.80-26.60	25.50±1.55
Nov.	225	15.00-20.10	17.50±1.00	16.60-19.80	18.70±1.00	23.60-28.00	25.00±1.48	22.00-28.00	26.80±1.51
	240	16.20-21.80	18.30±1.02	17.20-21.30	19.30±0.91	24.10-28.20	26.70±0.89	23.10-29.30	27.20±0.87
Final increm.		-	9.30	-	15.00	-	17.70	-	15.20

Table (14) : Growth in length (cm) of silver carp *(H. molitrix)* reared in earthen freshwater ponds at three different **food rations**, during the period from 1 April to 30 November, 1991.

Month	Days after stocking	Control (0% of T.wt)		1 % of T.wt		3 % of T. wt		5 % of T.wt	
		Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
	0	8.40-14.60	12.16±1.52	8.40-14.60	12.16±1.52	8.40-14.60	12.16±1.52	8.40-14.60	12.16±1.52
Apr.	15	9.20-15.30	12.30±2.04	10.00-16.00	12.50±2.04	10.50-15.50	13.80±2.13	11.00-18.00	14.00±2.12
	30	10.22-16.00	12.50±1.98	11.60-17.20	14.00±1.89	11.50-17.60	14.50±2.21	13.20-18.60	16.00±1.88
May.	45	11.41-16.60	13.50±1.86	13.00-20.00	15.50±1.61	13.60-21.80	16.00±2.45	14.00-22.30	17.50±1.65
	60	11.80-17.50	14.30±1.52	14.20-20.60	16.20±1.54	14.85-22.00	17.50±1.75	16.70-23.30	19.60±2.02
Jun.	75	12.00-18.00	14.50±2.00	15.60-21.00	17.00±1.05	16.70-23.80	19.60±2.03	17.60-23.50	20.80±1.65
	90	13.00-19.00	15.00±1.03	16.30-22.00	18.20±2.06	17.43-25.00	21.50±2.00	18.30-25.60	21.70±2.08
Jul.	105	13.68-20.00	16.10±2.00	18.20-23.00	19.00±1.56	20.60-27.80	23.70±1.87	20.60-27.70	23.80±2.05
	120	14.00-21.00	17.00±2.15	20.00-24.00	21.20±2.12	22.50-29.00	25.66±2.00	23.80-30.60	26.20±2.03
Aug.	135	14.50-21.00	17.80±2.75	22.00-25.20	23.00±2.15	23.44-30.60	26.80±2.02	25.00-32.80	28.80±2.07
	150	15.00-22.00	18.50±1.53	23.60-26.00	24.00±2.15	24.60-31.70	27.80±2.15	25.50-36.20	30.60±3.02
Sep.	165	15.60-22.00	19.18±1.55	24.00-27.30	26.60±2.06	24.80-32.33	28.60±1.86	28.80-36.60	31.40±2.01
	180	16.00-22.00	20.31±1.41	25.00-28.80	27.00±2.41	26.80-33.60	29.75±1.72	30.80-37.37	33.50±2.21
Oct.	195	16.50.22.00	21.22±1.55	26.20-30.00	28.00±2.16	27.60-34.50	31.40±2.10	31.80-38.60	34.30±2.02
	210	17.50-22.50	22.15±1.25	27.00-31.80	29.20±2.00	29.88-36.70	32.60±1.85	33.30-41.60	36.80±1.88
Nov.	225	19.00-24.00	23.10±1.50	28.60-23.00	30.00±1.86	30.60-37.80	33.70±2.05	35.00-42.80	38.70±1.75
	240	23.30-27.80	24.20±1.43	29.20-23.60	31.30±1.07	32.30-37.00	35.30±0.88	39.60-43.00	40.80±1.55
Final increm.		-	12.04	-	19.14	-	23.14	-	28.64

Table (15) : Growth in length (cm) of Nile tilapia *(O. niloticus)* reared in earthen freshwater ponds at three different **food rations**, during the period from 1 April to 30 November, 1991.

Month	Days after stocking	Control (0% of T.wt)		1 % of T.wt		3 % of T. wt		5 % of T.wt	
		Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
	0	7.30-12.50	9.00±1.75	7.30-12.50	9.00±1.75	7.30-12.50	9.00±1.75	7.30-12.50	9.00±1.75
Apr.	15	7.50-12.50	9.50±1.29	8.00-12.50	10.00±1.65	8.50-12.50	10.50±1.55	8.00-13.50	11.00±1.62
	30	7.70-12.50	10.00±1.33	9.00-12.60	10.50±1.72	9.00-12.80	10.50±1.62	9.50-13.50	11.50±1.85
May.	45	8.00-12.60	10.40±1.42	9.00-12.80	10.50±1.83	9.60-13.00	11.30±1.74	10.00-14.60	12.00±2.02
	60	8.60-12.80	11.30±0.62	9.20-13.60	11.50±0.78	10.00-14.50	12.50±1.02	11.00-16.80	13.50±1.28
Jun.	75	9.30-13.20	12.00±1.03	9.50-14.80	12.60±1.05	11.80-17.00	14.70±1.55	12.80-18.00	15.70±1.03
	90	10.00-14.00	12.60±1.05	10.00-16.00	13.00±1.55	13.60-19.50	16.00±1.43	14.70-20.86	17.60±1.55
Jul.	105	10.40-14.50	13.00±1.25	10.80-16.50	13.80±1.50	15.30-11.00	17.80±2.06	15.88-21.70	18.80±1.55
	120	10.90-15.50	13.30±1.18	11.30-17.60	14.30±1.50	16.10-22.30	18.30±2.52	17.60-23.80	19.60±2.03
Aug.	135	11.00-15.80	13.20±0.75	12.60-18.70	15.60±1.50	17.00-23.00	19.00±2.01	18.00-24.00	20.80±2.03
	150	11.20-16.00	14.00±1.52	13.80-19.00	16.80±1.74	18.00-23.50	20.60±1.55	18.66-24.00	21.66±1.73
Sep.	165	11.50-16.50	14.50±1.23	14.00-14.50	17.60±1.26	18.60-24.00	21.40±1.42	19.80-24.60	22.20±1.05
	180	12.00-17.00	15.00±1.25	15.60-12.50	18.60±1.75	19.00-25.00	22.00±1.55	20.80-26.50	23.00±1.76
Oct.	195	12.50-18.10	15.80±1.48	16.70-22.00	19.70±1.55	20.10-26.00	23.00±1.63	21.00-25.00	23.60±1.54
	210	13.60-19.30	16.60±1.61	17.80-23.00	20.80±1.65	11.80-27.00	23.50±1.86	22.60-27.80	24.80±1.51
Nov.	225	15.00-20.10	17.50±1.00	19.00-23.80	21.60±1.00	23.60-28.00	25.00±1.48	24.00-28.60	26.00±1.08
	240	16.20-21.80	18.30±1.02	20.30-24.60	22.40±1.06	24.10-28.20	26.70±0.89	24.60-29.00	27.50±1.55
Final increm.		-	9.30	-	13.40	-	17.70	-	18.50

The control group of these fishes increased from initial length of 12.16 ± 1.52 cm and 9.00 ± 1.75 cm to 24.20 ± 1.43 cm and 18.30 ± 1.02 cm for carp and tilapia respectively.

4- Growth in weight :

The present investigation indicate that, at stocking density of one fish/m^2 , the weight of silver carp and Nile tilapia increased from initial average weight of 21.8 ± 3.2 gm and 15.2 ± 2.5 gm/fish to 892.0 ± 30.5 gm and 368.0 ± 19.0 gm/fish respectively. While at stocking of two fish/m^2, the average weight of 612.0 ± 15.0 gm and 332.0 ± 16.0 gm/fish were obtained. However, at the highest stocking density (three fish/m^2) the fishes reached a weight of 370.0 ± 15.1 gm and 253.0 ± 14.1 gm/fish after 244 days, tables (16,17) and figures (7,8). It was found also that the weight increment of the both species was indirectly proportional with the stocking density. This means that the lowest stocking densiy gave the highest weight increment for both.

From tables (18,19) and figures (9, 10) observed that ***H. molitrix*** fed on diet contain 40% protein gave the maximum weight/fish (averge 1012.0 ± 25.6 gm/fish) while ***O. niloticus*** gained the highest weight (332.0 ± 16.0 gm/fish) at diet with 30% protein. The minimum weight of silver carp and Nile tilapia (290.0 ± 13.0 gm and 223.0 ± 11.0 gm respectively) were recorded on feeding with a diet contain 20% protein. The same trend prevailed the weight increment for both species. This

Table (16) : Growth in weight (gm) of silver carp *(H. molitrix)* reared in earthen freshwater ponds at three different **stocking densities**, during the period from 1 April to 30 November, 1991.

Month	Days after stocking	Control (100 fish/pond)		100 fish/pond		200 fish/pond		300 fish/pond	
		Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
	0	14.0- 31.5	21.8± 3.2	14.0- 31.5	21.8± 3.2	14.0- 31.5	21.8± 3.2	14.0- 31.5	21.8± 3.2
Apr.	15	14.5- 34.5	22.0± 6.9	23.0- 47.0	36.5± 8.8	20.5- 41.0	30.0± 9.8	16.5- 42.5	23.5± 9.8
	30	15.5- 40.0	23.0± 7.5	32.0-84.0	45.0±14.1	24.0- 56.0	38.5± 8.5	21.0- 46.0	28.0± 8.4
May.	45	19.0- 51.0	24.0± 8.1	50.0-110.0	72.0±20.1	35.0- 96.0	58.0±10.2	26.0- 73.0	45.0± 7.2
	60	20.0- 52.0	27.0±11.6	68.0-132.0	91.0±18.8	42.0- 87.0	68.0±10.2	38.0- 82.0	47.0±20.2
Jun.	75	25.0- 61.0	30.0±16.1	110.0-180.0	130.0±25.0	71.0-138.0	92.0±23.1	50.0- 87.0	60.0±18.6
	90	37.0- 65.0	40.0±12.5	140.0-212.0	162.0±25.0	100.0-170.0	120.0±25.2	52.0-122.0	72.0±25.2
Jul.	105	40.0- 84.0	45.0±20.1	240.0-275.0	195.0±40.0	111.0-183.0	138.0±22.5	68.0-138.0	88.0±24.1
	120	42.0-106.0	50.0±28.0	231.0-302.0	232.0±34.0	146.0-218.0	170.0±24.1	75.0-145.0	95.0±12.6
Aug.	135	44.0-110.0	56.0±14.5	256.0-326.0	276.0±25.1	165.0-235.0	200.0±17.6	105.0-175.0	110.0±32.5
	150	51.0-111.0	62.0±14.4	302.0-375.0	320.0±27.5	180.0-275.0	240.0±20.0	130.0-200.0	148.0±26.0
Sep.	165	35.0-113.0	70.0±15.5	372.0-445.0	192.0±26.5	240.0-350.3	282.0±34.2	150.0-211.0	170.0±13.5
	180	62.0-115.0	82.0±26.1	455.0-545.0	486.0±29.5	312.0-380.0	335.0±22.5	180.0-250.0	197.0±26.5
Oct.	195	67.0-130.0	95.0±17.5	545.0-615.0	572.0±21.3	392.0-460.0	406.0±27.0	200.0-270.0	215.0±27.5
	210	84.0-143.0	110.0±16.5	645.0-751.0	700.0±25.5	420.0-520.0	460.0±30.2	225.0-295.0	240.0±27.5
Nov.	225	97.0-172.0	128.0±22.0	782.0-880.0	840.0±20.2	540.0-622.0	572.0±25.0	310.0-365.0	336.0±14.5
	240	142.0-195.0	150.0±22.6	858.0-953.0	892.0±30.5	575.0-641.0	612.0±15.0	337.0-400.0	370.0±15.1
Final increm.		-	128.20	-	870.20	-	590.20	-	348.20

Table (17) : Growth in weight (gm) of Nile tilapia *(O. niloticus)* reared in earthen freshwater ponds at three different **stocking densities**, during the period from 1 April to 30 November, 1991.

Month	Days after stocking	Control(100 fish/pond)		100 fish/pond		200 fish/pond		300 fish/pond	
		Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
	0	8.3- 22.5	15.2± 2.5	8.3- 22.5	15.2± 2.5	8.8- 22.5	15.2± 2.5	8.3- 22.5	15.2± 2.5
Apr.	15	9.0- 23.0	15.5± 2.4	14.0- 34.5	20.0± 7.4	12.0- 33.5	18.0± 8.7	10.5- 27.5	16.5± 6.9
	30	10.0- 24.0	16.7± 2.4	15.0- 43.0	23.5± 8.2	14.0- 36.5	20.0± 8.9	11.0- 29.0	18.5± 7.0
May.	45	13.0- 28.0	19.0± 2.7	21.0- 65.0	42.0± 9.2	15.0- 41.0	28.0± 9.2	15.0- 30.0	21.5± 7.7
	60	14.5- 34.0	21.0± 7.1	50.0- 97.0	70.5±13.6	28.0- 63.0	43.0±10.2	23.0- 52.0	33.0± 9.7
Jun.	75	20.0- 41.0	26.0±12.5	75.0-175.0	95.0±15.1	45.0- 81.0	64.0± 8.5	25.0- 67.0	50.0± 8.9
	90	22.0- 45.0	27.0± 1.6	84.0-136.0	123.0± 6.1	72.0-122.0	90.3±16.0	40.0- 75.0	55.0±10.5
Jul.	105	23.0- 46.0	28.0± 9.0	122.0-172.0	140.0±16.0	97.0-147.0	100.0±23.5	45.0- 85.0	56.2± 8.5
	120	25.0- 48.0	30.0± 9.0	205.0-255.0	225.0±15.0	132.0-205.0	131.0±42.5	47.0-108.0	70.0±19.0
Aug.	135	30.0- 56.0	33.0± 9.5	230.0-280.0	263.0± 8.5	140.0-210.0	164.0±23.0	90.0-130.0	95.0±17.5
	150	30.0- 58.0	37.0± 9.7	250.0-300.0	270.0±15.1	161.0-212.1	192.5±15.1	105.0-164.0	123.0±20.4
Sep.	165	30.0- 71.0	42.0±41.5	265.0-315.0	287.0±17.6	212.0-260.0	235.0±13.5	114.0-182.0	132.0±25.1
	180	40.0- 80.0	50.0±15.0	288.0-340.0	308.0±16.0	225.0-275.0	248.0±14.0	130.0-195.0	151.0±22.0
Oct.	195	42.0- 90.0	61.0±15.5	305.0-360.0	324.0±18.0	244.0-300.0	265.0±17.6	150.0-218.0	176.0±21.0
	210	45.0-102.0	72.0±15.0	322.0-372.0	345.0±27.5	273.0-322.0	291.0±15.6	175.0-240.0	126.0±22.0
Nov.	225	80.0-112.0	85.0±13.5	335.0-390.0	356.0±18.5	290.0-355.0	311.0±22.2	191.0-255.0	228.0±11.4
	240	82.0-135.0	105.0±15.0	345.0-392.0	368.0±19.0	320.0-375.0	332.0±16.0	222.0-208.0	253.0±14.1
Final increm.		-	89.80	-	352.80	-	316.80	-	237.80

Table (18) : Growth in weight (gm) of silver carp ***(H. molitrix)*** reared in earthen freshwater ponds at three different **dietary protein levels**, during the period from 1 April to 30 November, 1991.

Month	Days after stocking	Control (0 %protein)		20 % protein		30 % protein		40 % protein	
		Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
	0	14.0- 31.5	21.8± 3.2	14.0- 31.5	21.8± 3.2	14.0- 31.5	21.8± 3.2	14.0- 31.5	21.8± 3.2
Apr.	15	14.5- 34.5	22.0± 6.9	15.0- 52.0	22.5± 9.5	20.5- 41.0	30.0± 9.8	26.5- 56.0	36.0±11.1
	30	15.5- 40.0	23.0± 7.5	18.5- 50.0	25.0± 9.3	24.0- 56.0	38.5± 8.5	40.0- 86.0	48.0±16.5
May.	45	19.0- 51.0	24.0± 8.1	26.0- 54.0	35.5± 9.1	35.0- 96.0	58.0±10.2	75.0-112.0	90.0±21.5
	60	20.0- 52.0	27.0±11.6	30.0- 65.0	40.0±12.6	42.0- 87.0	68.0±10.2	90.0-132.0	115.5± 8.6
Jun.	75	25.0- 61.0	30.0±16.1	45.0- 83.0	55.0±13.6	71.0-138.0	92.0±23.1	130.0-190.0	150.0±20.1
	90	37.0- 65.0	40.0±12.5	55.0-125.0	65.3±30.1	100.0-170.0	120.0±25.2	199.0-270.0	220.0±25.1
Jul.	105	40.0- 84.0	45.0±20.1	60.0-130.0	80.0±25.1	111.0-183.0	138.0±22.5	229.0-300.0	250.0±25.0
	120	42.0-106.0	50.0±28.0	70.0-123.0	88.0±23.5	146.0-218.0	170.0±24.1	250.0-320.0	270.3±25.1
Aug.	135	44.0-110.0	56.0±14.5	85.0-155.0	104.0±25.5	165.0-235.0	200.0±17.6	282.0-355.0	292.0±31.5
	150	51.0-111.0	62.0±14.4	106.0-175.0	124.5±25.1	180.0-275.0	240.0±20.0	353.0-425.0	370.0±27.5
Sep.	165	35.0-113.0	70.0±15.5	130.0-200.0	146.0±27.1	240.0-350.3	282.0±34.2	405.0-495.0	438.4±28.7
	180	62.0-115.0	82.0±26.1	165.0-235.0	185.0±25.0	312.0-380.0	335.0±22.5	470.0-560.0	517.2±21.5
Oct.	195	67.0-130.0	95.0±17.5	190.0-260.0	206.0±14.6	392.0-460.0	406.0±27.0	630.0-730.0	686.0±22.1
	210	84.0-143.0	110.0±16.5	210.0-280.0	224.6±28.0	420.0-520.0	460.0±30.2	750.0-850.0	806.0±22.0
Nov.	225	97.0-172.0	128.0±22.0	240.0-312.0	262.0±25.0	540.0-622.0	572.0±25.0	915.0-1012	965.0±23.5
	240	142.0-195.0	150.0±22.6	248.0-316.0	290.0±13.0	575.0-641.0	612.0±15.0	1000 -1063	1012 ±25.6
Final increm.		-	128.20	-	268.20	-	590.20	-	990.20

Table (19) : Growth in weight (gm) of Nile tilapia ***(O. niloticus)*** reared in earthen freshwater ponds at three different **dietary protein levels,** during the period from 1 April to 30 November, 1991.

Month	Days after stocking	Control (0 % protein)		20 % protein		30 % protein		40 % protein	
		Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
	0	8.3- 22.5	15.2± 2.5	8.3- 22.5	15.2± 2.5	8.3- 22.5	15.2± 2.5	8.3- 22.5	15.2± 2.5
Apr.	15	9.0- 23.0	15.5± 2.4	9.0- 22.5	16.0± 5.1	12.0- 33.5	18.0± 8.7	10.5- 27.0	17.0± 9.5
	30	10.0- 24.0	16.7± 2.4	10.5- 23.0	17.0± 5.4	14.0- 36.5	20.0± 8.9	12.0- 29.0	19.0± 9.7
May.	45	13.0- 28.0	19.0± 2.7	12.0- 25.0	19.6± 6.1	15.0- 41.0	28.0± 9.2	16.0- 42.0	23.3±10.2
	60	14.5- 34.0	21.0± 7.1	15.0- 40.0	24.0± 8.1	28.0- 63.0	43.0±10.2	25.0- 60.0	35.4±12.6
Jun.	75	20.0- 41.0	26.0±12.5	30.0- 60.0	42.3± 9.1	45.0- 81.0	64.0± 8.5	50.0- 62.0	54.0± 4.0
	90	22.0- 45.0	27.0± 1.6	39.0- 61.0	50.0± 5.5	72.0-122.0	90.3±16.0	37.0- 90.0	58.0±16.0
Jul.	105	23.0- 46.0	28.0± 9.0	40.0- 69.0	51.0± 9.0	97.0-147.0	100.0±23.5	45.0-103.0	60.0±21.5
	120	25.0- 48.0	30.0± 9.0	50.0- 88.0	65.0±11.6	132.0-205.0	131.0±42.5	52.0-118.0	75.0± 8.5
Aug.	135	30.0- 56.0	33.0± 9.5	65.0-106.0	88.0± 9.0	140.0-210.0	164.0±23.0	97.0-142.0	105.0±18.5
	150	30.0- 58.0	37.0± 9.7	72.0-150.0	101.5±24.4	161.0-212.1	192.5±15.1	110.0-175.0	128.5±23.6
Sep.	165	30.0- 71.0	42.0±41.5	105.0-161.0	120.0±20.6	212.0-260.0	235.0±13.5	140.0-195.0	158.0±18.6
	180	40.0- 80.0	50.0±15.0	119.0-175.0	136.4±19.4	225.0-275.0	248.0±14.0	160.0-206.0	186.0±10.1
Oct.	195	42.0- 90.0	61.0±15.5	135.0-184.0	154.0±15.1	244.0-300.0	265.0±17.6	190.0-243.0	217.0±13.1
	210	45.0-102.0	72.0±15.0	140.0-192.0	168.0±12.0	273.0-322.0	291.0±15.6	210.0-270.0	236.6±17.1
Nov.	225	80.0-112.0	85.0±13.5	190.0-255.0	200.0±27.5	290.0-355.0	311.0±22.2	240.0-295.0	270.0±12.5
	240	82.0-135.0	105.0±15.0	192.0-245.0	223.0±11.0	320.0-375.0	332.0±16.0	262.0-320.0	288.0±16.0
Final increm.		-	89.80	-	207.80	-	316.80	-	272.80

Fig (7) : Growth in weight (gm) of silver carp ***(H.molitrix)*** reared in earthen ponds at different stocking densities from 1 Apr.- 30 Nov.,1991

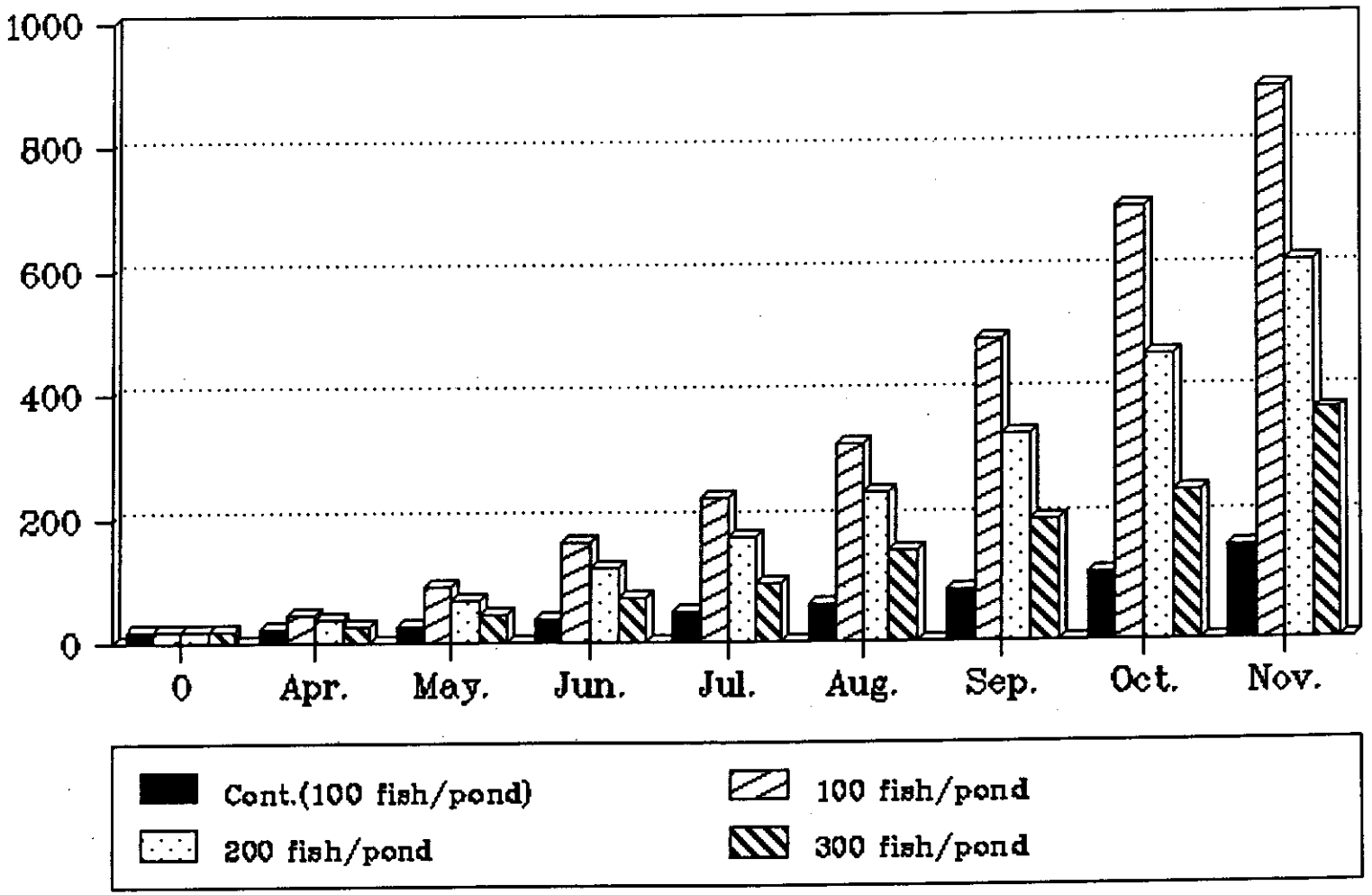


Fig (8) : Growth in weight (gm) of Nile tilapia ***(O. niloticus)*** reared in earthen ponds at different stocking densities from 1 Apr.-30 Nov.,1991.

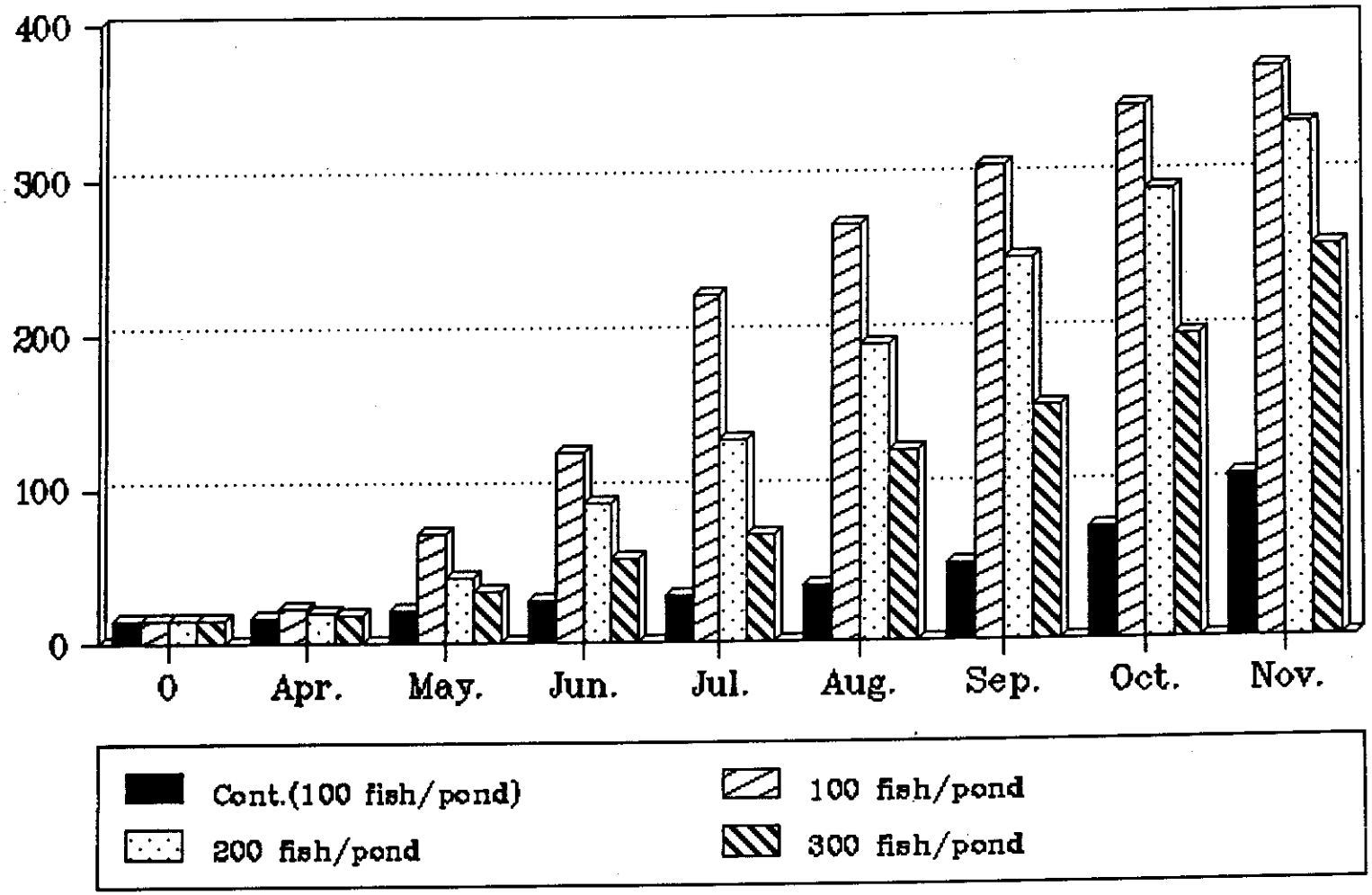


Fig (9) : Growth in weight (gm) of silver carp *(H.molitrix)* reared in earthen ponds at different dietary protein from 1 Apr.-30 Nov.,1991 .

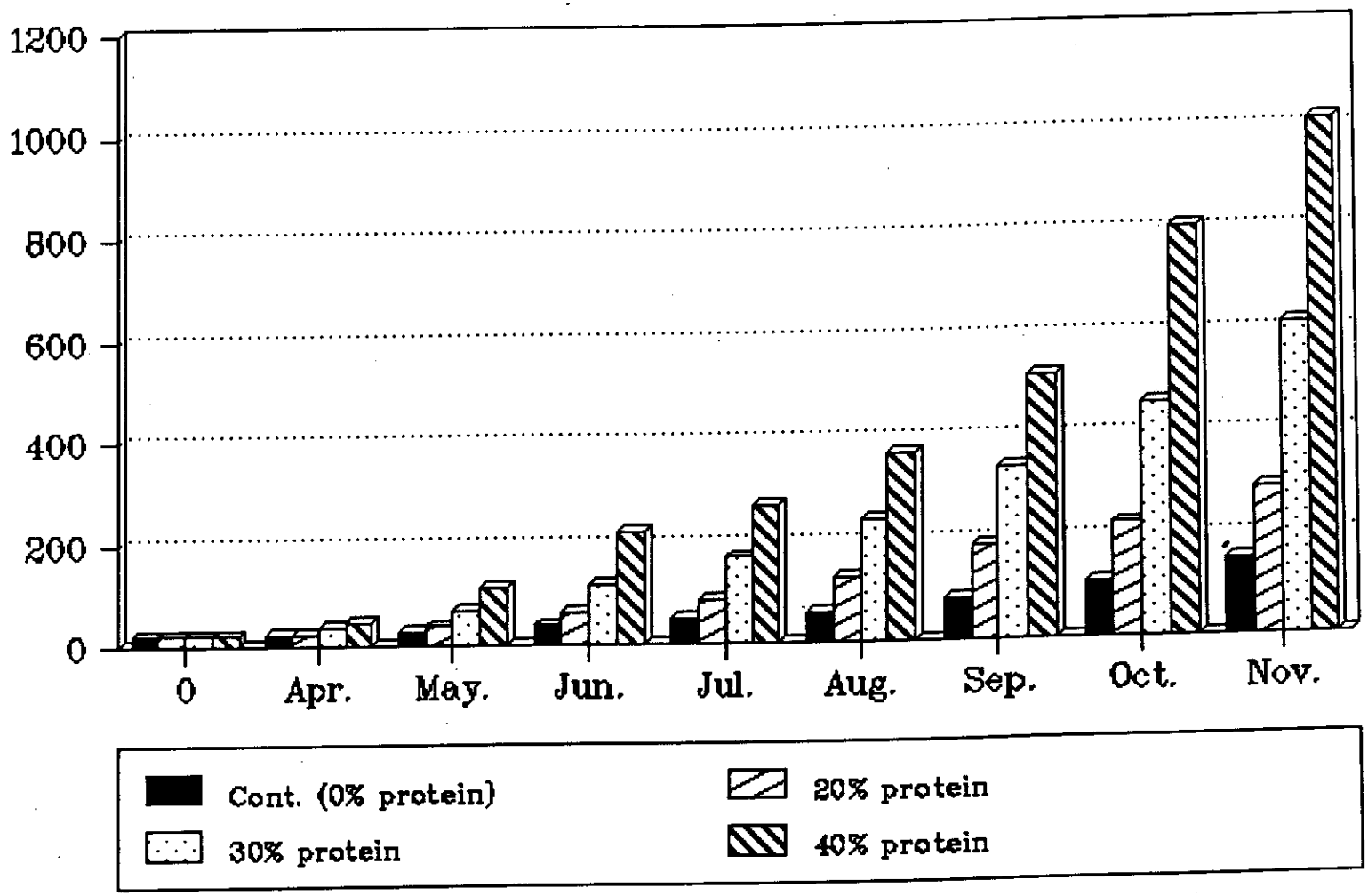
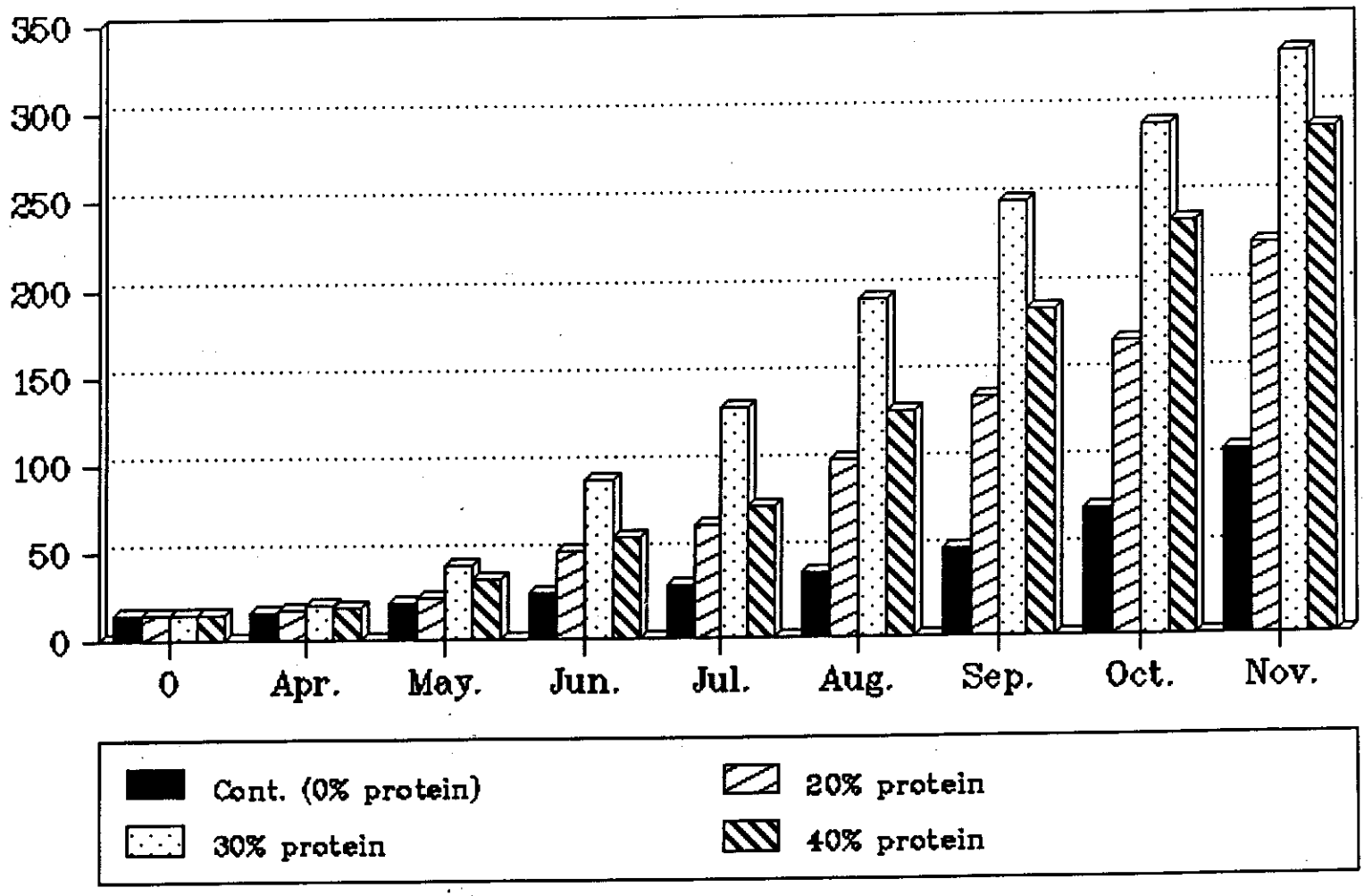


Fig (10) : Growth in weight (gm) of Nile tilapia ***(O. niloticus)*** reared in earthen ponds at different dietary protein from 1 Apr. - 30 Nov.,1991.



means that the highest weight increment was recorded with 40% protein level for ***H. molitrix*** and only 30% for ***O. niloticus.***

As shown in tables (20,21) and figures (11,12) silver carp reared with large initial size (61.1 ± 5.4 gm) and fed on diet contain 30% protein with 3% food ration showed the highest average weight (1074.0 ± 28.0 gm/fish) as well as highest weight increment. Under the same feeding condition Nile tilapia gave the maximum average weight (361.0 ± 17.1 gm/fish) also at the large initial size (35.8 ± 8.6 gm/fish), inspit of the weight increment of this large size of tilapia not far from that of the middle size. The lowest average weight of both fish species (200.0 ± 23.0 gm and 210.0 ± 13.9 gm/fish respectively) were recorded at small initial size (7.4 ± 2.3, 6.9 ± 1.3 gm/fish for carp and tilapia respectively).

The average growth in weight of ***H. molitrix*** and ***O. niloticus*** fed on diet contain 30% protein with different food ration were presented in tables (22,23) and figures (13,14). The given data indicated that, in both rearing fish the maximum average weight (810.0 ± 21.0 gm and 340.0 ± 11.6 gm/fish respectively) were observed at 5% food ration. These values decreased at 3% food ration until it reach its minimum values (360.0 ± 16.1 gm and 284.0 ± 17.3 gm/fish for carp and tilapia respectively) at 1% food ration. This was also observed taking the weight increment into consideration, meaning that, the highest weight increment was recorded at 5% food ration for the two species.

Table (20) : Growth in weight (gm) of silver carp ***(H. molitrix)*** reared in earthen freshwater ponds at three different **initial sizes**, during the period from 1 April to 30 November, 1991.

Month	Days after stocking	Cont.(12.16cm,21.75gm)		6.20 cm, 7.40 gm		12.16 cm, 21.75 gm		17.56 cm, 61.05 gm	
		Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
	0	14.0- 31.5	21.8± 3.2	5.5- 12.0	7.4± 2.3	14.0- 31.5	21.8± 3.2	40.5- 72.0	61.1± 5.4
Apr.	15	14.5- 34.5	22.0± 6.9	7.0- 12.0	8.0± 1.9	20.5- 41.0	30.0± 9.8	46.5-130.0	80.0± 2.1
	30	15.5- 40.0	23.0± 7.5	10.0- 18.0	12.0± 2.9	24.0- 56.0	38.5± 8.5	77.5-140.0	100.0±23.1
May.	45	19.0- 51.0	24.0± 8.1	10.0- 21.0	14.0± 3.1	35.0- 96.0	58.0±10.2	115.0-142.0	132.0± 5.0
	60	20.0- 52.0	27.0±11.6	15.0- 23.0	16.5± 2.8	42.0- 87.0	68.0±10.2	103.0-182.0	145.3±20.1
Jun.	75	25.0- 61.0	30.0±16.1	20.0- 25.0	21.0± 2.1	71.0-138.0	92.0±23.1	153.0-2250	175.0±25.1
	90	37.0- 65.0	40.0±12.5	22.0- 34.0	25.5± 4.5	100.0-170.0	120.0±25.2	219.0-300.0	240.0±23.1
Jul.	105	40.0- 84.0	45.0±20.1	27.0- 35.0	30.6± 2.6	111.0-183.0	138.0±22.5	239.0-310.0	260.0±25.1
	120	42.0-106.0	50.0±28.0	36.0- 50.0	45.0± 2.3	146.0-218.0	170.0±24.1	280.0-350.0	300.6±25.1
Aug.	135	44.0-110.0	56.0±14.5	51.0- 75.0	65.0± 5.0	165.0-235.0	200.0±17.6	342.0-415.0	362.0±26.6
	150	51.0-111.0	62.0±14.4	72.0-117.0	95.0±11.0	180.0-275.0	240.0±20.0	385.0-472.0	434.0±19.1
Sep.	165	35.0-113.0	70.0±15.5	94.0-135.0	108.0±13.5	240.0-350.3	282.0±34.2	465.0-552.0	515.0±18.7
	180	62.0-115.0	82.0±26.1	97.0-165.0	120.5±22.4	312.0-380.0	335.0±22.5	545.0-670.0	624.5±23.1
Oct.	195	67.0-130.0	95.0±17.5	100.0-192.0	136.0±28.0	392.0-460.0	406.0±27.0	780.0-880.0	838.0±21.0
	210	84.0-143.0	110.0±16.5	127.0-211.0	158.0±26.5	420.0-520.0	460.0±30.2	810.0-910.0	867.0±21.6
Nov.	225	97.0-172.0	128.0±22.0	170.0-225.0	186.5±19.5	540.0-622.0	572.0±25.0	945.0-1076	992.0±65.5
	240	142.0-195.0	150.0±22.6	190.0-246.0	200.0±23.0	575.0-641.0	612.0±15.0	1048 -1130	1074 ±28.0
Final increm.		-	128.20	-	192.60	-	590.20	-	1012.90

Table (21) : Growth in weight (gm) of Nile tilapia *(O. niloticus)* reared in earthen freshwater ponds at three different **initial sizes,** during the period from 1 April to 30 November, 1991.

Month	Days after stocking	Cont.(9.00 cm,15.24gm)		4.30 cm, 6.85 gm		9.00 cm, 15.24 gm		12.00 cm, 35.79 gm	
		Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
	0	8.3- 22.5	15.2± 2.5	3.2- 9.4	6.9± 1.3	8.3- 22.5	15.2± 2.5	16.5- 63.0	35.8± 8.6
Apr.	15	9.0- 23.0	15.5± 2.4	6.5- 10.0	7.5± 1.2	12.0- 33.5	18.0± 8.7	20.0- 65.0	37.5±14.6
	30	10.0- 24.0	16.7± 2.4	7.5- 11.0	9.0± 1.2	14.0- 36.5	20.0± 8.9	24.0- 67.0	40.0±15.1
May.	45	13.0- 28.0	19.0± 2.7	7.5- 12.5	10.0± 1.3	15.0- 41.0	28.0± 9.2	40.0- 75.0	45.0±17.4
	60	14.5- 34.0	21.0± 7.1	8.0- 18.0	13.0± 2.5	28.0- 63.0	43.0±10.2	35.0- 80.0	57.6±11.6
Jun.	75	20.0- 41.0	26.0±12.5	15.0- 25.0	20.0± 2.5	45.0- 81.0	64.0± 8.5	57.0- 48.0	72.0± 6.1
	90	22.0- 45.0	27.0± 1.6	20.0- 30.0	25.0± 2.6	72.0-122.0	90.3±16.0	66.0-125.0	97.0±14.0
Jul.	105	23.0- 46.0	28.0± 9.0	22.0- 40.0	27.5± 6.5	97.0-147.0	100.0±23.5	71.0-151.0	105.5±23.1
	120	25.0- 48.0	30.0± 9.0	25.0- 47.0	30.0± 2.6	132.0-205.0	131.0±42.5	125.0-175.0	150.0±12.6
Aug.	135	30.0- 56.0	33.0± 9.5	34.0- 56.0	44.0± 6.0	140.0-210.0	164.0±23.0	145.0-195.0	178.0± 8.5
	150	30.0- 58.0	37.0± 9.7	50.0- 85.0	66.0± 9.7	161.0-212.1	192.5±15.1	190.0-240.0	207.0±16.6
Sep.	165	30.0- 71.0	42.0±41.5	100.0-137.0	92.3±22.5	212.0-260.0	235.0±13.5	210.0-260.0	241.5±15.0
	180	40.0- 80.0	50.0±15.0	131.0-175.0	125.0±30.0	225.0-275.0	248.0±14.0	225.0-275.0	253.0±16.1
Oct.	195	42.0- 90.0	61.0±15.5	135.0-185.0	146.5±19.7	244.0-300.0	265.0±17.6	240.0-290.0	278.0±16.1
	210	45.0-102.0	72.0±15.0	143.0-200.0	172.0±14.1	273.0-322.0	291.0±15.6	273.0-350.0	312.0±17.0
Nov.	225	80.0-112.0	85.0±13.5	172.0-217.0	186.0±15.5	290.0-355.0	311.0±22.2	294.0-371.0	336.0±22.5
	240	82.0-135.0	105.0±15.0	186.0-241.0	210.0±13.9	320.0-375.0	332.0±16.0	321.0-386.0	361.0±17.1
Final increm.		-	89.80	-	203.10	-	316.80	-	325.20

Table (22) : Growth in weight (gm) of silver carp ***(H. molitrix)*** reared in earthen freshwater ponds at three different **food rations**, during the period from 1 April to 30 November, 1991.

Month	Days after stocking	Control (0% of T.wt)		1% of T.wt		3% of T.wt		5% of T. wt	
		Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
	0	14.0- 31.5	21.8± 3.2	14.0- 31.5	21.8± 3.2	14.0- 31.5	21.8± 3.2	14.0- 31.5	21.8± 3.2
Apr.	15	14.5- 34.5	22.0± 6.9	17.0- 45.0	24.0± 9.9	20.5- 41.0	30.0± 9.8	21.5- 49.5	34.0±13.9
	30	15.5- 40.0	23.0± 7.5	23.0- 50.0	37.0± 9.6	24.0- 56.0	38.5± 8.5	33.0- 73.0	45.0±13.2
May.	45	19.0- 51.0	24.0± 8.1	30.0- 80.0	42.6± 9.2	35.0- 96.0	58.0±10.2	35.0-108.0	70.6±12.7
	60	20.0- 52.0	27.0±11.6	35.0- 70.0	45.0±12.6	42.0- 87.0	68.0±10.2	60.0-120.0	82.0±19.3
Jun.	75	25.0- 61.0	30.0±16.1	40.0- 80.0	55.0±12.5	71.0-138.0	92.0±23.1	80.0-150.0	110.4±20.0
	90	37.0- 65.0	40.0±12.5	50.0-120.0	70.0±25.2	100.0-170.0	120.0±25.2	90.0-160.0	142.3± 9.1
Jul.	105	40.0- 84.0	45.0±20.1	70.0-140.0	83.0±28.5	111.0-183.0	138.0±22.5	116.0-188.0	164.0± 7.1
	120	42.0-106.0	50.0±28.0	72.0-142.0	92.0±25.0	146.0-218.0	170.0±24.1	210.0-280.0	230.0±25.1
Aug.	135	44.0-110.0	56.0±14.5	86.0-155.0	102.0±27.0	165.0-235.0	200.0±17.6	231.0-302.0	252.3±25.0
	150	51.0-111.0	62.0±14.4	150.0-220.0	125.0±17.5	180.0-275.0	240.0±20.0	238.0-370.0	300.0±35.1
Sep.	165	35.0-113.0	70.0±15.5	170.0-200.0	146.3±27.0	240.0-350.3	282.0±34.2	350.0-425.0	370.0±27.6
	180	62.0-115.0	82.0±26.1	177.0-223.0	170.0±26.5	312.0-380.0	335.0±22.5	395.0-485.0	428.0±28.5
Oct.	195	67.0-130.0	95.0±17.5	185.0-225.0	200.0±27.6	392.0-460.0	406.0±27.0	465.0-555.0	511.0±22.2
	210	84.0-143.0	110.0±16.5	195.0-265.0	217.5±24.1	420.0-520.0	460.0±30.2	562.0-650.0	607.0±21.5
Nov.	225	97.0-172.0	128.0±22.0	302.0-375.0	325.0±25.0	540.0-622.0	572.0±25.0	712.0-792.0	737.0±27.5
	240	142.0-195.0	150.0±22.6	340.0-392.0	360.0±16.1	575.0-641.0	612.0±15.0	802.0-852.0	810.0±21.0
Final increm.		-	128.20	-	338.20	-	590.20	-	788.20

Table (23) : Growth in weight (gm) of Nile tilapia ***(O. niloticus)*** reared in earthen freshwater ponds at three different **food rations**, during the period from 1 April to 30 November, 1991.

Month	Days after stocking	Control (0% of T.wt)		1% of T.wt		3% of T.wt		5% of T. wt	
		Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
	0	8.3- 22.5	15.2± 2.5	8.3- 22.5	15.0± 2.5	8.3- 22.5	15.2± 2.5	8.3- 22.5	15.2± 2.5
Apr.	15	9.0- 23.0	15.5± 2.4	10.0-25.5	17.0±5.7	12.0- 33.5	18.0± 8.7	12.0- 30.0	20.0± 6.9
	30	10.0- 24.0	16.7± 2.4	16.0- 25.5	21.0±5.9	14.0- 36.5	20.0± 8.9	17.0- 40.5	25.0± 7.2
May.	45	13.0- 28.0	19.0± 2.7	19.0- 40.5	23.5±6.2	15.0- 41.0	28.0± 9.2	22.0- 61.0	40.0± 7.8
	60	14.5- 34.0	21.0± 7.1	25.0- 53.0	37.0±8.1	28.0- 63.0	43.0±10.2	34.0- 77.0	59.0± 9.1
Jun.	75	20.0- 41.0	26.0±12.5	40.0- 71.0	55.0±8.1	45.0- 81.0	64.0± 8.5	55.0-106.0	58.0±10.5
	90	22.0- 45.0	27.0± 1.6	39.0- 83.0	60.0±11.1	72.0-122.0	90.3±16.0	82.0-132.0	115.0± 8.5
Jul.	105	23.0- 46.0	28.0± 9.0	45.0- 88.0	66.0±11.1	97.0-147.0	100.0±23.5	92.0-142.0	129.0± 6.6
	120	25.0- 48.0	30.0± 9.0	49.0-101.0	72.0±11.1	132.0-205.0	131.0±42.5	183.0-235.0	191.0±22.0
Aug.	135	30.0- 56.0	33.0± 9.5	90.0-133.0	101.0±16.1	140.0-210.0	164.0±23.0	215.0-262.0	218.0±22.0
	150	30.0- 58.0	37.0± 9.7	100.0-171.0	131.0±26.4	161.0-212.1	192.5±15.1	230.0-280.0	270.0± 5.0
Sep.	165	30.0- 71.0	42.0±41.5	130.0-184.0	156.0±7.6	212.0-260.0	235.0±13.5	253.0-295.0	275.0± 8.0
	180	40.0- 80.0	50.0±15.0	170.0-220.0	195.0±12.5	225.0-275.0	248.0±14.0	262.0-311.0	181.0±13.5
Oct.	195	42.0- 90.0	61.0±15.5	200.0-265.0	223.0±21.0	244.0-300.0	265.0±17.6	274.0-330.0	292.0±19.1
	210	45.0-102.0	72.0±15.0	212.0-270.0	238.0±16.1	273.0-322.0	291.0±15.6	295.0-365.0	312.0±24.1
Nov.	225	80.0-112.0	85.0±13.5	240.0-290.0	258.0±12.6	290.0-355.0	311.0±22.2	305.0-351.0	324.0±13.1
	240	82.0-135.0	105.0±15.0	256.0-318.0	284.0±17.3	320.0-375.0	332.0±16.0	320.0-360.0	340.0±11.6
Final increm.		-	89.80		268.80	-	316.80	-	324.80

Fig (11) : Growth in weight (gm) of silver carp ***(H.molitrix)*** reared in earthen ponds at different initial sizes from 1 Apr. - 30 Nov.,1991.

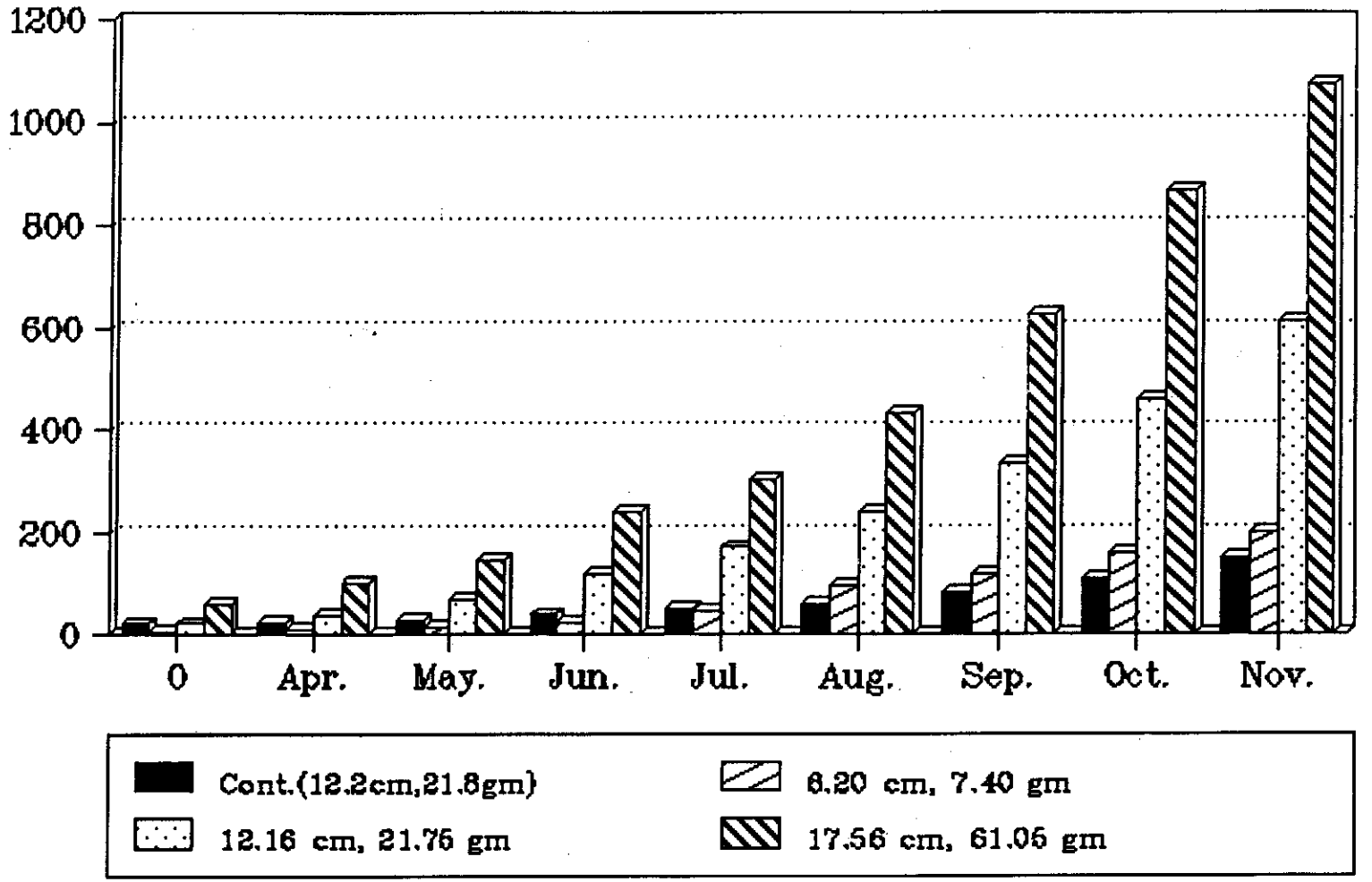


Fig (12) : Growth in weight (gm) of Nile tilapia ***(O. niloticus)*** reared in earthen ponds at different initial sizes from 1 Apr. - 30 Nov.,1991.

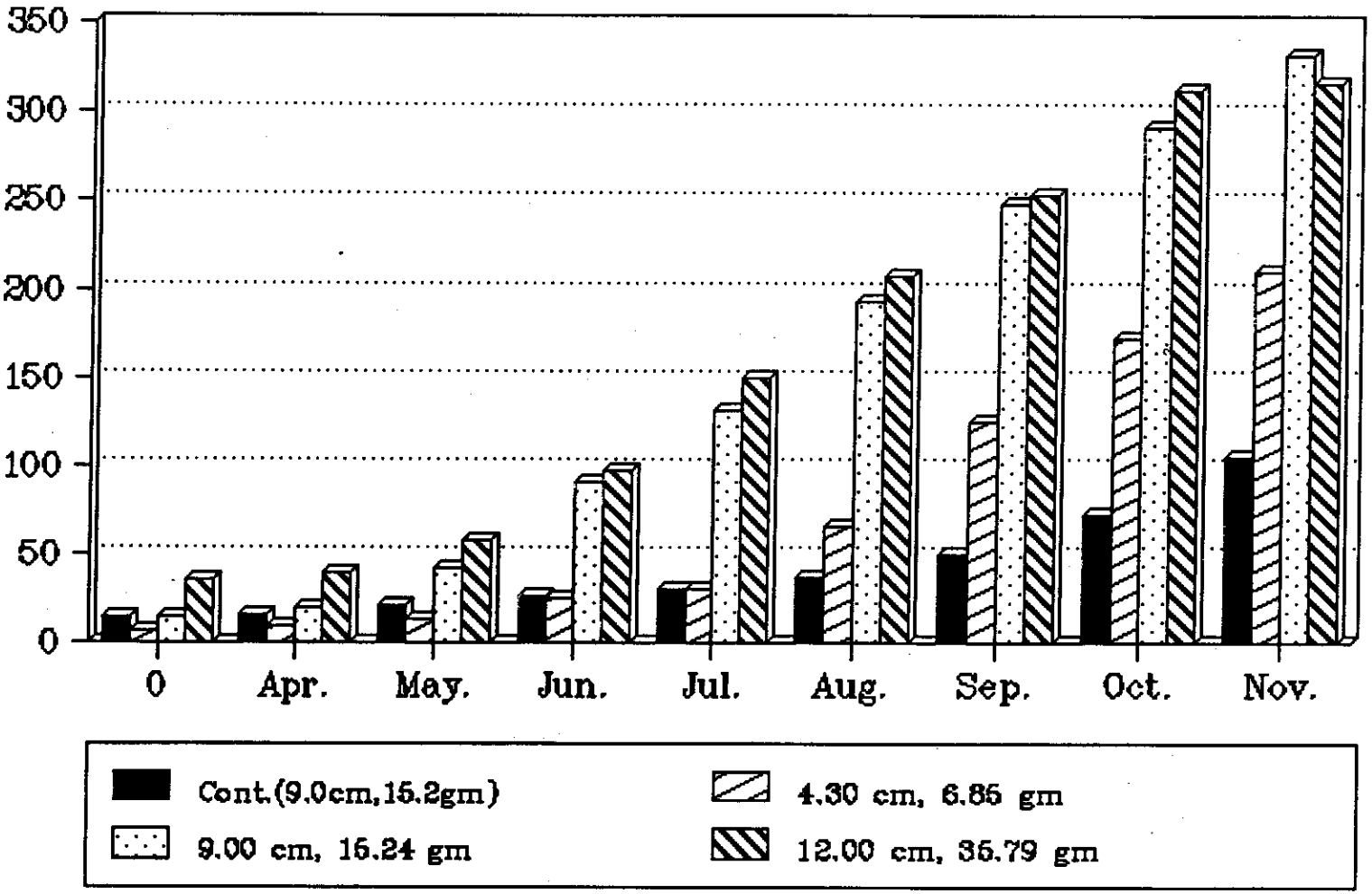


Fig (14) : Growth in weight (gm) of Nile tilapia ***(O. niloticus)*** reared in earthen ponds at different food rations from 1 Apr. - 30 Nov.,1991.

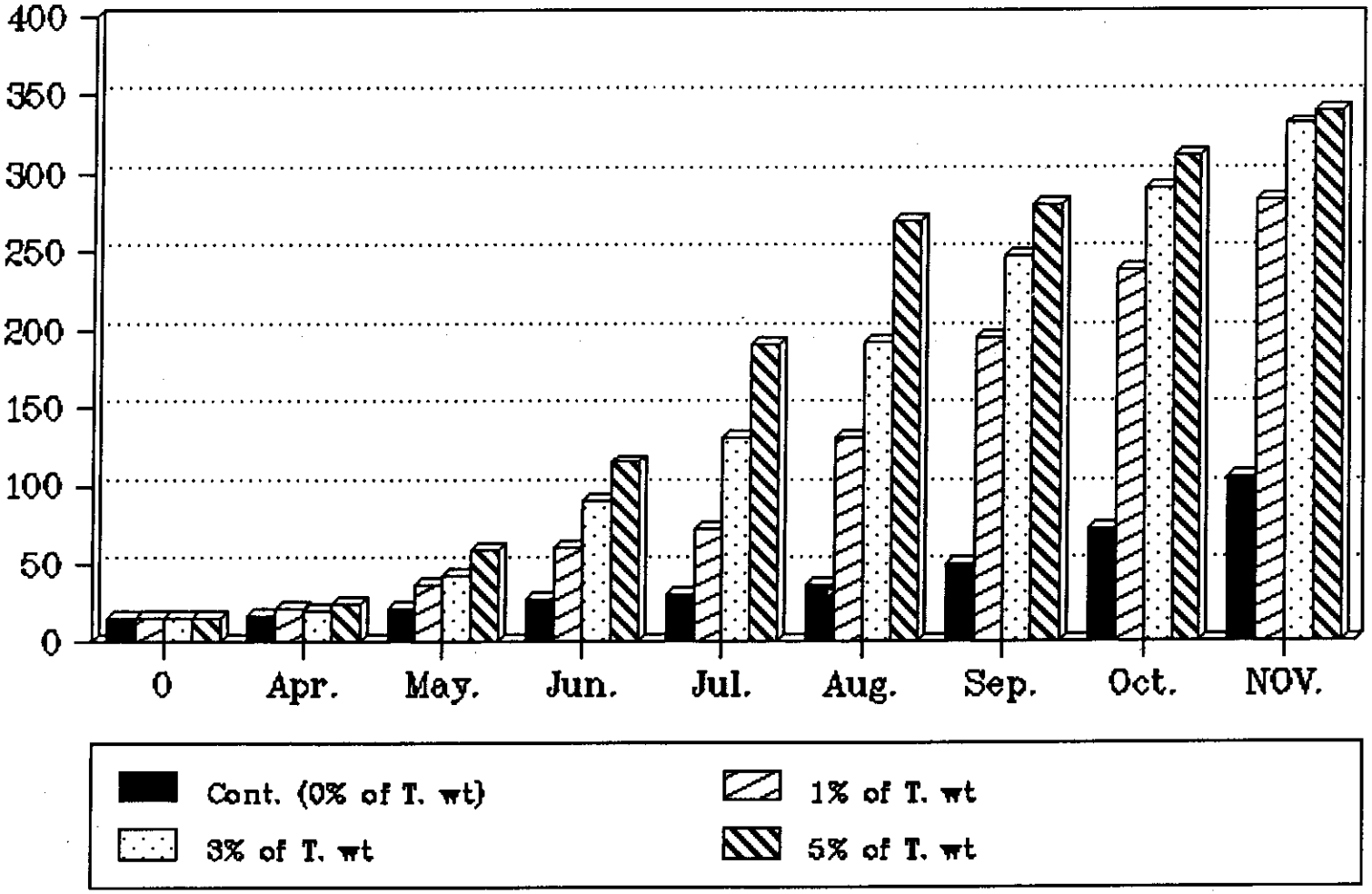
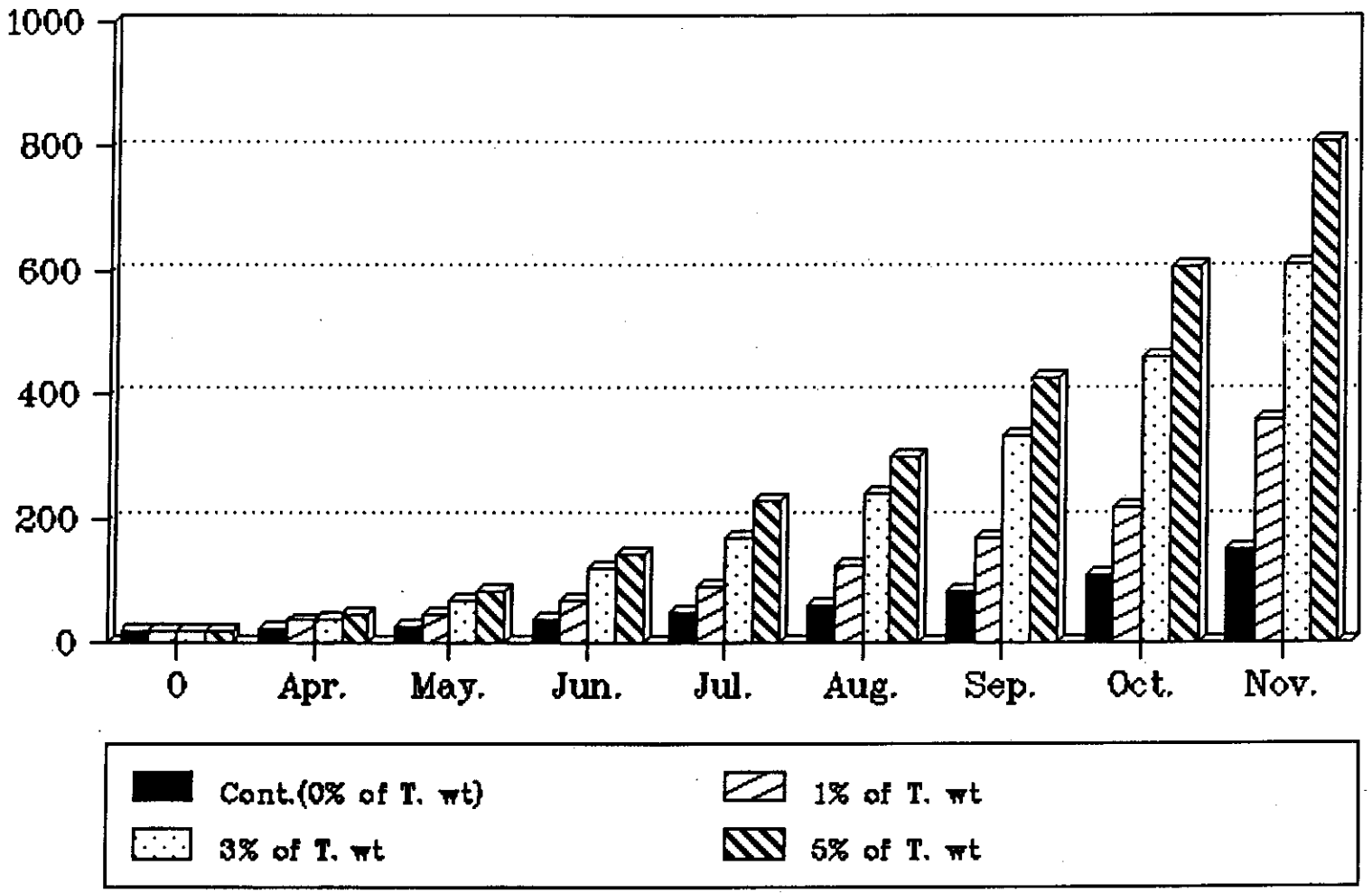


Fig (13) : Growth in weight (gm) of silver carp ***(H.molitrix)*** reared in earthen ponds at different food rations from 1 Apr. - 30 Nov.,1991.



Although the difference between weight increment of Nile tilapia feed on 3% and 5% food ration not large as that between 1% and 3% food ration.

The control group in all treatments increased from initial weight of 21.8 ± 3.2 and 15.2 ± 2.5 gm/fish to 150.0 ± 22.6 and 105.0 ± 15.0 gm/fish for silver carp and Nile tilapia respectively at the end of rearing period.

5-Percentage weight gain (PWG) :

The monthly percentage weight gain of ***H. molitrix*** and ***O. niloticus*** reared at different stocking densities and fed on diet contain 30% protein with 3% food ration, showed a highest values during the first four monthes. In these monthes of rearing, PWG obviously declined with the increasing stocking density and vice versa in the second four ones for the two species. The average values of PWG for the two fish species were slightly decreased whereas the final PWG clearly reduced with the increasing stocking density. The maximum values of mean (61.393 ± 30.2% , 58.094 ± 34.6% for carp and tilapia respectively) were recorded at stock of one fish/m^2. While the minimum limit (43.290 ± 16.4% and 43.981 ± 24.9% respectively) were observed at stock of three fish/m^2 (Table 24 and Figure 15).

As showen in table (25) and figure (16) carp and tilapia stocked at two fish/m^2 and fed on diets contain different protein levels, showed a

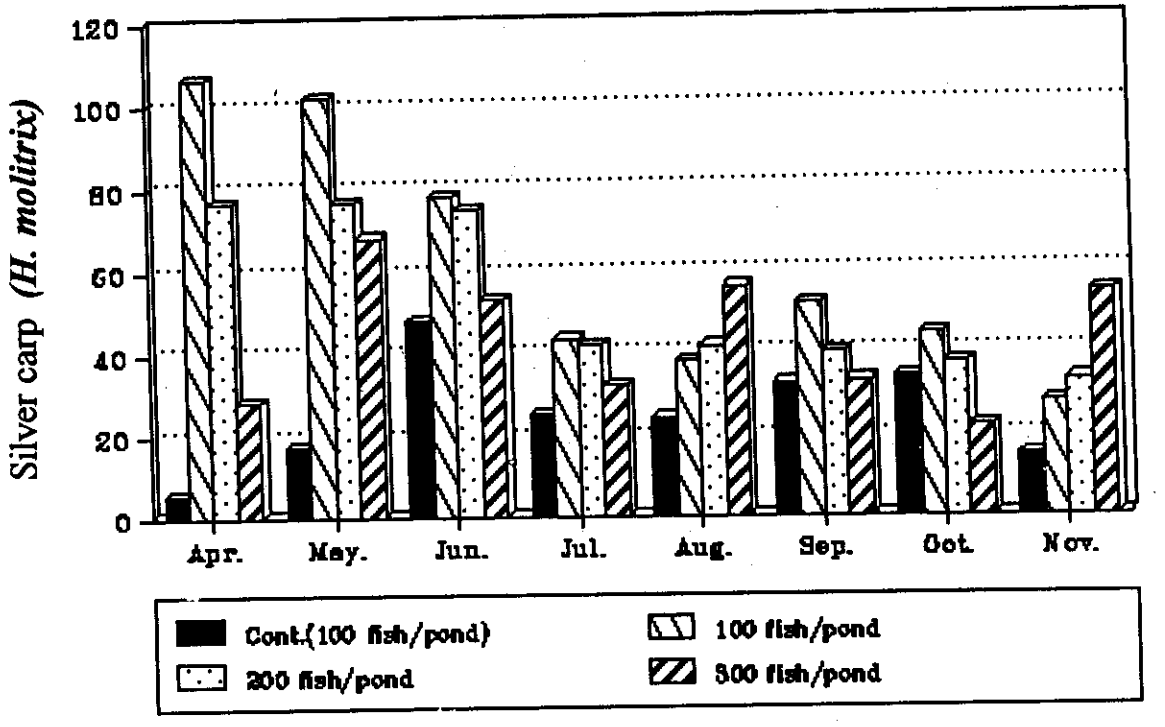
Table (24): Variations of percentage **weight gain** of silver carp ***(H.molitrix)*** and Nile tilapia ***(O.niloticus)*** reared in earthen ponds at three different **stocking densities**, during the period from 1 April to 30 November, 1991.

Month	Days after stocking	Stocking density (fish/pood)							
		Control (100 fish/pond)		100 fish / pond		200 fish / pond		300 fish / pond	
		Carp	Tilapia	Carp	Tilapia	Carp	Tilapia	Carp	Tilapia
Apr.	30	5.505	9.868	106.422	54.605	76.606	33.553	28.440	21.711
May.	60	17.391	25.479	102.222	200.000	76.623	111.823	67.857	78.378
Jun.	90	48.148	28.571	78.022	74.468	76.471	110.000	53.191	66.667
Jul.	120	25.000	11.111	43.210	82.927	41.667	45.072	31.944	27.727
Aug.	150	24.000	23.333	37.931	20.000	41.176	46.947	55.789	75.714
Sep.	180	32.258	35.135	51.875	14.074	39.583	28.831	33.108	22.764
Oct.	210	34.146	24.000	44.033	12.013	37.313	17.339	21.827	29.801
Nov.	240	14.667	45.833	27.429	6.667	33.044	14.089	54.167	29.082
Monthly Mean ± SD		25.139±13.2	25.450±11.8	61.393±30.2	58.094±34.6	52.810±19.8	50.956±38.7	43.290±16.4	43.981±24.9
Final wt gain %		588.073	590.789	3991.743	2321.053	2707.339	2084.211	1597.248	1564.474

Table (25): Variations of percentage **weight gain** of silver carp ***(H.molitrix)*** and Nile tilapia ***(O.niloticus)*** reared in earthen freshwater ponds at three different **stocking densities**, during the period from 1 April to 30 November, 1991.

Month	Days after stocking	Dietary protein level							
		Control (0 % protein)		20 % protein		30 % protein		40 % protein	
		Carp	Tilapia	Carp	Tilapia	Carp	Tilapia	Carp	Tilapia
Apr.	30	5.505	9.868	14.679	11.842	76.606	33.553	120.183	25.000
May.	60	17.391	25.479	60.000	41.176	76.623	111.823	140.625	86.316
Jun.	90	48.148	28.571	62.500	108.333	76.471	110.000	90.476	63.842
Jul.	120	25.000	11.111	35.385	30.000	41.667	45.072	22.727	29.310
Aug.	150	24.000	23.333	42.045	55.385	41.176	46.947	37.037	71.333
Sep.	180	32.258	35.135	48.00	34.653	39.583	28.831	39.730	44.747
Oct.	210	34.146	24.000	21.081	23.529	37.313	17.339	55.899	27.204
Nov.	240	14.667	45.833	29.464	32.738	33.044	14.089	25.558	21.724
Monthly Mean ± SD		25.139±13.2	25.450±11.8	39.144±17.3	42.207±29.6	52.810±19.8	50.956±38.7	66.529±45.1	46.185±24.6
Final wt gain %		588.073	590.789	1230.275	1367.105	2707.339	2084.211	4542.202	1794.737

Fig (15): Percentage weight gain of ***H.molitrix*** and ***O.niloticus*** reared in earthen ponds at different stocking densities (1 Apr.- 30 Nov.,1991).



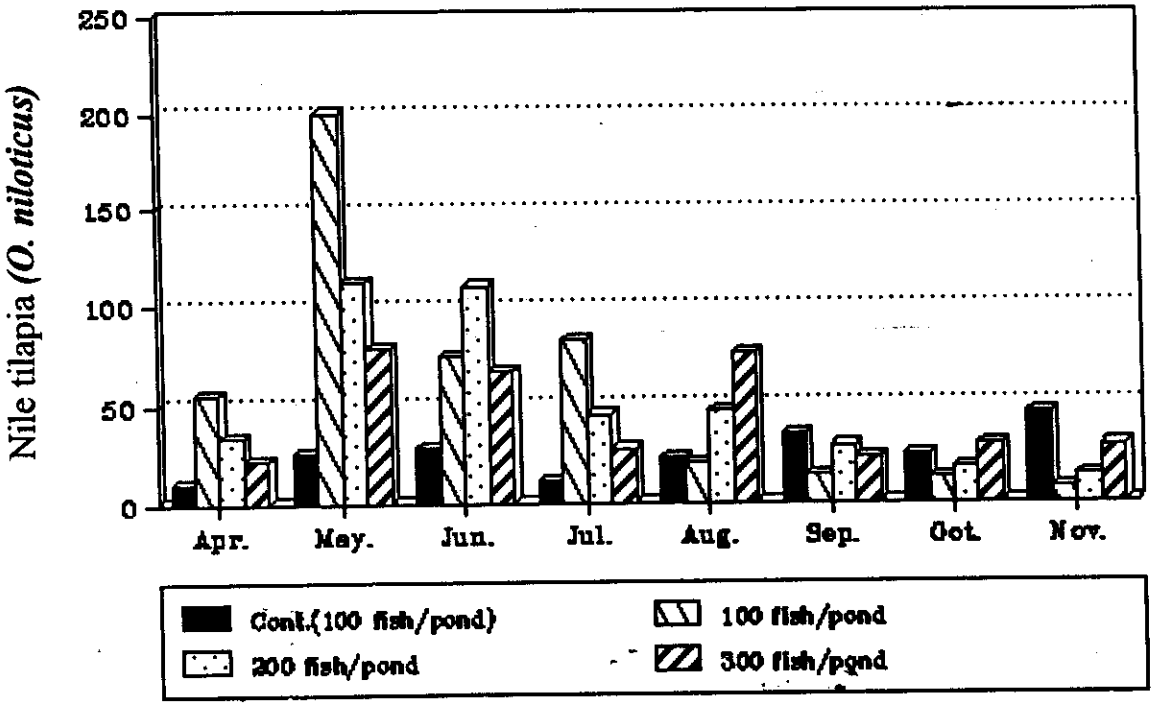
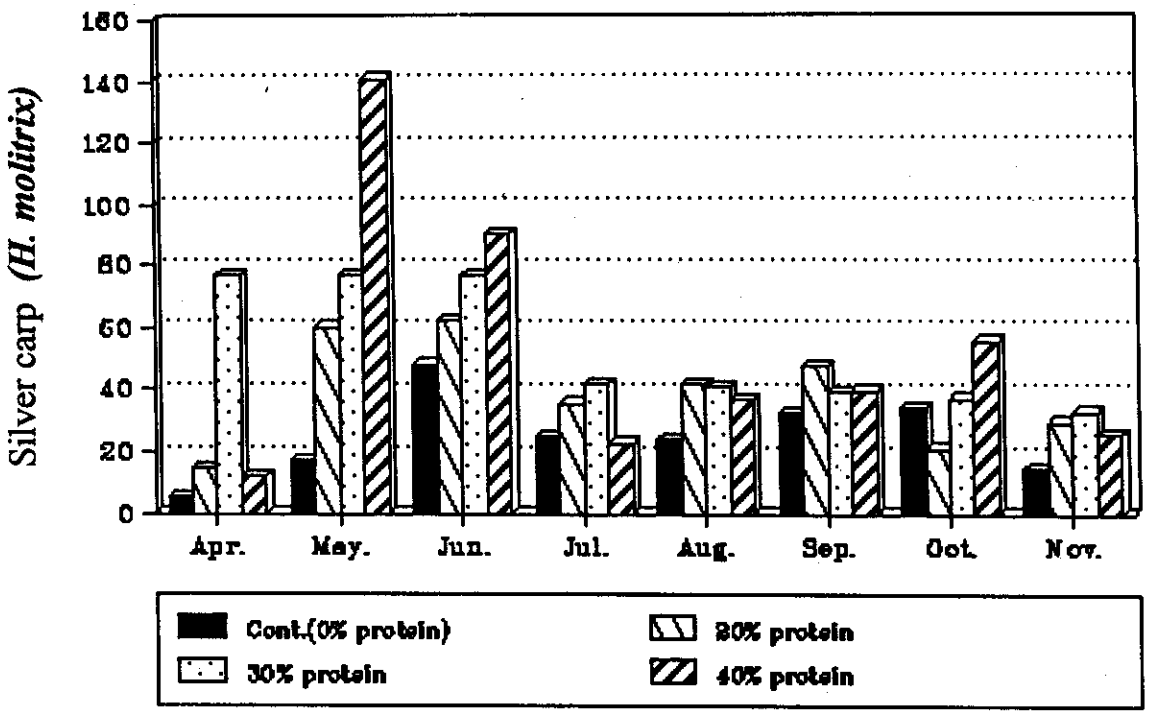
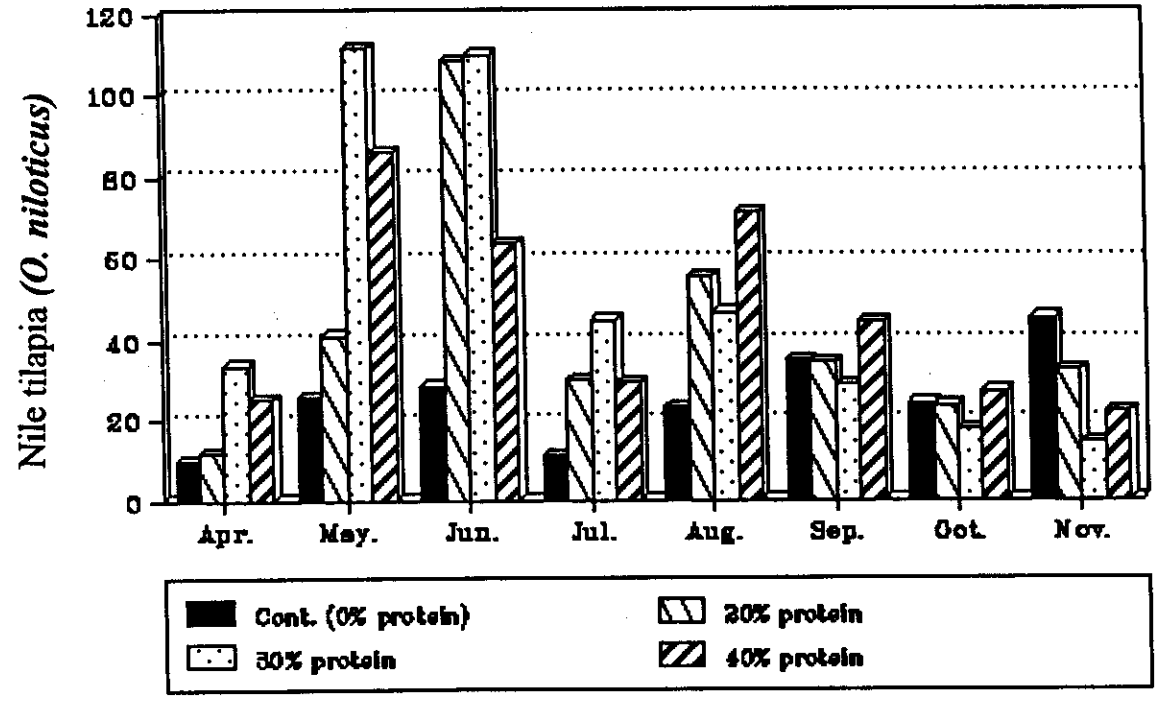


Fig (16): Percentage weight gain of ***H.molitrix*** and ***O.niloticus*** reared in earthen ponds at different dietary protein (1 Apr. - 30 Nov.,1991).





maximum values of final PWG (4542. 202%) and monthly mean value of 66.529% for silver carp at 40% dietary protein level. While the maximum value of final PWG (2084. 211%) and monthly mean value of 50.956% for Nile tilapia were recorded at 30% protein level. The minimum, final and monthly values of percentage weight gain (PWG) for both rearing fish were observed at 20% dietary protein level (1230.275% with average 39.144% and 1367.105% with average 42.207% respectively). From the tables and figuers it was also observed that the PWG was higher for tilapia than carp in summer monthes (May, June, July and August) specially with the 30% protein level.

The percentage weight gain of ***H. molitrix*** and ***O. niloticus*** reared with different initial size at stock of two fish/m² and fed on diet contain 30% protein level, were given in table (26) and figure (17). It is clear that, the average value of PWG for both fish species showed a slight gradual decrease with the increasing initial size of rearing fish. Its highest monthly mean values 53.292 ± 29.6% and 57.034 ± 38.0% for carp and tilapia respectively) were recorded with small initial size (6.20 cm, 7.40 gm for carp and 4.30 cm, 6.85 gm for tilapia), while the lowest values (43.782 ± 15.2% and 34.753 ± 20.0% respectively) at the largest initial size for both. The same trend also can be observed if take into considration the final weight gain percentage.

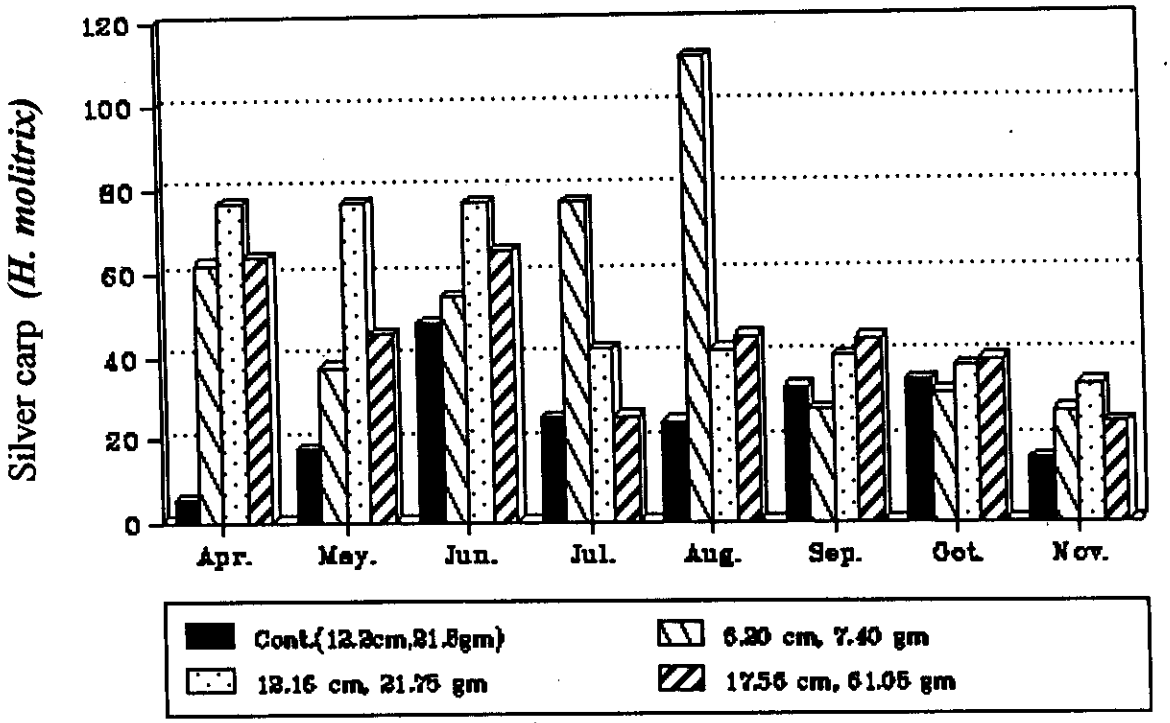
Table (26): Variations of percentage **weight gain** of silver carp ***(H.molitrix)*** and Nile tilapia ***(O.niloticus)*** reared in earthen freshwater ponds at three different **initial sizes**, during the period from 1 April to 30 November, 1991.

Month	Days after stocking	Control (cm,gm)		Different initial size (cm,gm)					
		12.16,21.75	9.00,15.24	6.20,7.40	4.30, 6.85	12.16,21.75	9.00,15.24	17.56,61.05	12.00,35.79
		Carp	Tilapia	Carp	Tilapia	Carp	Tilapia	Carp	Tilapia
Apr.	30	5.505	9.868	62.162	30.435	76.606	33.553	63.666	11.732
May.	60	17.391	25.749	37.500	44.444	76.623	111.823	45.300	44.000
Jun.	90	48.148	28.571	54.545	92.308	76.471	110.000	65.175	68.403
Jul.	120	25.000	11.111	76.471	20.000	41.667	45.072	25.250	54.639
Aug.	150	24.000	23.333	111.111	120.000	41.176	46.947	44.378	38.000
Sep.	180	32.258	35.135	26.842	89.394	39.583	28.831	43.779	22.222
Oct.	210	34.146	24.000	31.120	37.600	37.313	17.339	38.831	23.320
Nov.	240	14.667	45.833	26.582	22.093	33.044	14.089	23.875	15.705
Monthly Mean ± SD		25.139±13.2	25.450±11.8	53.292±29.6	57.034±38.0	52.810±19.8	50.956±38.7	43.782±15.2	34.753±20.0
Final wt gain %		588.073	590.789	2602.703	2943.478	2707.339	2084.211	1657.774	908.3807

Table (27): Variations of percentage **weight gain** of silver carp ***(H.molitrix)*** and Nile tilapia ***(O.niloticus)*** reared in earthen freshwater ponds at three different **food rations** during the period from 1 April to 30 November, 1991.

Month	Days after stocking	Different food ration							
		Control (0 % of T.wt)		1 % of T. wt		3 % T.wt		5 % T.wt	
		Carp	Tilapia	Carp	Tilapia	Carp	Tilapia	Carp	Tilapia
Apr.	30	5.505	9.868	69.725	38.158	76.606	33.553	106.422	64.474
May.	60	17.391	25.479	21.622	76.190	76.623	111.823	82.222	136.000
Jun.	90	48.148	28.571	55.556	62.162	76.471	110.000	73.537	94.915
Jul.	120	25.000	11.111	31.429	20.000	41.667	45.072	61.630	66.087
Aug.	150	24.000	23.333	35.870	81.944	41.176	46.947	30.435	41.361
Sep.	180	32.258	35.135	36.000	48.855	39.583	28.831	42.667	4.074
Oct.	210	34.146	24.000	27.941	22.051	37.313	17.339	41.822	11.032
Nov.	240	14.667	45.833	65.517	19.328	33.044	14.089	33.443	8.971
Monthly Mean ± SD		25.139±13.2	25.450±11.8	42.958±18.1	46.086±25.3	52.810±19.8	50.956±38.7	59.022±26.8	53.365±46.6
Final wt gain %		588.073	590.789	1551.376	1768.421	2707.339	2084.211	3615.596	2136.842

Fig (17): Percentage weight gain of ***H.molitrix*** and ***O.niloticus*** reared in earthen ponds at different initial sizes (1Apr. - 30 Nov. , 1991).



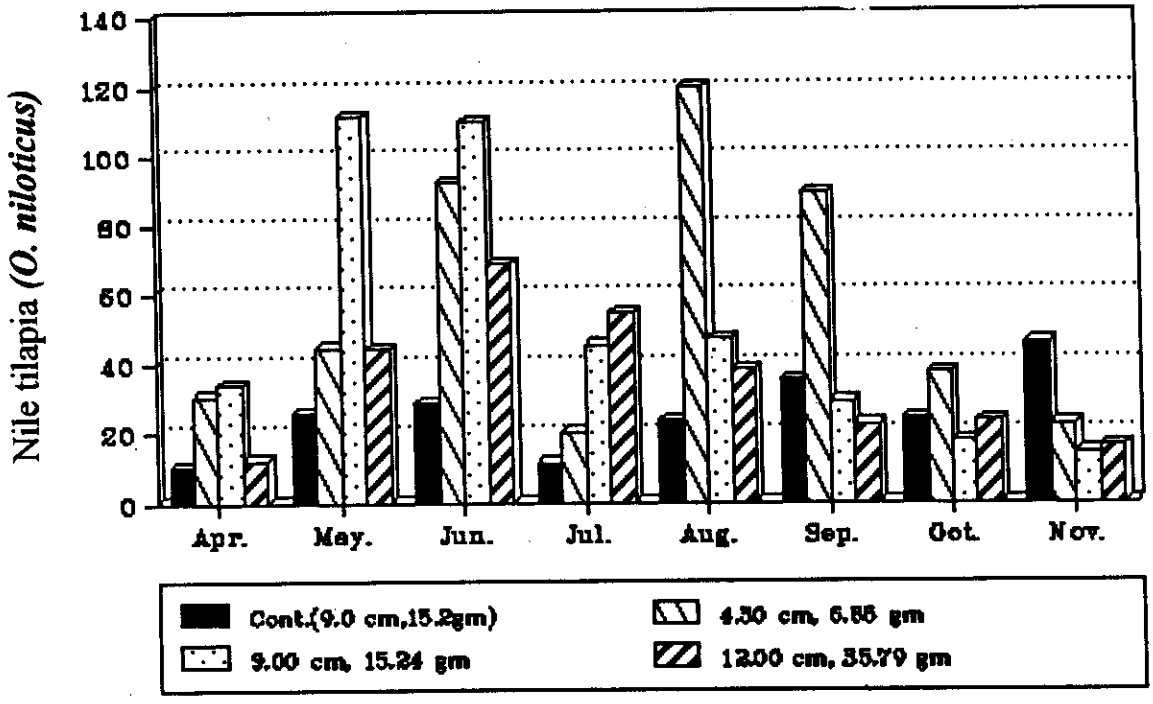
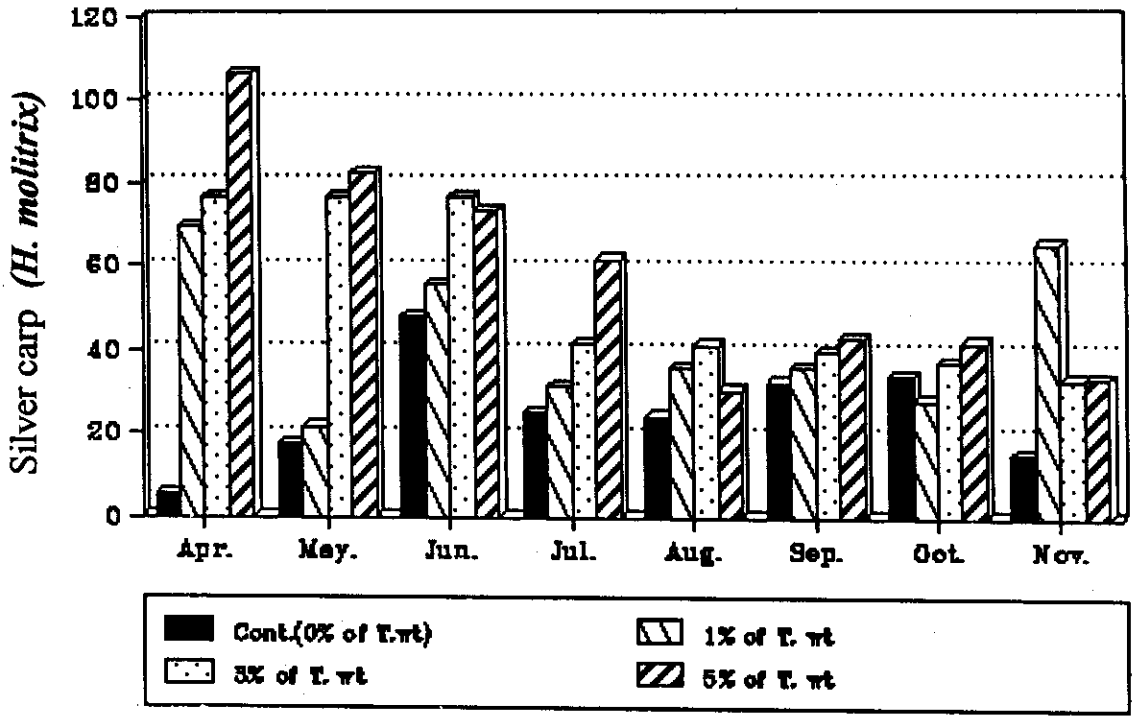
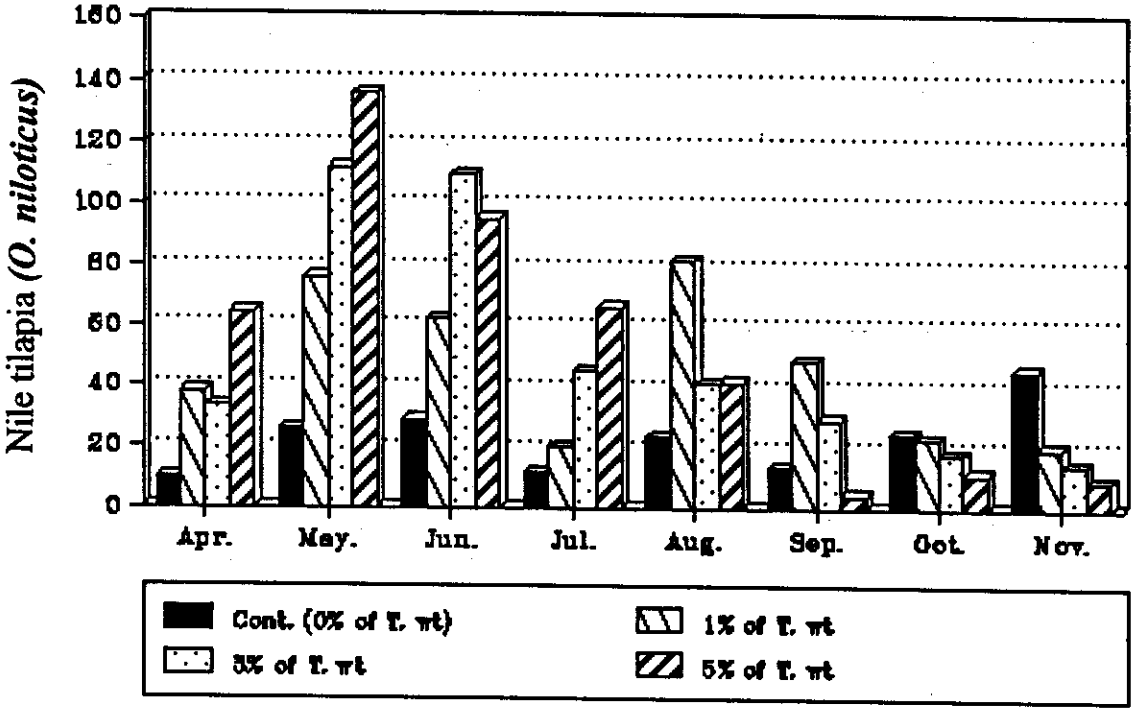


Fig (18): Percentage weight gain of ***H.molitrix*** and ***O.niloticus*** reared in earthen ponds at different food rations (1Apr. - 30 Nov. , 1991).





The prcentage weight gain of silver carp and Nile tilapia reared at stock of two fish/m² and fed on diet contain 30% protein level with different food ration, showed a maximum monthly mean values (59.022 ± 26.8% , 53.365 ± 46.6% for carp and tilapia respectively) at food ration of 5% of total body weight. While the minimum values (42.958 ± 18.1% and 46.086 ± 25.3% respectively) observed at 1% food ration. This was also recorded for the final weight gain, where its maximum values observed with the food ration of 5% and minimum values with 1% food ration (Table 27 and Figure 18).

The average values of percentage weight gain of both rearing fish *(H. molitrix* and *O. niloticus)* in control ponds (stock of one fish/m², 2nd initial size and maintained without supplementary food) were 25.139 ± 13.2% , 25.450 ± 11.8% respectively, lower than that in other rearing ponds.

6- Specific growth rate (SGR) :

Table (28) and figures (19,20) show the average values of specific growth rate of silver carp and Nile tilapia reared at different stocking densities and fed on diet contain 30% protein with 3% food ration.It is necessary to be noted that the highest SGR values were recorded at the beginning of rearing period specially with the lowest stocking density (2.42 in April for carp and 2.55 in May for tilapia), then slightly decreased regularly. However the SGR values were irregularly flactuated with the high stocking density. Generally the

values of SGR of both fish species were slightly decreased with the increase of stocking density in all monthes of rearing period. Stock of one fish/m² recorded the highest SGR mean values (1.96 ± 0.34, 1.93 ± 0.40 for carp and tilapia respectively), while stocking density of three fish/m² showed a mean values of 1.19 ± 0.15 and 1.21 ± 0.24 respectively.

As showen in table (29) and figures (21,22) ***H. molitrix*** and ***O. niloticus*** reared at stocking density of two fish/m² and fed on diets contained different protein levels, showed maximum mean values of SGR for carp (2.14 ± 0.46) at 40% dietary protein level and for tilapia (1.59 ± 0.35) at 30% protein level. While the minumum mean values (1.05 ± 0.25 and 1.05 ± 0.32 for both rearing fish respectively) were observed at 20% dietary protein level. It is worthily of mentioning also that the specific growth rate of carp showed its highest value at the beginning of rearing period specially with the high protein levels (30% and 40%). On the other hand SGR of rearing tilapia increased to reach its maximum values at June with all dietary protein levels then decreased.

The specific growth rate of ***H. molitrix*** and ***O. niloticus*** reared with different initial size at stock of two fish/m² and fed on diet contain 30% protein level with 3% food ration were summarized in table (30) and figures (23,24). It was noticed that the average values of SGR for carp were gradually increased with increasing the initial size. While in

Table (28): Variations of **specific growth rate** of silver carp ***(H.molitrix)*** and Nile tilapia ***(O.niloticus)*** reared in earthen ponds at three different **stocking densities**, during the period from 1 April-30 November, 1991.

Month	Days after stocking	Stocking density (fish/pood)							
		Control (100)		100		200		300	
		Carp	Tilapia	Carp	Tilapia	Carp	Tilapia	Carp	Tilapia
Apr.	30	0.18	0.32	2.42	1.53	1.90	0.97	0.84	0.66
May.	60	0.36	0.54	2.38	2.55	1.90	1.74	1.28	1.29
Jun.	90	0.68	0.64	2.23	2.32	1.90	1.98	1.33	1.43
Jul.	120	0.69	0.57	2.97	2.25	1.71	1.96	1.23	1.27
Aug.	150	0.70	0.59	1.79	1.92	1.41	1.81	1.28	1.39
Sep.	180	0.74	0.66	1.73	1.79	1.52	1.55	1.22	1.28
Oct.	210	0.77	0.74	1.65	1.62	1.45	1.40	1.14	1.22
Nov.	240	0.80	0.80	1.54	1.49	1.39	1.28	1.18	1.17
Mean ± SD		0.62±0.22	0.61±0.15	1.96±0.34	1.93±0.40	1.65±0.23	1.59±0.35	1.19±0.15	1.21±0.24

Table (29) : Variations of **specific growth rate** of silver carp ***(H.molitrix)*** and Nile tilapia ***(O.niloticus)*** reared in earthen freshwater ponds at three different **dietary protein** levels, during the period from 1 April to 30 November, 1991

Month	Days after stocking	Dietary protein level							
		Control (0 % protein)		20 % protein		30 % protein		40 % protein	
		Carp	Tilapia	Carp	Tilapia	Carp	Tilapia	Carp	Tilapia
Apr.	30	0.18	0.32	0.46	0.38	1.90	0.97	2.64	0.75
May.	60	0.36	0.54	1.01	0.76	1.90	1.74	2.77	1.39
Jun.	90	0.68	0.64	1.22	1.32	1.90	1.98	2.57	1.48
Jul.	120	0.69	0.57	1.16	1.21	1.71	1.96	2.10	1.33
Aug.	150	0.70	0.59	1.17	1.62	1.41	1.81	1.94	1.42
Sep.	180	0.74	0.66	1.19	1.22	1.52	1.55	1.76	1.34
Oct.	210	0.77	0.74	1.11	1.14	1.45	1.40	1.72	1.31
Nov.	240	0.80	0.80	11.08	1.12	1.39	1.28	1.60	1.23
Mean ± SD		0.62±0.22	0.61±0.15	1.05±0.25	1.05±0.32	1.65±0.23	1.59±0.35	2.14±0.46	1.28±0.23

Table (30) : Variations of specific growth rate of silver carp ***(H. molitrix)*** and Nile tilapia ***(O.niloticus)*** reared in earthen freshwater ponds at three different initial sizes, during the period from 1 April to 30 November, 1991.

Month	Days after stocking	Control (cm,gm)		Different initial size (cm,gm)					
		12.16,21.75	9.00,15.24	6.20,7.40	4.30, 6.85	12.16,21.75	9.00,15.24	17.56,61.05	12.00,35.79
		Carp	Tilapia	Carp	Tilapia	Carp	Tilapia	Carp	Tilapia
Apr.	30	0.18	0.32	1.62	1.92	1.90	0.97	2.65	0.37
May.	60	0.36	0.54	1.29	1.07	1.90	1.74	2.44	0.79
Jun.	90	0.68	0.64	1.35	1.44	1.90	1.98	2.52	1.11
Jul.	120	0.69	0.57	1.51	1.23	1.71	1.96	2.33	1.19
Aug.	150	0.70	0.59	1.10	1.51	1.41	1.81	2.31	1.17
Sep.	180	0.74	0.66	1.15	1.61	1.52	1.55	2.29	1.09
Oct.	210	0.77	0.74	1.16	1.54	1.45	1.40	1.86	1.03
Nov.	240	0.80	0.80	1.07	1.43	1.39	1.28	1.80	0.96
Mean ± SD		0.62±0.22	0.61±0.15	1.28±0.20	1.34±0.25	1.65±0.23	1.59±0.35	2.28±0.30	0.96±0.27

Table (31) : Variation of **specific growth rate** of silver carp ***(H.molitrix)*** and Nile tilapia ***(O.niloticus)*** reared in earthen freshwater ponds at three different **food rations**, during the period from 1 April to 30 November, 1991

Month	Days after stocking	Different food ration							
		Control (0 % of T.wt)		1 % of T. wt		3 % T.wt		5 % T.wt	
		Carp	Tilapia	Carp	Tilapia	Carp	Tilapia	Carp	Tilapia
Apr.	30	0.18	0.32	1.77	1.08	1.90	0.97	2.42	1.66
May.	60	0.36	0.54	1.21	1.48	1.90	1.74	2.21	2.26
Jun.	90	0.68	0.64	1.30	1.53	1.90	1.98	2.08	2.25
Jul.	120	0.69	0.57	1.20	1.30	1.71	1.96	1.97	2.11
Aug.	150	0.70	0.59	1.16	1.43	1.41	1.81	1.75	1.92
Sep.	180	0.74	0.66	1.14	1.42	1.52	1.55	1.66	1.62
Oct.	210	0.77	0.74	1.10	1.31	1.45	1.40	1.59	1.44
Nov.	240	0.80	0.80	1.17	1.22	1.39	1.28	1.51	1.30
Mean ±.SD		0.62±0.22	0.61±0.15	1.26±0.22	1.35±0.15	1.65±0.23	1.59±0.35	1.90±0.32	1.82±0.37

Fig (19): Specific growth rate of silver carp *(H. molitrix)* reared in earthen ponds at different stocking densities from 1Apr.to 30 Nov,1991

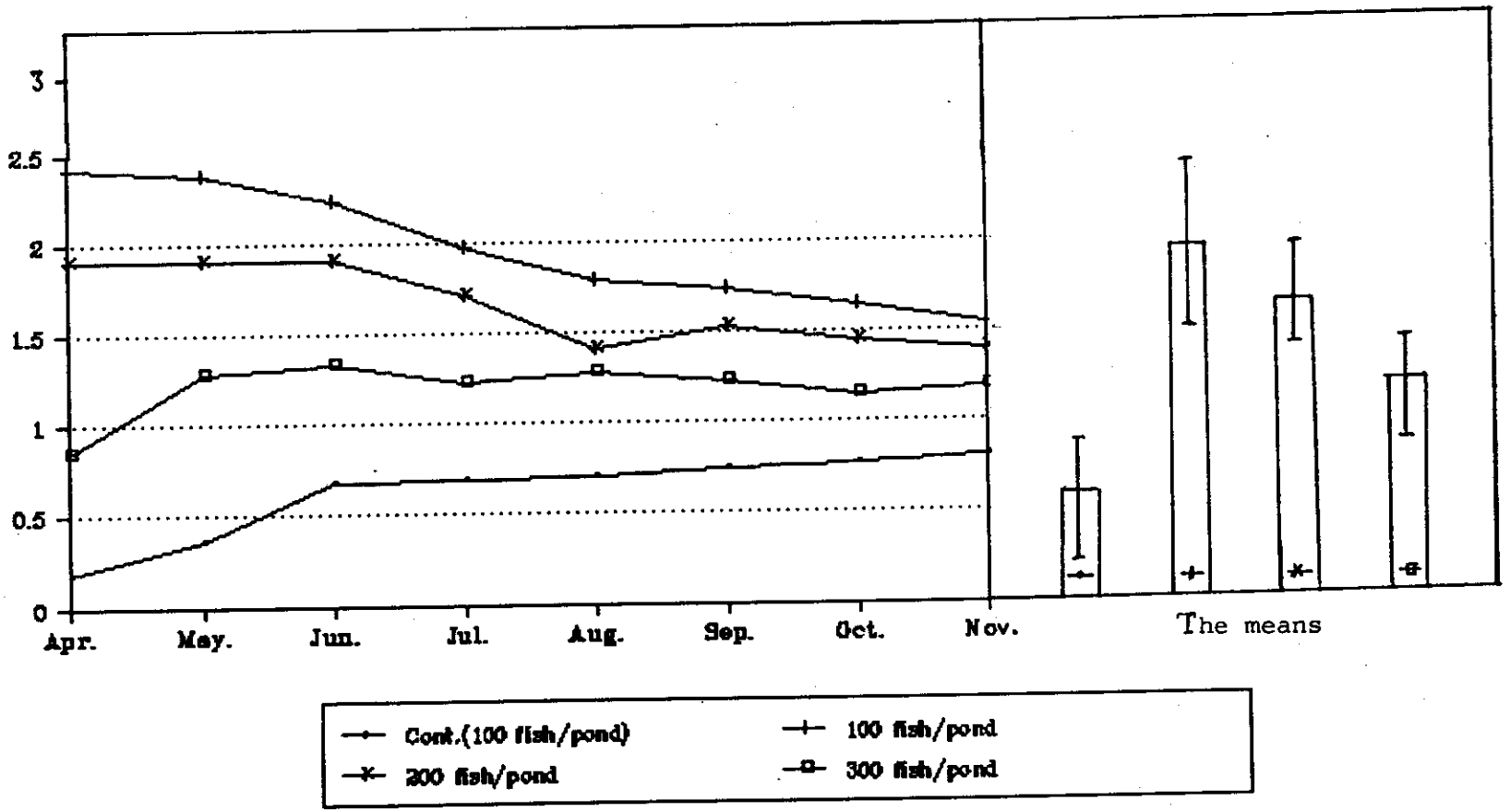


Fig (20): Specific growth rate of Nile tilapia *(O.niloticus)* reared in earthen ponds at different stocking densities from 1Apr.to 30 Nov.,1991

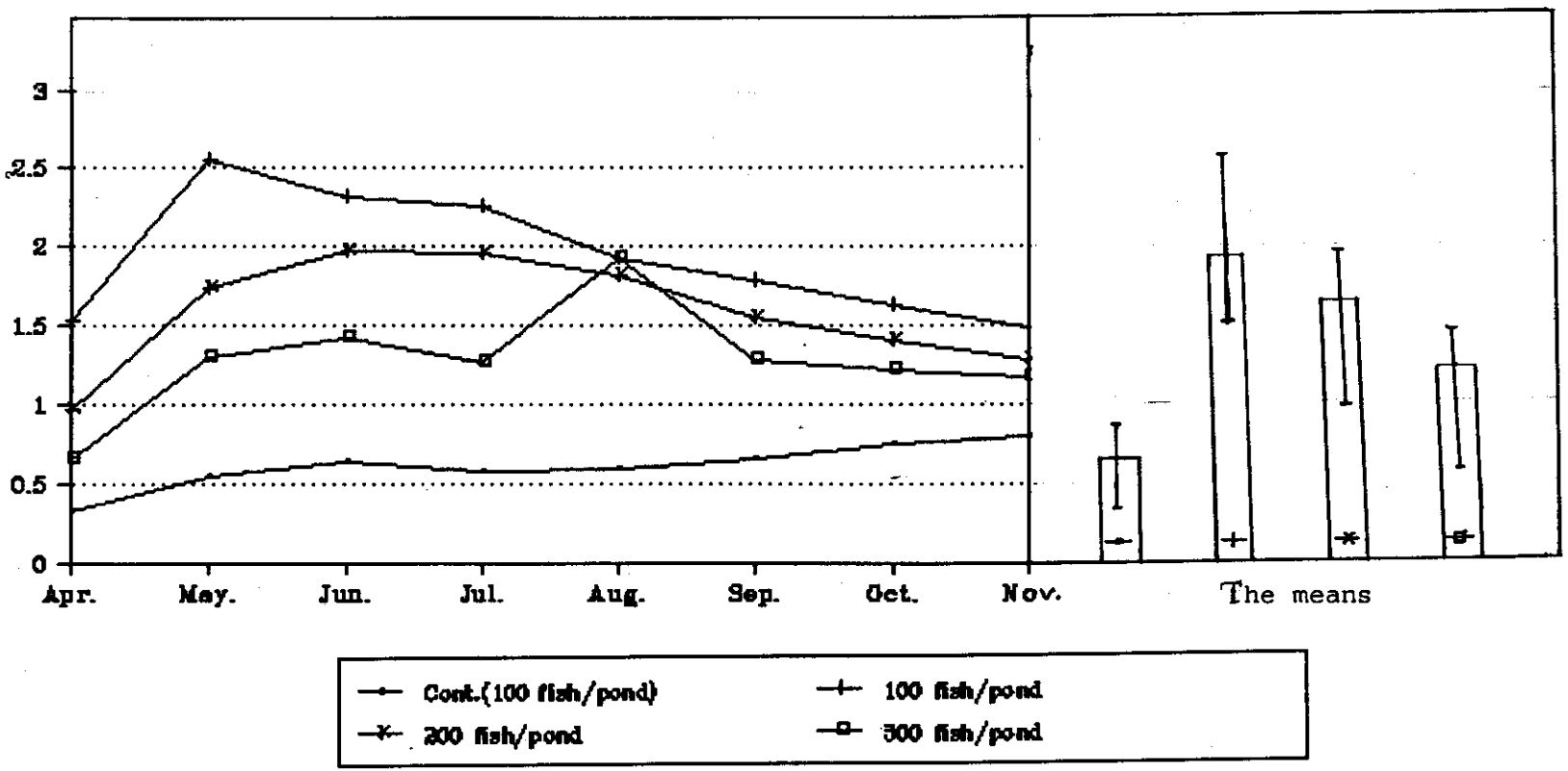


Fig (21): Specific growth rate of silver carp ***(H. molitrix)*** reared in earthen ponds at different dietary protein from 1 Apr. to 30 Nov.,1991.

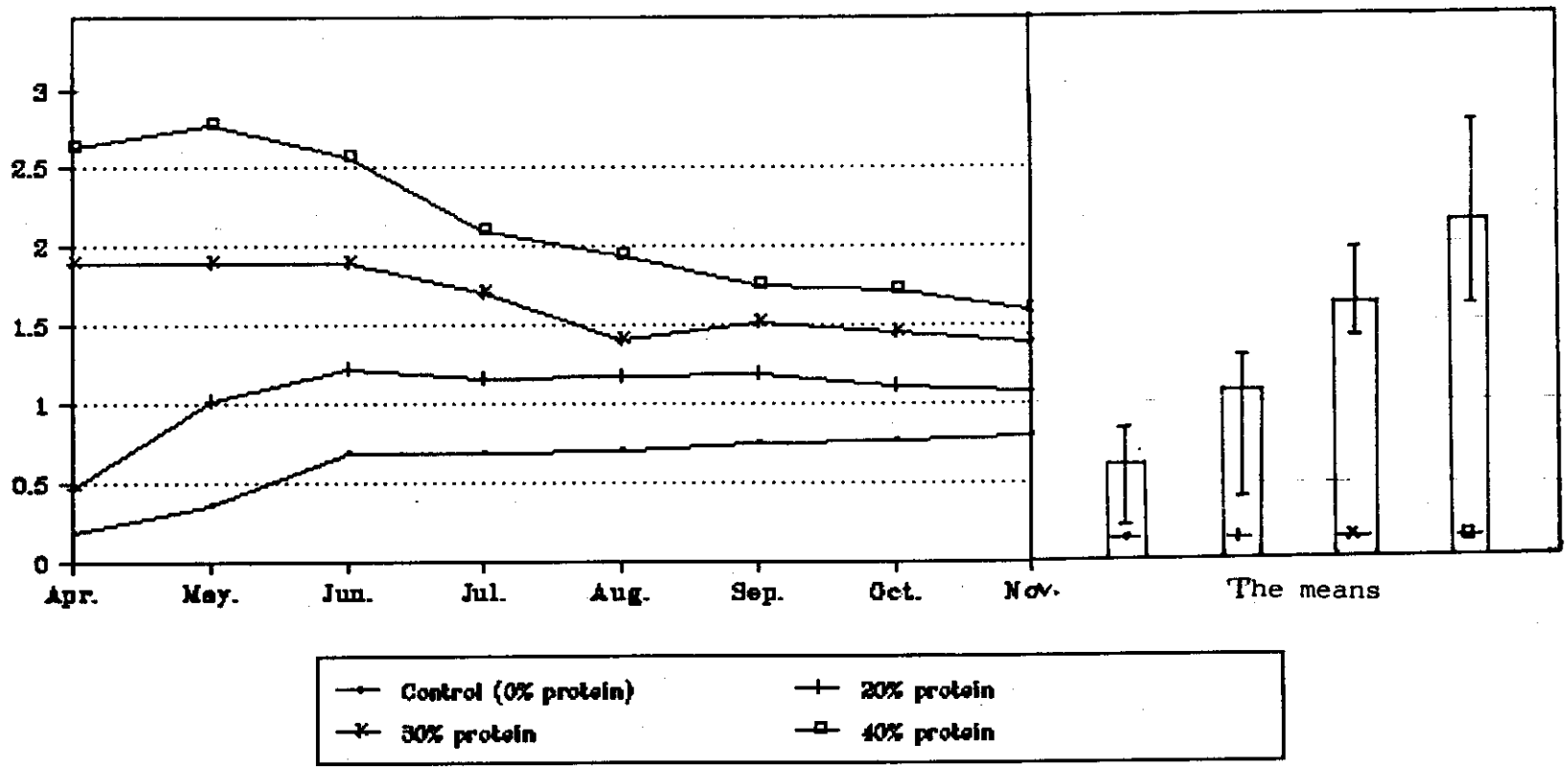


Fig (22): Specific growth rate of Nile tilapia ***(O.niloticus)*** reared in earthen ponds at different dietary protein from 1 Apr. to 30 Nov.,1991.

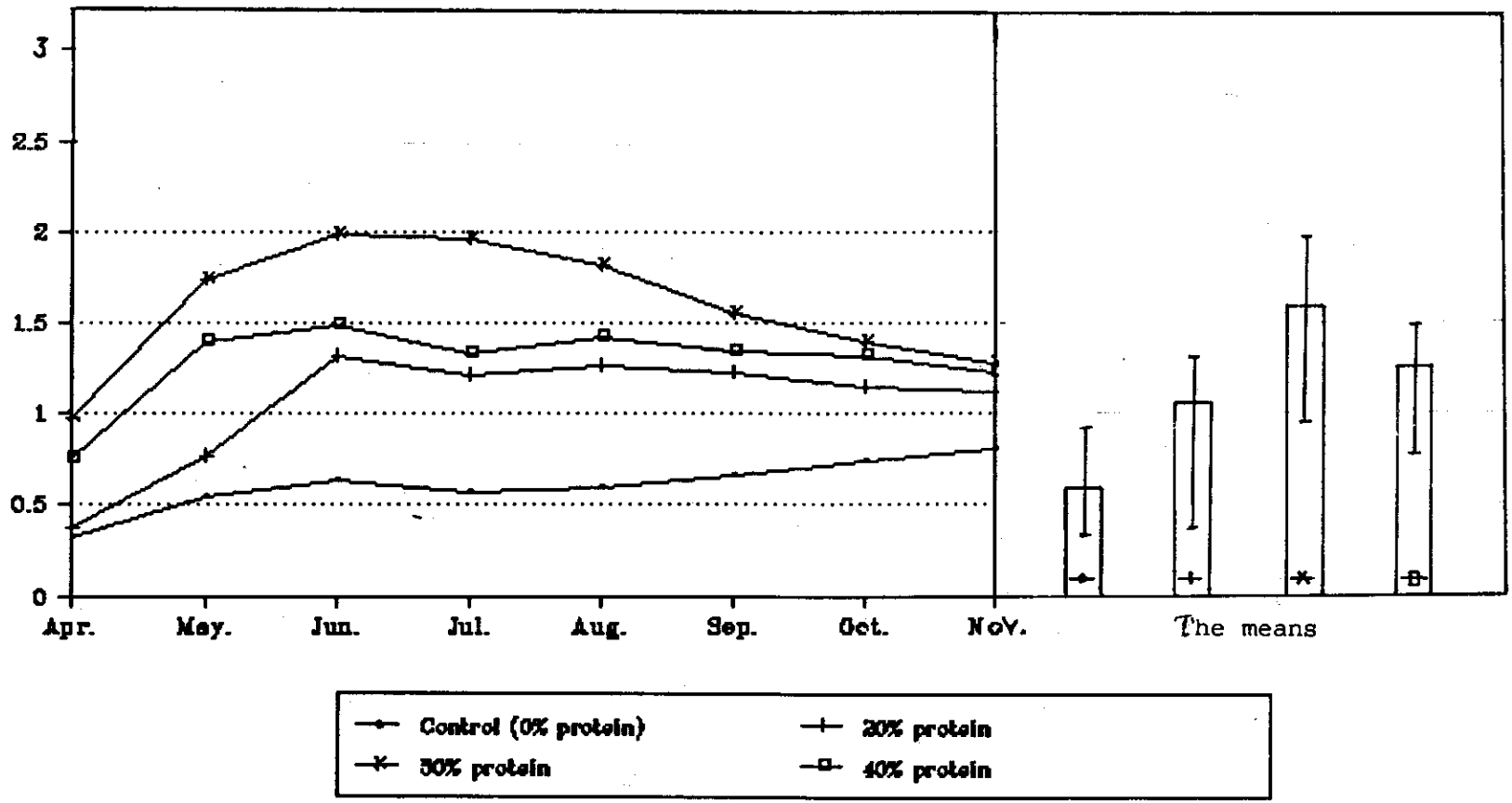


Fig (23): Specific growth rate of silver carp *(H. molitrix)* reared in earthen ponds at different initial sizes from 1 Apr. to 30 Nov.,1991.

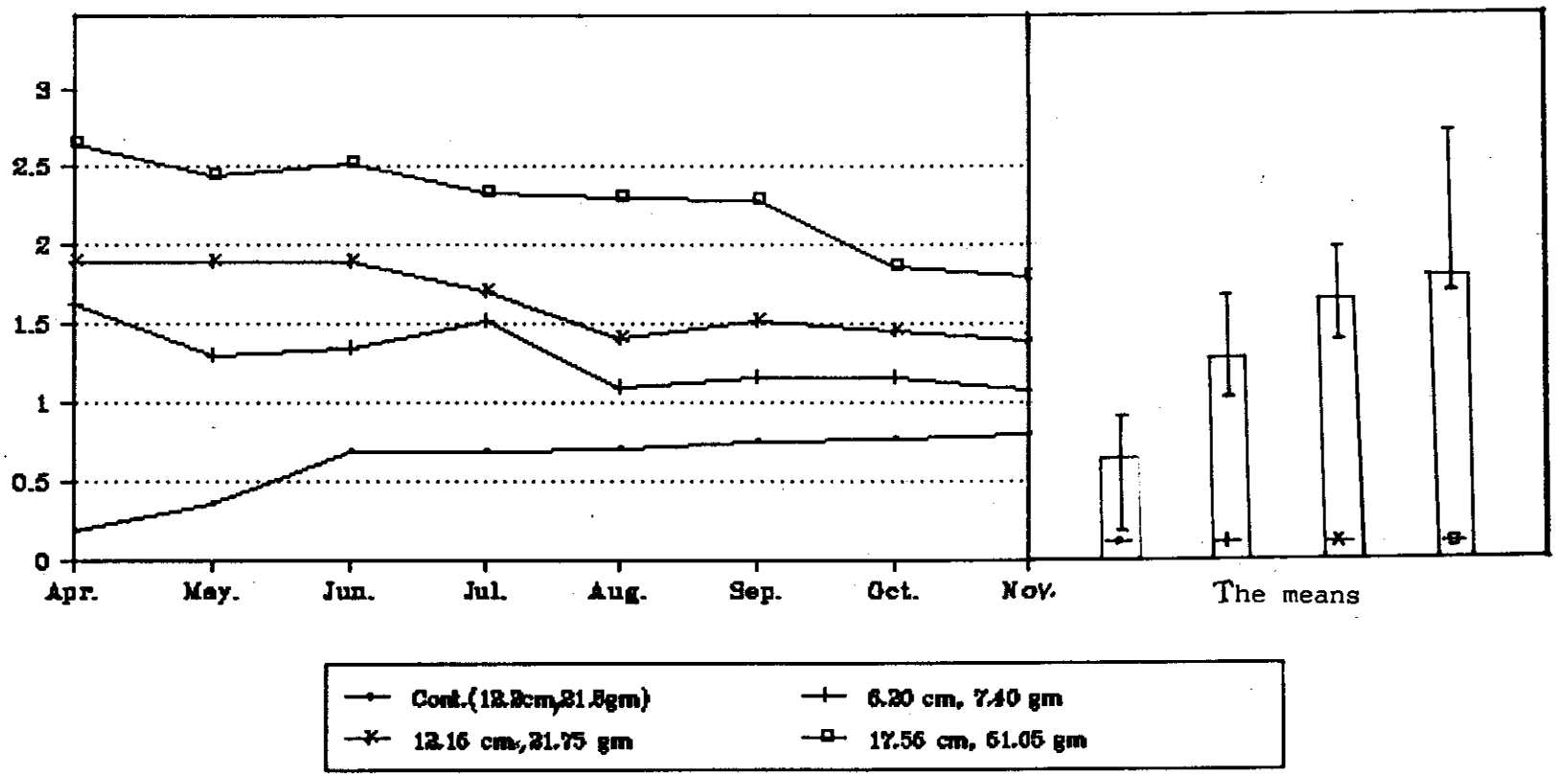


Fig (24): Specific growth rate of Nile tilapia ***(O.niloticus)*** reared in earthen ponds at different initial sizes from 1 Apr. to 30 Nov.,1991.

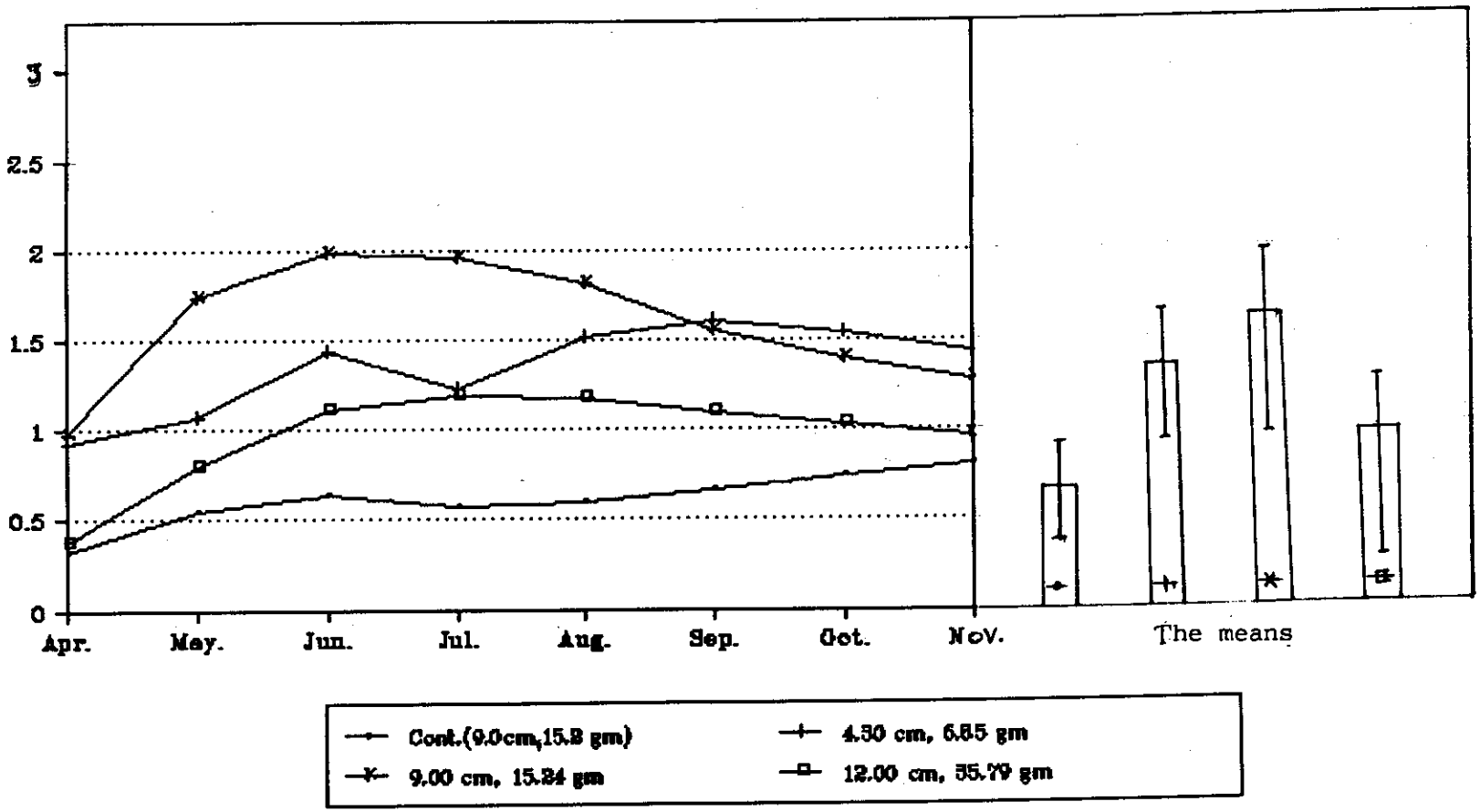
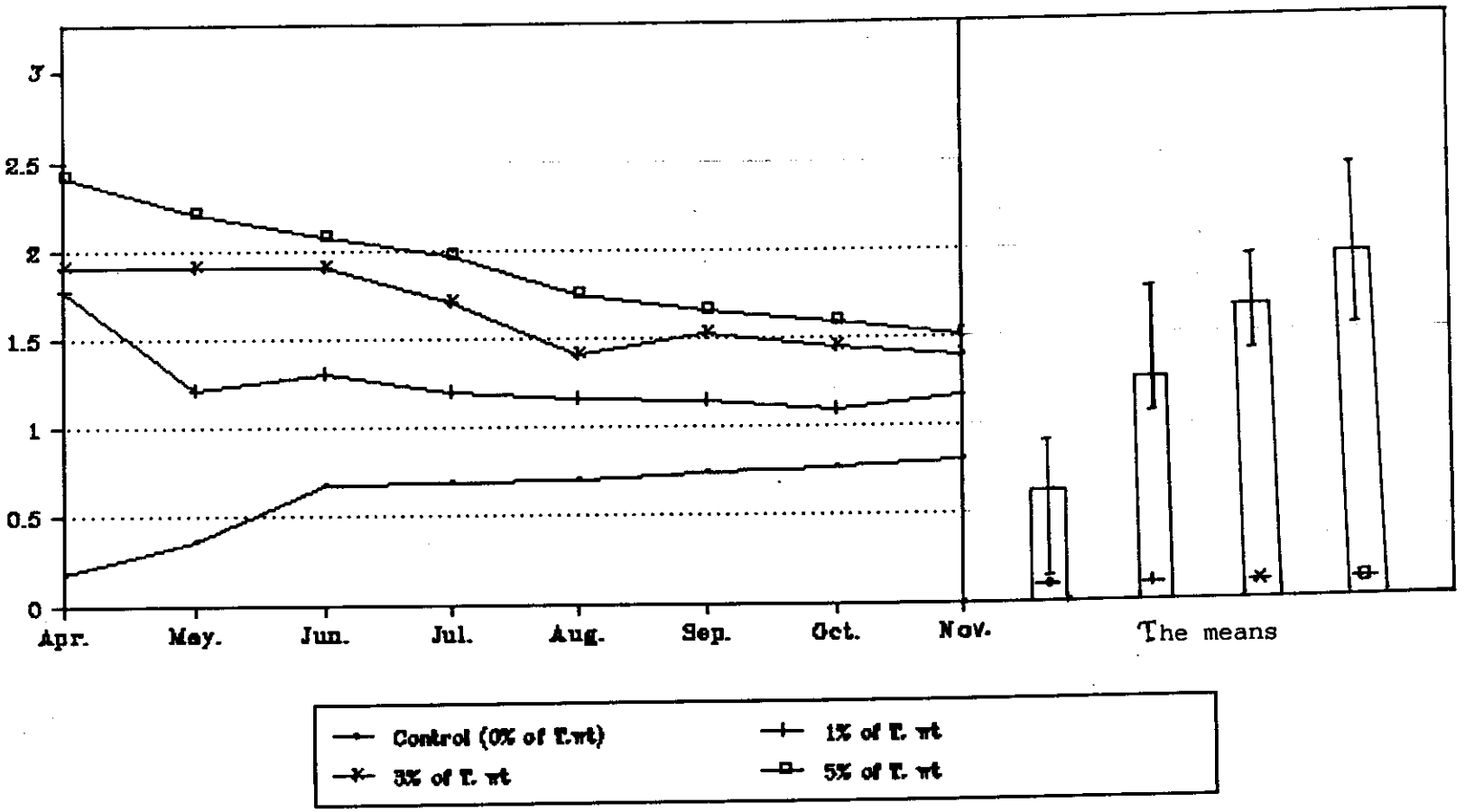


Fig (25): Specific growth rate of silver carp *(H. molitrix)* reared in earthen ponds at different food rations from 1 Apr. to 30 Nov.,1991.



tilapia these values increased from 1st initial size (small size) to 2nd one (middle size) then decreased at 3rd initial size (large size). The maximum value of SGR (2.28 ± 0.30 , 1.59 ± 0.35 for carp and tilapia) were recorded at the large initial size (17.56 cm, 61.05 gm) in carp and at the middle initial size (9.00 cm, 15.24 gm) in tilapia. While the minimum values (1.28 ± 0.20 and 0.96 ± 0.27 for carp and tilapia respectively) were observed at the smallest initial size of carp (6.20 cm, 7.40 gm) and the largest initial size of tilapia (12.00 cm, 35. 79 gm).

The specific growth rate of silver carp and Nile tilapia reared at stock of two fish/m^2 and fed on diet contain 30% protein level with different food ration, recorded its maximum values (1.90 ± 0.32 , 1.82 ± 0.37 for carp and tilapia respectively) at food ration of 5% of total body weight. While, the minimum values of SGR of carp and tilapia (1.26 ± 0.22 , 1.35 ± 0.15 respectively) were observed at 1% food ration. This mean that the SGR increased gradually with the increase of food ration in both species (Table 31 and Figures 25,26).

The average values of specific growth rate of both rearing fish ***(H. molitrix*** and ***O. niloticus)*** in control ponds were 0.62 ± 0.22 , 0.61 ± 0.15 for carp and tilapia respectively. The SGR of control groups were lower than that in other rearing ponds.

7- Food conversion (FC) :

Table (32) presents the average values of food conversion of ***H. molitrix*** and ***O. niloticus*** increased with the increasing stocking density. The maximum average values of FC for the two fish species (1.944 ± 1.011 and 2.047 ± 1.005 respectively) were recorded at the stock of three fish/m², while the minimum values (1.560 ± 0.721 and 1.614 ± 1.102 respectively) were observed at stock of one fish/m² .

Generally, the food conversion in both rearing fishes (carp and tilapia) increased with the increasing stocking density at any time of the rearing period. On the other hand, food conversion (FC) value flactuated with the time withen the same stocking density for each fish (Table 32).

The average value of food conversion of silver carp and Nile tilapia were decreased with the increasing dietary protein level in the diet. The maximum values of mean FC (2.483 ± 1.391 and 2.651 ± 1.778 respectively) were recorded at diet contain 20% protein level. These values were slightly decreased until it reach its minimum values of 1.502 ± 0.847 for carp at diet contain 40% protein and 1.733 ± 0.767 for tilapia at diet with 30% protein level. On the other hand the highest values of FC withen the different monthes of rearing period was recorded in April at 20% protein level (Table 33).

Table (32):Variations of **food conversion** of silver carp ***(H.molitrix)*** and Nile tilapia ***(O.niloticus)*** reared in earthen ponds at three different stocking density, from 1 April-30 November, 1991.

Month	Days after stocking	Stocking density(fish/pond)					
		100		200		300	
		Carp	Tilapia	Carp	Tilapia	Carp	Tilapia
Apr.	30	0.733	1.438	1.018	2.324	2.743	3.593
May.	60	0.763	0.390	0.018	1.698	1.149	0.995
Jun.	90	1.000	1.047	1.020	0.709	1.460	0.170
Jul.	120	1.805	0.941	1.872	1.731	2.442	2.860
Aug.	150	2.056	3.900	1.894	1.661	1.398	1.030
Sep.	180	1.504	1.542	1.971	2.705	2.356	1.426
Oct.	210	1.771	2.493	2.090	1.499	3.573	2.617
Nov.	240	2.844	1.170	2.361	2.536	0.432	2.682
Mean ± SD		1.560±0.721	1.614±1.102	1.656±0.549	1.733±0.767	1.944±1.011	2.047±1.005

Table(33):Variations of **food conversion** of silver carp ***(H.molitrix)*** and Nile tilapia ***(O.niloticus)*** reared in earthen ponds at three different dietary protein levels, from 1 April-30 November , 1991

Month	Days after stocking	Dietary protein level					
		20% protein		30% protein		40% protein	
		Carp	Tilapia	Carp	Tilapia	Carp	Tilapia
Apr.	30	5.314	6.587	1.018	2.324	0.649	3.120
May.	60	1.300	1.894	0.018	0.698	0.555	0.904
Jun.	90	1.253	0.720	1.020	0.709	0.620	1.222
Jul.	120	2.244	2.600	1.872	1.731	1.432	2.661
Aug.	150	1.830	1.389	1.894	1.661	2.106	1.093
Sep.	180	1.645	2.268	1.971	2.705	1.961	1.736
Oct.	210	3.644	3.367	2.090	1.499	1.396	2.867
Nov.	240	2.654	2.382	2.361	2.536	3.052	3.590
Mean ± SD		2.483±1.391	2.651±1.778	1.656±0.549	1.733±0.767	1.502±0.847	2.149±1.035

Table (34): Variations of **food conversion** of silver carp ***(H.molitrix)*** and Nile tilapia ***(O.niloticus)*** reared in earthen ponds at three different initial sizes, from 1 April-30 November,1991

Month	Days after stocking	Different initial size (cm,gm)					
		6.20, 7.40	4.30, 6.85	12.16 ,21.75	9.00 ,15.24	17.56,61.05	12.00,35.79
		Carp	Tilapia	Carp	Tilapia	Carp	Tilapia
Apr.	30	1.255	2.563	1.018	2.324	1.225	1.995
May.	60	2.080	1.755	0.018	0.698	1.722	1.773
Jun.	90	1.430	0.845	1.020	0.709	1.197	1.140
Jul.	120	1.020	3.900	1.872	1.731	3.104	1.428
Aug.	150	0.702	0.650	1.894	1.661	1.758	2.053
Sep.	180	2.906	0.873	1.971	2.705	1.778	3.510
Oct.	210	2.506	2.074	2.090	1.499	2.009	3.328
Nov.	240	2.934	3.531	2.361	2.536	3.267	5.002
Mean ± SD		1.854±0.871	2.024±1.240	1.656±0.549	1.733±0.767	2.007±0.780	2.529±1.306

Table (35):Variations of **food conversion** of silver carp ***(H.molitrix)*** and Nile tilapia ***(O.niloticus)*** reared in earthen ponds at three different **food ration,** from 1 April-30 November, 1991

Month	Days after stocking	Different food ration					
		1 % of T.wt		3 % of T.wt		5 % of T.wt	
		Carp	Tilapia	Carp	Tilapia	Carp	Tilapia
Apr.	30	0.373	0.681	1.018	2.324	1.222	2.016
May.	60	1.203	0.341	0.018	0.698	1.581	0.956
Jun.	90	0.468	0.418	1.020	0.709	1.768	1.370
Jul.	120	0.827	1.300	1.872	1.731	2.109	1.967
Aug.	150	0.725	0.317	1.894	1.661	2.271	3.143
Sep.	180	0.722	0.532	1.971	2.705	3.047	3.190
Oct.	210	0.931	1.179	2.090	1.499	3.108	1.178
Nov.	240	0.397	1.345	2.361	2.536	3.887	1.448
Mean ± SD		0.706±0.287	0.764±0.440	1.656±0.549	1.733±0.767	2.624±1.119	1.909±0.856

The present data given in table (34) show the variations of food conversion of ***H. molitrix*** and ***O. niloticus*** at different initial size. The maximum values of FC (2.007 ± 0.780 , 2.529 ± 1.306 for carp and tilapia respectively) were recorded at initial size of 17.56 cm, 61.05 gm for carp and 12.00 cm, 35. 79 gm for tilapia.

The average values of food conversion of silver carp and Nile tilapia increased with the increasing food ration. The highest values (2.624 ± 1.119 , 1.909 ± 0.856 for carp and tilapia respectively) were recorded at 5% food ration, these values decreased to 1.656 ± 0.549 and 1.733 ± 0.767 respectively at 3% food ration until it reach its minimum values (0.706 ± 0.287 and 0.764 ± 0.440 respectively) at 1% food ration (Table 35).

8-Protein efficiency ratio (PER) :

The variations of protein efficiency ratio (the weight of fish produced per unit weight of dietary protein) of silver carp and Nile tilapia at different stocking density were given in table (36). The average values of PER of both fish species decreased with the increase of stocking density, its highest values (2.623 ± 1.292 , 2.482 ± 1.759 for carp and tilapia respectively) were recorded at stock of one fish/m^2. These values slightly decreased to 2.257 ± 0.848 and 2.178 ± 1.657 respectively at stock of two fish/m^2 until it reach its minumum values (1.849 ± 0.702 ,1.877 ± 1.065 for carp and tilapia respectively) at stock of three fish/m^2.

Table (36) : Variations of **protein efficiency ratio** of silver carp ***(H.molitrix)*** and Nile tilapia ***(O.niloticus)*** reared in earthen ponds at three different stocking densities, from 1 April -30 November ,1991

Month	Days after stocking	Stocking density(fish/pond)					
		100		200		300	
		Carp	Tilapia	Carp	Tilapia	Carp	Tilapia
Apr.	30	4.947	2.334	3.274	1.434	1.215	0.928
May.	60	4.368	8.545	3.275	4.778	2.899	3.349
Jun.	90	3.334	3.182	3.268	4.701	2.273	2.849
Jul.	120	1.846	3.544	1.781	1.926	1.365	1.165
Aug.	150	1.621	0.855	1.759	2.006	2.384	3.236
Sep.	180	2.217	0.601	1.692	1.232	1.415	0.973
Oct.	210	1.882	0.513	1.595	0.741	0.933	1.274
Nov.	240	1.172	0.285	1.412	0.602	2.315	1.243
Mean ± SD		2.623±1.292	2.482±1.759	2.257±0.848	2.178±1.657	1.849±0.702	1.877±1.065

The average values of protein efficiency ratio of ***H. molitrix*** and ***O. niloticus*** also decreased with the increasing protein level in diet. The maximum values of PER (2.512 ± 1.116 , 2.706 ± 1.900 for carp and tilapia respectively) were recorded at diet with 20% protein, while its minimum values (2.132 ± 1.445 and 1.481 ± 0.789 respectively) were observed at the highest dietary protein level (40% protein) for both species (Table 37).

The given data (Table 38) also indicated that, the average values of protein efficiency ratio of silver carp and Nile tilapia decreased gradually with the increasing initial size of rearing fish. The highest average values of PER (2.276 ± 1.263 , 2.437 ± 1.623 for carp and tilapia respectively) were recorded at the smaller initial size (6.20 cm, 7.40 gm for carp and 4.30 cm, 6.85 gm for tilapia). While the lowest values (1.871 ± 0.651 and 1.485 ± 0.855 respectively) were observed at larger initial size (17.56 cm, 61.05 gm for carp and 12.00 cm, 35.79 gm for tilapia).

As showen in table (39) the average values of protein efficiency ratio of ***H. molitrix*** and ***O. niloticus*** also decreased with the increasing food ration. Its maximum values 5.507 ± 2.322 , 5.908 ± 3.248 for carp and tilapia respectively) were recorded at 1% food ration. These values were slightly decreased at 3% ration unitl it reah its minimum values (1.513 ± 0.287 for carp and 1.368 ± 1.194 for tilapia) at 5% food ration.

Table (37) : Variations of **protein efficiency ratio** of silver carp ***(H.molitrix)*** and Nile tilapia ***(O.niloticus)*** reared in earthen ponds at three different **dietary protein** levels, from 1 April -30 November, 1991

Month	Days after stocking	Dietary protein level					
		20% protein		30% protein		40% protein	
		Carp	Tilapia	Carp	Tilapia	Carp	Tilapia
Apr.	30	0.941	0.759	3.274	1.434	3.852	0.801
May.	60	3.846	2.639	3.275	4.778	4.507	2.766
Jun.	90	4.054	6.944	3.268	4.701	2.899	2.046
Jul.	120	2.228	1.923	1.781	1.926	0.728	0.939
Aug.	150	2.732	3.599	1.759	2.006	1.187	2.286
Sep.	180	3.039	2.204	1.692	1.232	1.275	1.439
Oct.	210	1.372	1.485	1.595	0.741	1.790	0.872
Nov.	240	1.884	2.098	1.412	0.602	0.819	0.696
Mean ± SD		2.512±1.116	2.706±1.900	2.257±0.848	2.178±1.657	2.132±1.445	1.481±0.789

Table(38): Variations of **protein efficiency ratio** of silver carp ***(H.molitrix)*** and Nile tilapia ***(O.niloticus)*** reared in earthen ponds at three different initial sizes, from 1 April-30 November, 1991

Month	Days after stocking	Different initial size (cm,gm)					
		6.20, 7.40	4.30, 6.85	12.16 ,21.75	9.00 ,15.24	17.56,61.05	12.00,35.79
		Carp	Tilapia	Carp	Tilapia	Carp	Tilapia
Apr.	30	2.655	1.300	3.274	1.434	2.721	0.501
May.	60	1.602	1.899	3.275	4.778	1.935	1.880
Jun.	90	2.331	3.945	3.268	4.701	2.785	2.923
Jul.	120	3.267	0.855	1.781	1.926	1.074	2.335
Aug.	150	4.748	5.128	1.759	2.006	1.896	1.624
Sep.	180	1.147	3.820	1.692	1.232	1.875	0.949
Oct.	210	1.329	1.606	1.595	0.741	1.659	1.002
Nov.	240	1.135	0.944	1.412	0.602	1.020	0.666
Mean ± SD		2.276±1.263	2.437±1.623	2.257±0.848	2.178±1.657	1.871±0.651	1.485±0.855

Table (39):Variations of **protein efficiency ratio** of silver carp ***(H.molitrix)*** and Nile tilapia ***(O.niloticus)*** reared in earthen ponds at three different food ration, from 1 April-30 November, 1991

Month	Days after stocking	Different food ration					
		1 % of T.wt		3 % of T.wt		5 % of T.wt	
		Carp	Tilapia	Carp	Tilapia	Carp	Tilapia
Apr.	30	8.941	4.890	3.274	1.434	2.728	1.653
May.	60	2.772	9.768	3.275	4.778	2.108	3.487
Jun.	90	7.122	7.969	3.268	4.701	1.885	2.434
Jul.	120	4.029	2.564	1.781	1.926	1.580	1.694
Aug.	150	4.598	10.505	1.759	2.006	0.780	1.060
Sep.	180	4.615	6.263	1.692	1.232	1.094	0.104
Oct.	210	3.582	2.827	1.595	0.741	1.072	0.283
Nov.	240	8.339	2.478	1.412	0.602	0.857	0.230
Mean ± SD		5.507±2.322	5.908±3.248	2.257±0.848	2.178±1.657	1.513±0.287	1.368±1.194

9- Protein retention :

The protein retention, which is the percentage of protein increase in fish body to the given protein of ***H. molitrix*** and ***O. niloticus*** decreased slightly with the increasing stocking density. Its highest values (1.96 , 1.40 for carp and tilapia respectively) were recorded at stock of one fish/m^2. The lowest values for both was observed at stocking density of 3 fish/m^2 (Table 40).

The protein retention of silver carp and Nile tilapia also decreased gradually with the increasing dietary protein level. The maximum values (1.21, 1.39 for carp and tilapia respectively) were recorded at diet contain 20% protein, while its minimum values (0.75 and 0.70 for both fish species respectively) were observed at 40% dietary protein level (Table 41).

The protein retention of rearing fish (carp and tilapia) also vaired with different initial size of the fish (Table 42). Its values were 0.90, 1.12 ; 0.93, 0.78 and 0.87, 0.68 for carp and tilapia at the three different initial size respectively.

The variations of protein retention of silver carp and Nile tilapia at different food ration were given in table (43). The highest values of protein retention (2.83, 2.67 for carp and tilapia respectively) were recorded at 1% food ration, whereas the lowest values (0.60 and 0.43 respectively) at 5% ration.

Table (40) : Growth, production, mortality and retention values for silver carp ***(H. molitrix)*** and Nile tilapia ***(O. niloticus)*** reared in earthen freshwater ponds at three different stocking densities.

Item	Stocking density (fish / pond)							
	Control (100)		100		200		300	
	Carp	Tilapia	Carp	Tilapia	Carp	Tilapia	Carp	Tilapia
Initial average weight / fish (gm)	21.75	15.24	21.75	15.24	21.75	15.24	21.75	15.24
Final average weight / fish (gm)	150.00	105.00	892.00	368.00	612.00	332.00	370.00	253.00
Gain in weight / fish (gm)	128.25	89.76	870.25	352.76	590.25	316.76	348.25	237.76
Gain in weight / fish / day (gm)	0.526	0.368	3.566	1.446	2.419	1.298	1.427	0.974
Initial average length (cm)	12.16	9.00	12.16	9.00	12.16	9.00	12.16	9.00
Final average length (cm)	24.20	18.30	42.00	27.50	35.30	26.70	33.00	22.00
Gain in length (cm)	12.04	9.30	29.84	18.50	23.14	17.70	20.84	13.00
Number of fish / pond	50	50	50	50	100	100	150	150
Number of loss	1	2	2	1	2	1	4	3
Percent of survival	98.00	96.00	96.00	98.00	98.00	99.00	97.33	98.00
Total food given (kg)	—	—	89.15	56.585	126.06	90.235	110.933	84.064
Total crop / pond (kg)	6.284	4.308	41.77	17.285	57.844	31.359	50.844	34.951
Production / m^2 (kg)	0.063	0.043	0.41	0.173	0.57	0.314	0.608	0.349
Protein retention	—	—	1.96	1.40	0.93	0.78	0.60	0.61
Fat retention	—	—	3.82	1.80	1.90	1.10	1.40	1.10
Energy retention	—	—	1.51	0.92	0.75	0.54	0.50	0.68

10- Fat retention :

The present study recorded in table (40) indicate that, the fat retention, which in the percentage of fat increase in fish body to the given fat of ***H. molitrix*** and ***O. niloticus*** decreased slightly with the increasing stocking density. Its values were 3.82, 1.80 ; 1.90, 1.10 and 1.40, 1.10 for carp and tilapia at the three different stocking densities respectively. On the other hand, no significant differences between the values of fat retention of both rearing fish (carp and tilapia) at different dietary protein levels and different initial sizes of fishes were observed (Tables 41, 42).

Nevertheless, the fat retention of silver carp and Nile tilapia decreased gradually with the increasing food ration, its maximum values (6.70, 4.40 for carp and tilapia respectively) were recorded at 1% food ration, while the minimum values (1.10 and 0.50 respectively) were observed at 5% food ration (Table 43).

11- Energy retention :

From the present investigation it was noticed that, the energy retention percentage of energy increase in fish body to energy given, of ***H. molitrix*** and ***O. niloticus*** decrease slightly with the increasing stocking density. Its values were 1.51, 0.92 ; 0.75, 0.54 and 0.50, 0.68 for carp and tilapia at the three different stocking densities respectively. While, at different dietary protein levels or different initial fish size

Table (41) : Growth, production, mortality and retention values for silver carp ***(H. molitrix)*** and Nile tilapia ***(O. niloticus)*** reared in earthen freshwater ponds at three different dietary protein levels .

Item		Dietary protein level							
		Control (0 %)		20 % protein		30 % protein		40 % protein	
		Carp	Tilapia	Carp	Tilapia	Carp	Tilapia	Carp	Tilapia
Initial average weight / fish	(gm)	21.75	15.24	21.75	15.24	21.75	15.24	21.75	15.24
Final average weight / fish	(gm)	150.00	105.00	290.00	223.00	612.00	332.00	1012.00	288.00
Gain in weight / fish	(gm)	128.25	89.76	268.25	207.76	590.25	316.76	990.25	272.76
Gain in weight / fish / day	(gm)	0.526	0.368	1.099	0.851	2.419	1.298	4.058	1.117
Initial average length	(cm)	12.16	9.00	12.16	9.00	12.16	9.00	12.16	9.00
Final average length	(cm)	24.20	18.303	30.00	20.60	35.30	26.70	41.20	24.30
Gain in length	(cm)	12.04	9.30	17.84	11.60	23.14	17.70	29.04	15.30
Number of fish / pond		50	50	100	100	100	100	100	100
Number of loss		1	2	4	3	2	1	5	3
Percent of survival		98.00	96.00	96.00	97.00	98.00	99.00	95.00	97.00
Total food given	(kg)	——	——	65.759	49.453	126.061	90.235	205.769	64.663
Total crop / pond	(kg)	6.284	4.308	25.752	20.153	57.844	31.359	94.074	26.458
Production / m^2	(kg)	0.063	0.043	0.257	0.202	0.578	0.314	0.941	0.265
Protein retention		——	——	1.21	1.39	0.93	0.78	0.75	0.70
Fat retention		——	——	2.20	1.80	1.90	1.10	1.60	1.40
Energy retention		—-	——	0.74	0.75	0.75	0.54	0.71	0.63

there were no significant differences between the energy retention values (Table 40).

In case of fish reared at different food rations, the energy retention values of silver carp and Nile tilapia were decreased gradually with the increasing food ration. The highest values (2.40, 2.00 for carp and tilapia respectively) were recorded at low food ration (1%) while its lowest values (0.46 and 0.28 respectively) at high food ration (5% of total body weight).

12- Production :

The tabulated gain in weight/fish/day of ***H. molitrix*** and ***O. niloticus*** given in table (40) decreased gradually with the increasing stocking density. Its values were 3.566, 1.446 gm ; 2.419, 1.298 gm and 1.427 , 0.974 gm for carp and tilapia at the stocking densities of one fish/m^2, two fish/m^2 and three fish/m^2 respectively. While the total crop/pond (area, 100 m^2) were slightly raised with the increased stocking density, its maximum values for carp (57.844 kg) were at stock of two fish/m^2 and for tilapia (34.951 kg) at stock of three fish/m^2.

On the other hand, at different dietary protein levels (Table 41) the gain in weight/fish/day and total crop/pond of silver carp increased gradually with the increased protein level in the diet. Its maximum values (4.058 gm and 94.074 kg respectively) were recorded at high

Table (42) · Growth, production, mortality and retention values for silver carp ***(H. molitrix)*** and Nile tilapia ***(O. niloticus)*** reared in earthen freshwater ponds at three different dietary protein levels .

Item	Control (Cm,gm)		Different initial size (cm,gm)					
	6 , 7	4 , 6	6 , 7	4 , 6	12,21	9 , 15	17,61	12 , 35
	Carp	Tilapia	Carp	Tilapia	Carp	Tilapia	Carp	Tilapia
Initial average weight / fish (gm)	21.75	15.24	7.40	6.85	21.75	15.24	61.05	35.79
Final average weight / fish (gm)	150.00	105.00	200.00	210.00	612.00	332.00	1074.00	361.00
Gain in weight / fish (gm)	128.25	89.76	192.60	203.15	590.25	316.76	1012.95	325.21
Gain in weight / fish / day (gm)	0.526	0.368	0.789	0.832	2.419	1.298	4.151	1.333
Initial average length (cm)	12.16	9.00	6.20	4.30	12.16	9.00	17.56	12.00
Final average length (cm)	24.20	18.303	25.80	19.30	35.30	26.70	43.60	27.20
Gain in length (cm)	12.04	9.30	19.60	15.00	23.14	17.70	26.04	15.20
Number of fish / pond	50	50	100	100	100	100	100	100
Number of loss	1	2	3	3	2	1	2	1
Percent of survival	98.00	96.00	97.00	97.00	98.00	99.00	98.00	99.00
Total food given (kg)	——	——	40.912	38.261	126.061	90.235	238.931	90.877
Total crop / pond (kg)	6.284	4.308	18.682	19.705	57.844	31.359	99.269	32.196
Production / m^2 (kg)	0.063	0.043	0.187	0.197	0.578	0.314	0.993	0.325
Protein retention	——	——	0.90	1.12	0.93	0.78	0.87	0.68
Fat retention	——	——	2.10	1.90	1.90	1.10	1.60	1.10
Energy retention	——	——	0.75	0.83	0.75	0.54	0.66	0.50

protein level (40% protein), while the minimum values (1.099 gm and 25.752 kg) were observed at low dietary protein level (20% protein). In case of Nile tilapia the gain in weight/fish/day and total crop/pond reached its highest values (1.298 gm and 31.359 kg respectively) at 30% dietary protein level. While the lowest values (0.851 gm and 20.153 kg respectively) were also recorded at diet of 20% protein level.

The gain in weight/fish/day and total crop/pond of ***H.molitrix*** and ***O.niloticus*** were gradually increased with the increase of initial size of rearing fish. Its maximum values (4.151 gm, 99.269 kg ; 1.333 gm, 32.196 kg for carp and tilapia respectively) were recroded at the largest initial size (17.56 cm, 61.05 gm for carp and 12.00 cm, 35.79 gm for tilapia). While the minimum values of both fish species (0.789 gm, 18.682 kg and 0.832 gm, 19.705 kg respectively) were observed at the smallest initial size (Table 42).

It was also noticed that, gain in weight/fish/day and total crop/pond for both rearing fishes (carp and tilapia) were slightly increased with the increasing food ration. The highest values of gain in weight/fish/day (3.230 , 1.331 gm for carp and tilapia respectively) were recorded at high food ration (5% of total body weight), while its lowest values (1.386 and 1.101 gm respectively) at low food ration (1% of total body weight). Also total crop/pond reach its maximum values (75.672 kg, 31.826 kg for carp and tilapia respectively) at 5%

Table (43) : Growth, production, mortality and retention values for silver carp ***(H. molitrix)*** and Nile tilapia ***(O. niloticus)*** reared in earthen freshwater ponds at three different food rations.

Item		Different food ration							
		Conrol (0%)		1 % of T. Wt		3 % T.wt		5 % T . wt	
		Carp	Tilapia	Carp	Tilapia	Carp	Tilapia	Carp	Tilapia
Initial average weight / fish	(gm)	21.75	15.24	21.75	15.24	21.75	15.24	21.75	15.24
Final average weight / fish	(gm)	150.00	105.00	360.00	284.00	612.00	332.00	810.00	340.00
Gain in weight / fish	(gm)	128.25	89.76	338.25	286.76	590.25	316.76	788.25	324.76
Gain in weight / fish / day	(gm)	0.526	0.368	1.386	1.101	2.419	1.298	3.230	1.331
Initial average length	(cm)	12.16	9.00	12.16	9.00	12.16	9.00	12.16	9.00
Final average length	(cm)	24.20	18.303	31.30	22.40	35.30	26.70	40.80	27.50
Gain in length	(cm)	12.04	9.30	19.14	13.40	23.14	17.70	28.64	18.50
Number of fish / pond		50	50	100	100	100	100	100	100
Number of loss		1	2	3	2	2	1	4	2
Percent of survival		98.00	96.00	97.00	98.00	98.00	99.00	96.00	98.00
Total food given	(kg)	——	——	22.849	21.694	126.061	90.235	266.847	172.980
Total crop / pond	(kg)	6.284	4.308	32.810	26.338	57.844	31.359	75.672	31.826
Production / m^2	(kg)	0.063	0.043	0.033	0.026	0.578	0.314	0.76	0.23
Protein retention		——	——	2.83	2.67	0.93	0.78	0.60	0.43
Fat retention		——	——	6.70	4.40	1.90	1.10	1.10	0.50
Energy retention		——	——	2.40	2.00	0.75	0.54	0.46	0.28

food ration and the minimum values (32.810 kg and 26.338 kg respectively) were observed at 1% food ration (Table 43).

The control groups showed a gain in weight/fish/day of 0.526 gm and 0.368 gm for carp and tilapia respectively, while the values of total crop/pond for the two fish species were 6.284 kg and 4.308 kg respectively in all different treatments.

CHAPTER 3

BIOLOGICAL CONDITIONS AND STOMACH ANALYSIS

1- Biological conditions :

1-1- Hepatosomatic index (H.S.I.) :

The average values of H.S.I. of males and females ***H. molitrix*** and ***O.niloticus*** slightly decreased with the increase of stocking densities. Its maximum values (1.29 ± 0.15, 1.61 ± 0.22 and 2.34 ± 0.15, 2.81 ± 0.20 for males and females of carp and tilapia respectively) were recorded at stock of one fish/m^2, while the minimum values (0.81 ± 0.20, 1.02 ± 0.25 and 1.90 ± 0.20, 2.22 ± 0.24 respectively) were observed at stock of three fish/m^2 (Tables 44, 45 and Figures 27,28).

On the other hand, the average values of H.S.I. of the males and females of the two reared fish (silver carp and Nile tilapia) raised gradually with the increased dietary protein levels (Tables 46, 47 and Figures 29, 30). Fishes fed on diet with 40% gave highest H.S.I. values (2.12 ± 0.31, 2.47 ± 0.28 and 2.50 ± 0.18, 2.75 ± 0.23 for males and females carp and tilapia respectively), while fishes fed on diet contain 20% protein showed lowest H.S.I. values (0.89 ± 0.18, 0.95 ± 0.21 and 1.41 ± 0.23, 2.02 ± 0.28 respectively). It was found also that, H.S.I. of females was higher than that of males for the two rearing fish.

The hepatosomatic index of males and females silver carp and Nile tilapia at different initial size were summarized in tables (48,49)

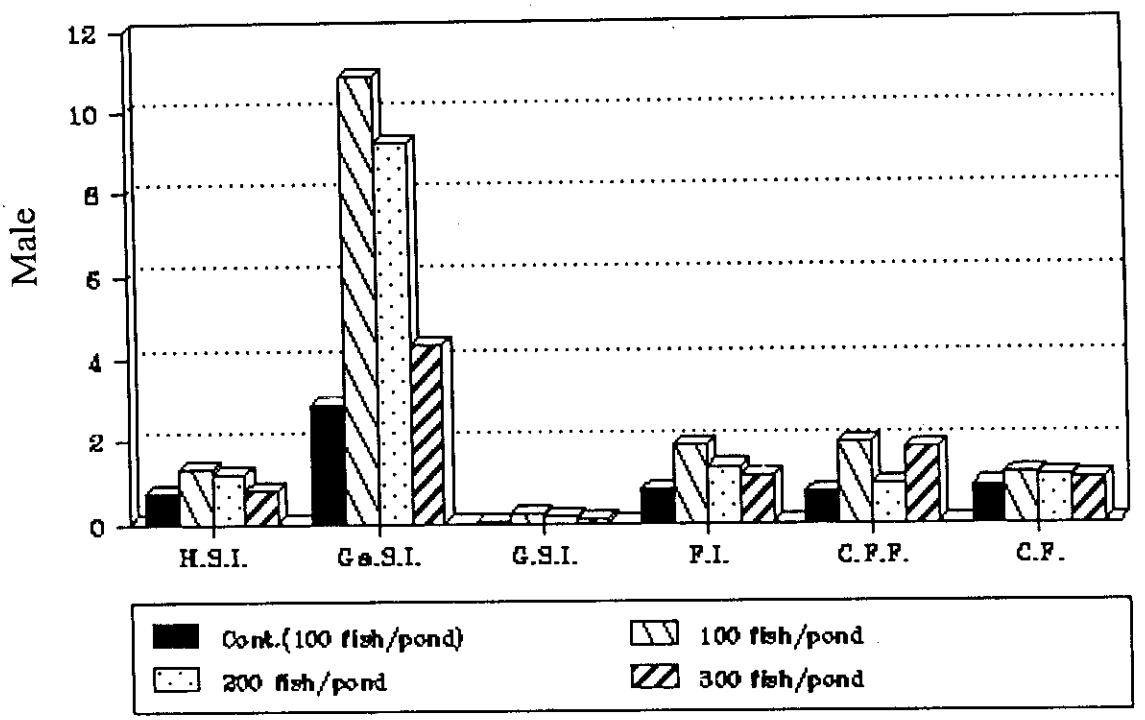
Table (44) : Effect of stocking density on biological conditions of males and females silver carp ***(H.molitrix)*** reared in earthen ponds for 244 days (Numerator is the value of male and denomirator is value of female).

Stocking density	Control (100 fish/pond)		100 fish / pond		200 fish / pond		300 fish / pond	
Item	Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
Total length (T.l)	24.15-29.70 24.21-28.33	25.12±1.38 25.27±1.25	40.11-46.00 37.37-42.35	42.21±1.88 40.51±1.92	32.12-38.02 32.30-37.14	37.66±1.18 36.00±0.57	29.80-35.02 31.52-36.70	32.35±1.33 33.12±1.29
Total weight (T.wt)	135.0-190.0 149.0-200.0	142.0±23.50 160.0±20.72	821.0-935.0 854.0-977.0	888.0±28.41 896.0±40.52	570.0-632.0 581.0-650.0	601.0±15.50 625.0±12.81	321.0-330.0 230.0-310.0	355.5±12.25 405.0±18.00
Gutted weight (G.wt)	105.0-165.0 98.5-160.0	118.0±23.50 111.5±25.00	680.0-825.0 665.0-802.0	730.0±50.00 712.0±44.00	445.0-535.0 424.0-517.0	490.0±22.50 472.0±23.21	241.0-330.0 230.0-310.0	285.0±20.00 264.0±18.50
Hepatosomatic index (H.S.I.)	0.70-0.82 0.82-1.13	0.75±0.04 0.90±0.08	0.91-1.58 1.04-1.72	1.29±0.15 1.61±0.22	0.92-1.40 1.05-1.60	1.18±0.11 1.33±0.09	0.34-1.21 0.50∘1.48	0.81±0.20 1.02±0.25
Gastrosmatic index (Ga.S.I.)	2.68-3.08 3.21-3.50	2.88±0.10 3.34±0.15	8.80-11.08 9.42-13.88	10.85±0.62 11.22±0.75	8.00-9.52 8.82-10.24	9.23±0.15 9.87±0.17	2.67-5.75 3.04-6.28	4.32±0.71 4.85±0.92
Gonadosmatic index (G.S.I.)	0.02-0.10 0.05-0.18	0.03±0.02 0.08±0.02	0.10-0.28 0.15-0.32	0.20±0.01 0.24±0.03	0.07-0.24 0.11-0.28	0.15±0.07 0.18±0.05	0.03-0.14 0.07-0.21	0.11±0.02 0.15±0.03
Food index (F.I.)	0.72-1.34 0.85-1.38	0.80±0.19 0.91±0.22	1.36-220 2.05-2.48	1.93±0.74 2.21±0.85	0.78-1.81 0.94-1.86	1.34±0.14 1.68±0.18	0.69-1.11 0.83-1.42	1.10±0.12 1.27±0.15
Condition of fish flesh (C.F.F.)	0.54-1.13 0.42-1.02	0.74±0.16 0.69±0.21	0.74-1.45 0.82-1.64	0.97±0.18 1.07±0.15	0.71-1.32 0.78-1.53	0.92±0.21 1.01±0.17	0.65-1.26 0.53-1.11	0.84±0.13 0.73±0.22
Condition factor (C.F.)	0.73-0.96 0.82-1.24	0.89±0.03 0.99±0.05	0.96-1.27 1.28-1.59	1.18±0.17 1.35±0.22	0.90-1.22 0.27-1.72	1.13±0.13 1.34±0.19	0.88-1.21 0.94-1.23	1.05±0.16 1.11±0.13

Table (45) : Effect of stocking density on biological conditions of males and females Nile tilapia (***O. niloticus***) reared in earthen ponds for 244 days (Numerator is the value of male and denomirator is value of female).

Stocking density	Control (100 fish/pond)		100 fish / pond		200 fish / pond		300 fish / pond	
Item	Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
Total length (T.l)	17.30-22.50 17.00-23.00	19.36±1.57 19.41±2.81	26.22-30.43 24.35-28.11	27.02±1.03 25.16±0.72	24.00-28.30 22.20-26.00	26.00±1.15 24.72±1.23	21.75-25.36 19.47-23.50	24.11±1.12 23.50±1.34
Total weight (T.wt)	82.0-130.0 86.0-141.0	95.0±17.50 117.0±12.32	332.0-374.0 361.0-412.0	365.0±11.50 374.0±12.31	310.0-360.0 330.0-391.0	321.0±19.50 344.0±24.11	235.0-255.0 251.0-285.0	251.5±6.75 275.3±8.84
Gutted weight (G.wt)	55.0-95.0 52.0-87.0	73.0±11.00 69.0±12.50	253.0-352.0 246.0-338.0	335.0±18.50 297.0±16.00	265.0-326.0 260.0-318.0	290.0±17.50 277.0±13.50	175.0-238.0 164.0-231.0	210.0±14.00 198.0±12.50
Hepatosomatic index (H.S.I.)	0.88-1.24 1.04-2.18	1.06±0.04 1.75±0.08	1.88-2.62 2.11-3.07	2.34±0.15 2.81±0.20	1.72-2.73 2.34-3.14	2.21±0.24 2.66±0.18	1.76-2.30 2.13-2.82	1.90±0.20 2.22±0.24
Gastrosmatic index (Ga.S.I.)	5.80-7.07 6.36-7.68	6.75±0.16 7.34±0.15	7.82-10.23 8.43-10.84	9.70±0.25 10.28±0.27	7.67-10.43 8.25-10.91	9.04±0.71 9.65±0.83	6.68-9.55 7.21-9.93	7.85±0.32 8.42±0.35
Gonadosmatic index (G.S.I.)	0.42-0.99 0.75-1.28	0.68±0.10 0.88±0.11	1.58-2.24 1.90-2.65	1.90±0.14 2.13±0.25	0.75-1.24 1.06-1.84	1.13±0.07 1.45±0.11	0.83-1.07 1.00-1.48	0.99±0.04 1.12±0.08
Food index (F.I.)	0.56-0.85 0.75-1.06	0.72±0.07 0.93±0.08	2.04-2.86 2.12-2.95	2.25±0.12 2.47±0.18	1.55-2.04 1.74-2.27	1.96±0.05 2.18±0.11	1.00-1.64 1.56-2.12	1.34±0.26 1.66±0.37
Condition of fish flesh (C.F.F.)	0.72-1.53 0.85-1.62	1.01±0.24 1.14±0.28	1.14-2.24 1.06-2.02	1.70±0.36 1.86±0.42	1.08-2.11 1.21-2.36	1.65±0.27 1.83±0.34	1.01-1.95 1.13-1.98	1.50±0.24 1.53±0.27
Condition factor (C.F.)	1.14-1.58 1.16-2.60	1.31±0.13 1.60±1.19	1.63-2.34 1.84-2.50	1.85±0.15 2.37±0.24	1.07-2.24 1.60-2.33	1.83±0.61 2.12±0.26	1.56-2.28 1.58-2.79	1.79±0.23 1.98±0.68

Fig (27): Biological conditions of males and females ***H. molitrix*** reared in earthen ponds at different stocking densities (period of 244 days).



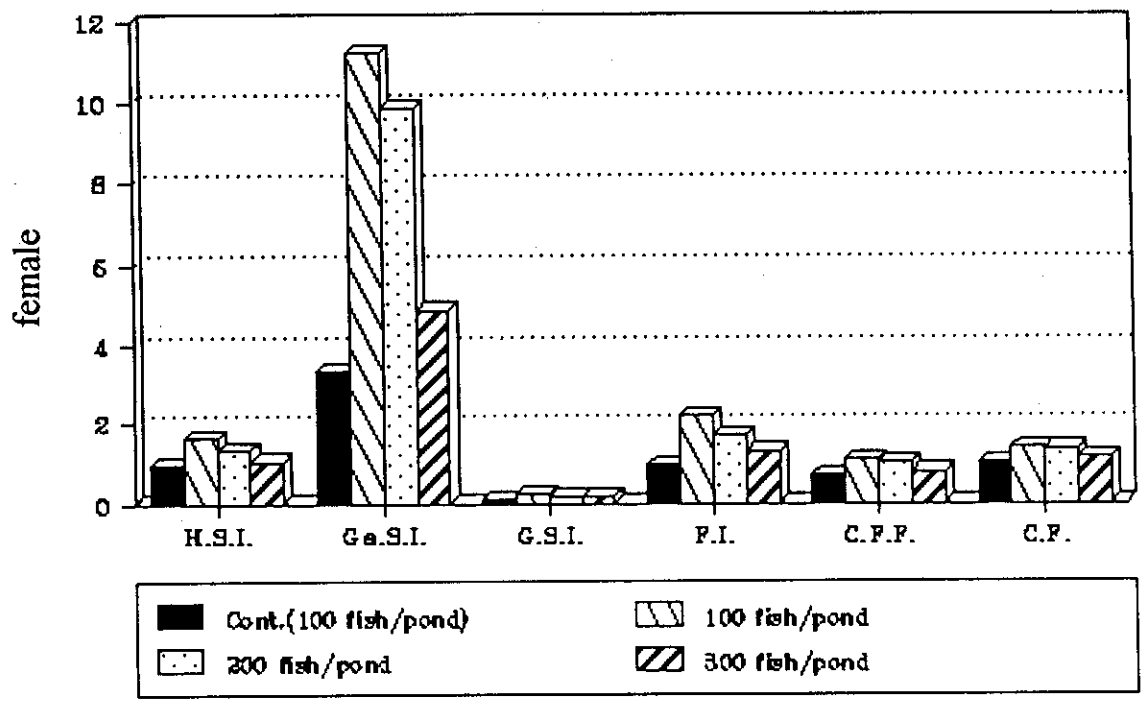
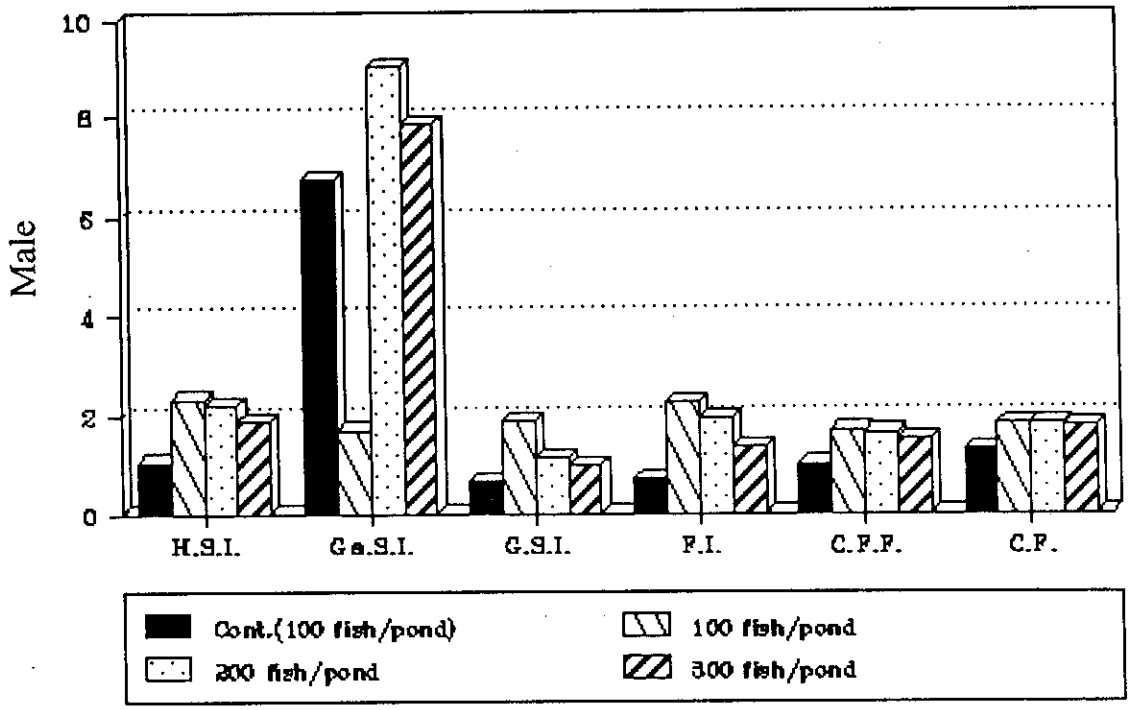
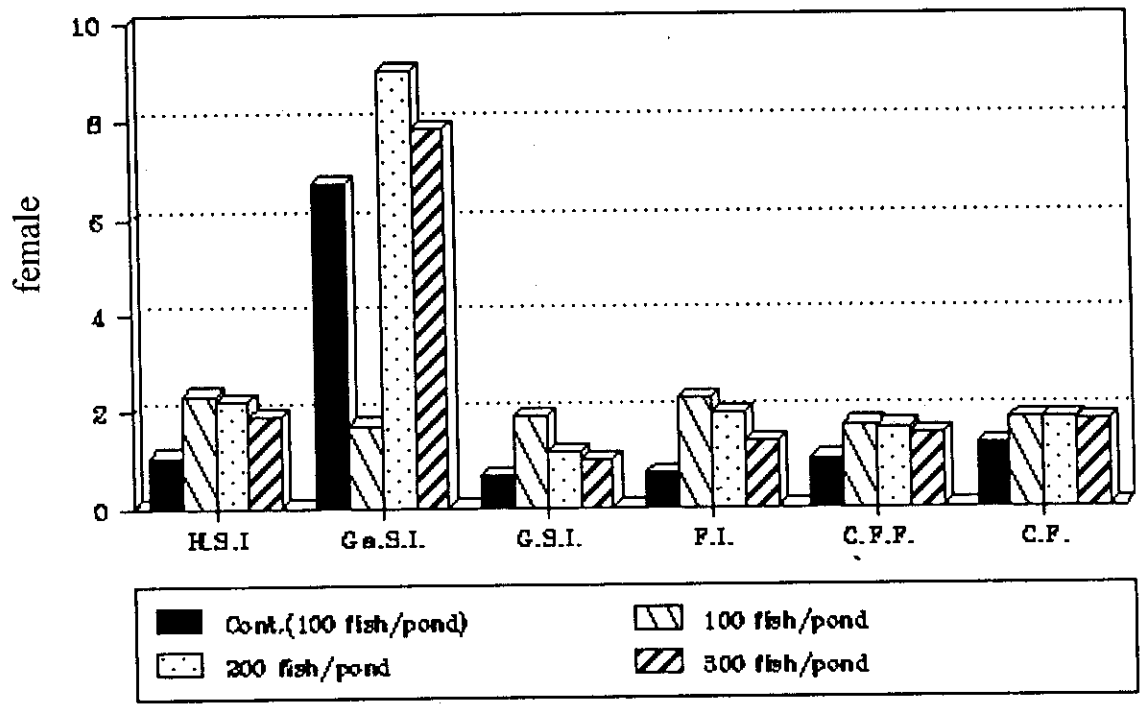


Fig (28): Biological conditions of males and females ***O.niloticus*** reared in earthen ponds at different stocking densities (period of 244 days).





and figures (31, 32). The maximum values (1.99 ± 0.21, 2.44 ± 0.33 and 2.49 ± 0.55, 2.87 ± 0.72 for males and females of carp and tilapia respectively) were recorded at the large initial size (17.56 cm, 61.05 gm for carp and 12.00 cm, 35.79 gm for tilapia). These values slightly decreased at middle initial size until it reach its minimum values (0.87 ± 0.02, 0.98 ± 0.07 and 1.19 ± 0.16, ± 1.70 ± 0.22 for male and female fishes respectively) at the smallest initial size (6.20 cm, 7.40 gm for carp and 4.30 cm, 6.85 gm for tilapia). H.S.I. was also higher in females than in males.

As shown in tables (50, 51) and figures (33, 34) the fishes fed with 5% food ration showed a highest values of H.S.I. (1.39 ± 0.23, 1.58 ± 0.35 and 2.55 ± 0.75, 3.01 ± 1.21 for males and females of carp and tilapia respectively). While the lowest values (0.92 ± 0.22, 1.06 ± 0.31 and 1.76 ± 0.21, 2.08 ± 0.36 for male and female fishes respectively) were observed at low food ration (1% of total body weight). In both rearing fish the H.S.I. values of females were higher than that of males.

1-2- Gastrosomatic index (Ga. S.I.) :

From the present study it was noticed that, the average values of Ga.S.I. of males and females ***H. molitrix*** and ***O. niloticus*** slightly increased with the increase stocking densities. Its maximum values (10.85 ± 0.62, 11.22 ± 0.75 and 9.70 ± 0.25, 10.28 ± 0.27 for males and females of carp and tilapia respectively) were recorded at lowest

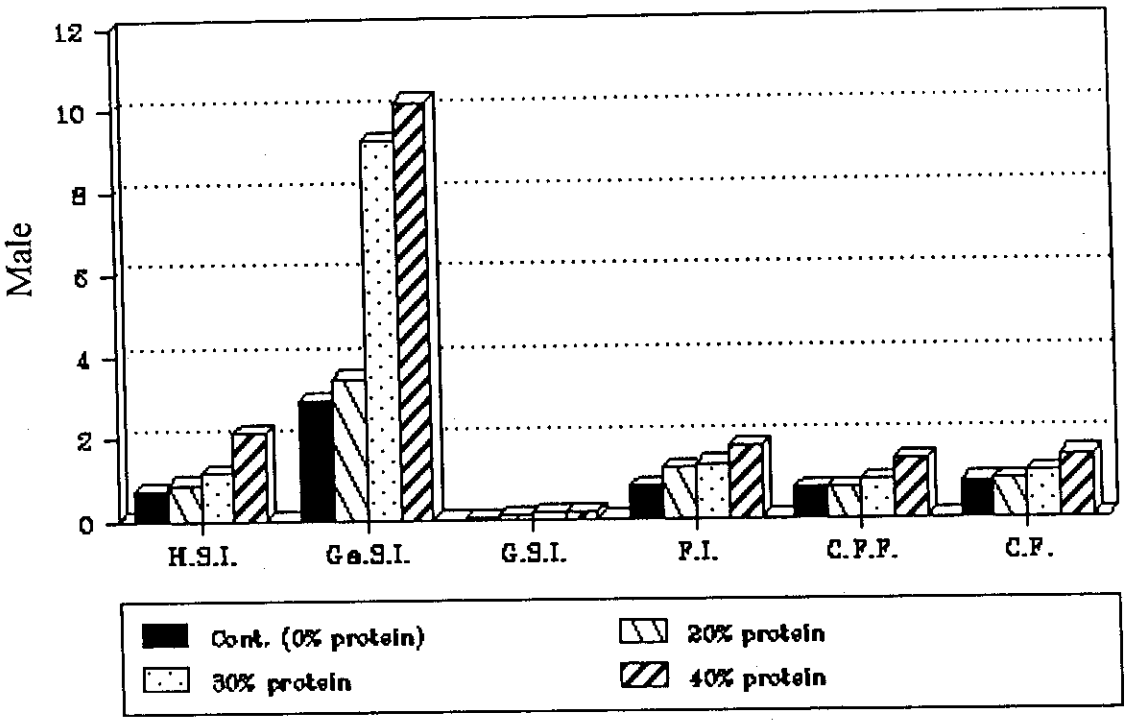
Table (46) : Effect of dietary protein level on biological conditions of males and females silver carp (***H.molitrix***) reared in earthen ponds for 244 days (Numerator is the value of male and denomirator is value of female).

Protein levels	Control (10 % protein)		20 % protein		30 % protein		40 % protein	
Item	Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
Total length (T.l)	24.15-29.70 24.21-28.33	25.12±1.38 25.27±1.25	37.33-33.00 27.20-31.11	31.00±1.42 29.10±1.65	32.12-38.02 32.30-37.14	37.66±1.18 36.00±0.57	39.82-45.17 39.22-43.00	40.20±1.48 40.11±1.44
Total weight (T.wt)	135.0-190.0 149.0-200.0	142.0±23.50 160.0±20.72	241.0-310.0 255.0-322.0	275.0±17.50 306.0±8.77	570.0-632.0 581.0-650.0	601.0±15.50 625.0±12.81	980-1045 1025-1083	996±25.51 1030±26.58
Gutted weight (G.wt)	105.0-165.0 98.5-160.0	118.0±23.50 111.5±25.00	205.0-238.0 218.5-241.0	221.0±8.50 225.0±6.70	445.0-535.0 424.0-517.0	490.0±22.50 472.0±23.21	900.0-952.0 887.0-930.0	945.0±22.50 942.0±21.00
Hepatosomatic index (H.S.I.)	0.70-0.82 0.82-1.13	0.75±0.04 0.90±0.08	0.57-0.92 0.62-1.28	0.89±0.18 0.95±0.21	0.92-1.40 1.05-1.60	1.18±0.11 1.33±0.09	1.64-2.54 1.88-2.77	2.12±0.31 2.47±0.28
Gastrosmatic index (Ga.S.I.)	2.68-3.08 3.21-3.50	2.88±0.10 3.34±0.15	2.77-4.92 2.95-5.86	3.45±0.73 3.78±1.02	8.00-9.52 8.82-10.24	9.23±0.15 9.87±0.17	8.43-11.22 8.72-11.63	10.16±1.03 10.62±1.14
Gonadosmatic index (G.S.I.)	0.02-0.10 0.05-0.18	0.03±0.02 0.08±0.02	0.03-0.15 0.08-0.19	0.11±0.02 0.14±0.03	0.07-0.24 0.11-0.28	0.15±0.07 0.18±0.05	0.05-0.28 0.09-0.34	0.18±0.07 0.24±0.11
Food index (F.I.)	0.72-1.34 0.85-1.38	0.80±0.19 0.91±0.22	0.85-1.88 1.12-1.93	1.25±0.18 1.46±0.22	0.78-1.81 0.94-1.86	1.34±0.14 1.68±0.18	0.92-2.04 1.31-2.28	1.75±0.21 1.94±0.28
Condition of fish flesh (C.F.F.)	0.54-1.13 0.42-1.02	0.74±0.16 0.69±0.21	0.55-1.14 0.65-1.37	0.74±0.18 0.91±0.24	0.71-1.32 0.78-1.53	0.92±0.21 1.01±0.17	0.96-1.74 0.94-1.72	1.45±0.24 1.43±0.23
Condition factor (C.F.)	0.73-0.96 0.82-1.24	0.89±0.03 0.99±0.05	0.86-1.18 1.07-1.27	0.92±0.13 1.24±0.02	0.90-1.22 0.27-1.72	1.13±0.13 1.34±0.19	1.33-1.84 1.36-1.70	1.53±0.06 1.59±0.05

Table (47) : Effect of dietary protein level on biological conditions of males and females Nile tilapia (*O. niloticus*) reared in earthen ponds for 244 days (Numerator is the value of male and denomirator is value of female).

Protein level	Control (0 % protein)		20 % protein		30 % protein		40 % protein	
Item	Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
Total length (T.l)	17.30-22.50 17.00-23.00	19.36±1.57 19.41±2.81	19.00-25.00 19.22-25.20	23.00±1.55 23.50±1.62	24.00-28.30 22.20-26.00	26.00±1.15 24.72±1.23	23.30-27.00 23.60-27.32	25.00±1.50 25.65±1.33
Total weight (T.wt)	82.0-130.0 86.0-141.0	95.0±17.50 117.0±12.32	180.0-240.0 210.0-251.0	204.0±18.21 230.0±4.56	310.0-360.0 330.0-391.0	321.0±19.50 344.0±24.11	251.0-310.0 272.0-333.0	271.0±16.72 307.0±14.25
Gutted weight (G.wt)	55.0-95.0 52.0-87.0	73.0±11.00 69.0±12.50	155.0-184.0 160.0-203.0	164.0±8.50 178.5±9.40	265.0-326.0 260.0-318.0	290.0±17.50 277.0±13.50	230.0-273.0 221.0-262.0	248.0±12.50 240.0±14.20
Hepatosomatic index (H.S.I.)	0.88-1.24 1.04-2.18	1.06±0.04 1.75±0.08	1.15-1.80 1.37-2.15	1.41±0.23 2.02±0.28	1.72-2.73 2.34-3.14	2.21±0.24 2.66±0.18	1.28-3.14 1.57-1.66	2.50±0.18 2.75±0.23
Gastrosmatic index (Ga.S.I.)	5.80-7.07 6.36-7.68	6.75±0.16 7.34±0.15	7.88-10.75 8.30-11.41	8.42±0.71 8.91±0.65	7.67-10.43 8.25-10.91	9.04±0.71 9.65±0.83	7.91-11.03 8.46-11.63	9.72±0.65 10.23±0.87
Gonadosmatic index (G.S.I.)	0.42-0.99 0.75-1.28	0.68±0.10 0.88±0.11	0.68-0.93 0.95-1.26	0.77±0.13 1.04±0.16	0.75-1.24 1.06-1.84	1.13±0.07 1.45±0.11	1.58-2.82 1.87-3.14	1.99±0.42 2.21±0.56
Food index (F.I.)	0.56-0.85 0.75-1.06	0.72±0.07 0.93±0.08	0.85-1.76 0.90-1.87	1.33±0.21 1.45±0.24	1.55-2.04 1.74-2.27	1.96±0.05 2.18±0.11	0.64-1.88 0.95-2.70	1.54±0.41 1.76±0.43
Condition of fish flesh (C.F.F.)	0.72-1.53 0.85-1.62	1.01±0.24 1.14±0.28	0.92-1.88 0.97-1.94	1.35±0.41 1.38±0.45	1.08-2.11 1.21-2.36	1.65±0.27 1.83±0.34	1.06-2.15 1.08-2.24	1.39±0.38 1.42±0.36
Condition factor (C.F.)	1.14-1.58 1.16-2.60	1.31±0.13 1.60±1.19	1.23-2.02 1.41-2.14	1.68±0.56 1.77±0.21	1.07-2.24 1.60-2.33	1.83±0.61 2.12±0.26	1.57-2.18 1.63-2.25	1.73±0.33 1.82±0.26

Fig (29): Biological conditions of males and females *H. molitrix* reared in earthen ponds at different dietary protein levels (period of 244 days).



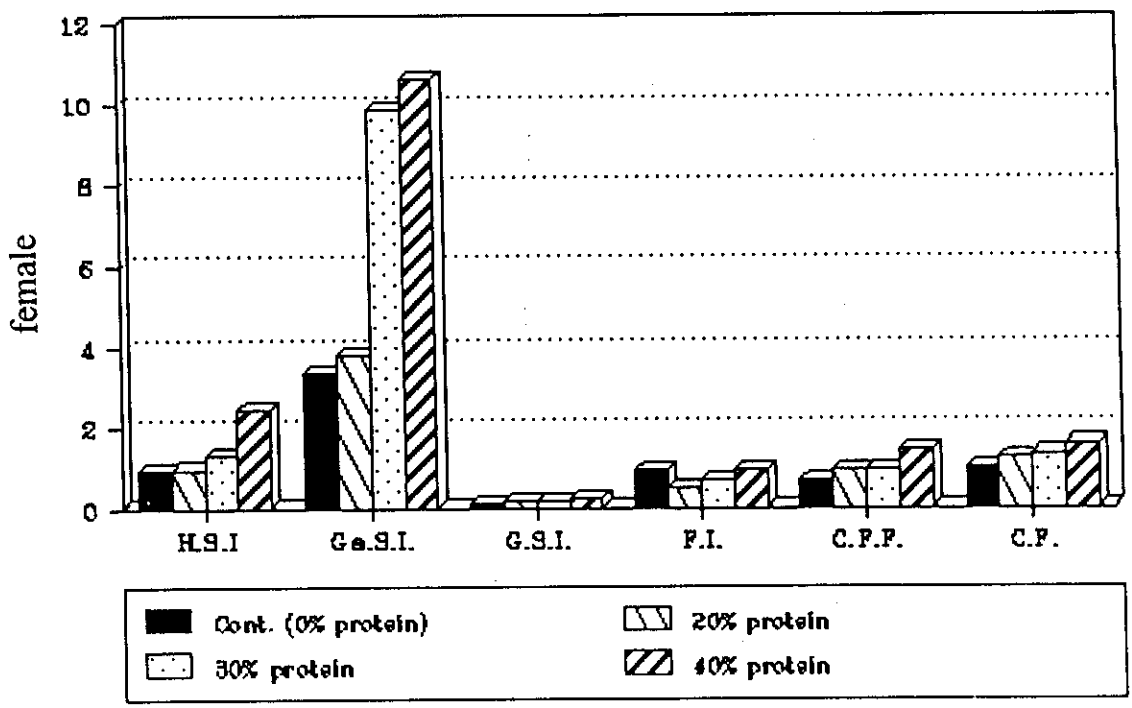
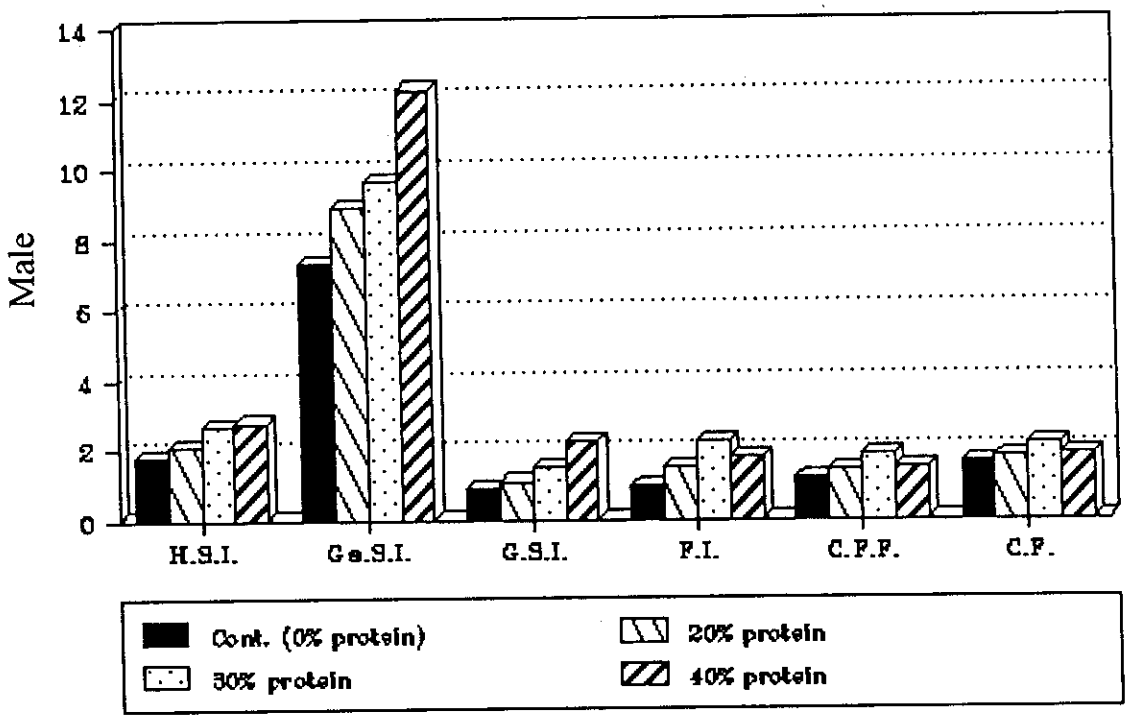
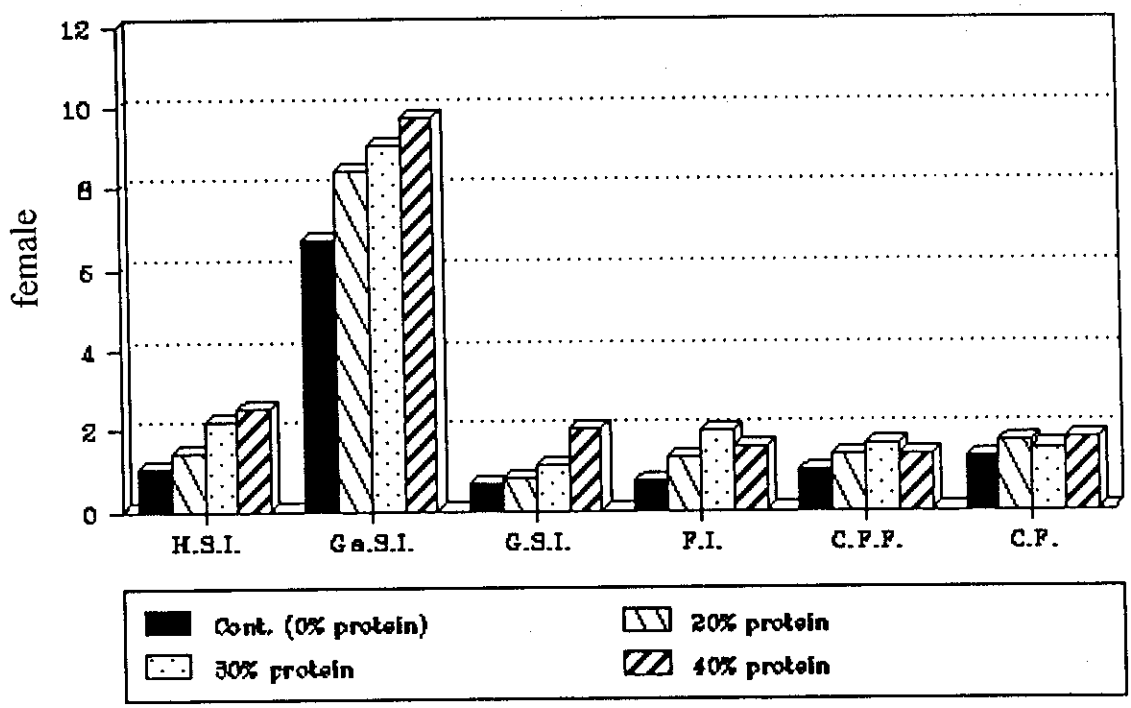


Fig (30): Biological conditions of males and females ***O.niloticus*** rearęd in earthen ponds at different dietary protein levels (period of 244 days).





stocking density (one fish/m^2), while the minimum values (4.32 ± 0.71, 4.85 ± 0.92 and 7.85 ± 0.33, 8.42 ± 0.35 respectively) were observed at highest stocking density (Tables 44, 45 and Figuers 27, 28).

On the other hand, the Ga.S.I. values of male and female fishes were elevated gradually with the increased dietary protein levels (Tables 46, 47 and Figuers 29, 30). Fishes fed on diet with 40% protein gave highest Ga.S.I. values (10.16 ± 1.03, 10.62 ± 1.14 and 9.72 ± 0.65, 10.23 ± 0.87 for males and females carp and tilapia respectively), while fishes fed on diet contain 20% protein showed a lowest Ga.S.I. values (3.45 ± 0.73, 3.78 ± 1.02 and 8.42 ± 0.71, 8.91 ± 0.65 respectively).

Similarly, the gastrosomatic index of males and females increased gradually with the increased initial size of reared carp and tilapia. The maximum values (9.98 ± 0.87 ± 10.32 ± 1.04 and 9.70 ± 1.22, 10.33 ± 1.62 for males and females of silver carp and Nile tilapia respectively) were recorded at large initial size (17.56 cm, 61.05 gm for carp and 12.00 cm, 35.79 gm for tilapia). This values slightly decreased at middle initial size until it reach its minimum values (3.83 ± 0.22, 4.22 ± 0.45 and 8.33 ± 1.52, 8.92 ± 2.04 respectively) at smallest initial size (6.20 cm, 7.40 gm for carp and 4.30 cm, 6.85 gm for tilapia) tables (48, 49) and figures (31, 32).

Table (48) : Effect of initial size on biological conditions of males and females silver carp (***H.molitrix***) reared in earthen ponds for 244 days (Numerator is the value of male and denomirator is value of female).

Initial size	Cont.(12.16cm, 21.75gm)		6.20 cm , 7.40 gm		12.16 cm , 21.75 gm		17.56 cm , 61.05 gm	
Item	Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
Total length (T.l)	24.15-29.70 24.21-28.33	25.12±1.38 25.27±1.25	23.42-28.73 22.14-26.00	26.20±1.26 25.35±1.04	32.12-38.02 32.30-37.14	37.66±1.18 36.00±0.57	42.00-47.22 39.50-45.36	44.50±1.78 42.11±1.62
Total weight (T.wt)	135.0-190.0 149.0-200.0	142.0±23.50 160.0±20.72	186.0-223.0 200.0-237.0	195.5±10.00 210.0±8.75	570.0-632.0 581.0-650.0	601.0±15.50 625.0±12.81	968-1045 1087-1190	1013±22.60 1140±34.00
Gutted weight (G.wt)	105.0-165.0 98.5-160.0	118.0±23.50 111.5±25.00	145.0-210.0 150.0-212.0	156.0±22.43 155.0±23.11	445.0-535.0 424.0-517.0	490.0±22.50 472.0±23.21	943-1000 930.0-982.0	964.0±18.50 951.0±19.12
Hepatosomatic index (H.S.I.)	0.70-0.82 0.82-1.13	0.75±0.04 0.90±0.08	0.55-0.91 0.64-1.17	0.87±0.02 0.98±0.07	0.92-1.40 1.05-1.60	1.18±0.11 1.33±0.09	1.61-2.42 1.87-2.75	1.99±0.21 2.44±0.33
Gastrosmatic index (Ga.S.I.)	2.68-3.08 3.21-3.50	2.88±0.10 3.34±0.15	2.45-4.25 2.77-4.60	3.83±0.22 4.22±0.45	8.00-9.52 8.82-10.24	9.23±0.15 9.87±0.17	8.75-10.23 9.04-10.61	9.98±0.87 10.32±1.04
Gonadosmatic index (G.S.I.)	0.02-0.10 0.05-0.18	0.03±0.02 0.08±0.02	0.03-0.12 0.07-0.23	0.04±0.02 0.11±0.08	0.07-0.24 0.11-0.28	0.15±0.07 0.18±0.05	0.14-0.24 0.18-0.31	0.20±0.06 0.25±0.11
Food index (F.I.)	0.72-1.34 0.85-1.38	0.80±0.19 0.91±0.22	0.86-1.65 1.04-1.78	1.12±0.21 1.34±0.35	0.78-1.81 0.94-1.86	1.34±0.14 1.68±0.18	0.90-1.83 1.24-2.11	1.64±0.18 1.82±0.21
Condition of fish flesh (C.F.F.)	0.54-1.13 0.42-1.02	0.74±0.16 0.69±0.21	0.64-1.25 0.72-1.37	0.87±0.22 0.95±0.26	0.71-1.32 0.78-1.53	0.92±0.21 1.01±0.17	0.81-1.42 0.97-1.65	1.09±0.37 1.27±0.35
Condition factor (C.F.)	0.73-0.96 0.82-1.24	0.89±0.03 0.99±0.05	0.95-1.45 1.05-1.64	1.08±0.12 1.29±0.17	0.90-1.22 0.27-1.72	1.13±0.13 1.34±0.19	0.99-1.33 1.27-1.76	1.15±0.09 1.53±0.11

Table (49) : Effect of initial size on biological conditions of males and females Nile tilapia (*O. niloticus*) reared in earthen ponds for 244 days (Numerator is the value of male and denomirator is value of female).

Initial size	Cont.(9.00cm, 15.24gm)		4.30 cm , 6.85 gm		9.00 cm, 15.24 gm		12.00 cm, 35.79 gm	
Item	Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
Total length (T.l)	17.30-22.50 17.00-23.00	19.36±1.57 19.41±2.81	20.00-26.50 23.50-25.83	24.00±1.76 23.50±1.85	24.00-28.30 22.20-26.00	26.00±1.15 24.72±1.23	25.44-31.04 24.17-29.46	27.50±2.33 26.00±1.65
Total weight (T.wt)	82.0-130.0 86.0-141.0	95.0±17.50 117.0±12.32	176.5-224.0 192.0-244.0	208.0±13.55 213.0±21.11	310.0-360.0 330.0-391.0	321.0±19.50 344.0±24.11	364.0-428.0 372.0-431.0	405.0±15.50 416.0±17.34
Gutted weight (G.wt)	55.0-95.0 52.0-87.0	73.0±11.00 69.0±12.50	152.0-212.0 160.0-205.0	165.0±13.50 171.0±14.25	265.0-326.0 260.0-318.0	290.0±17.50 277.0±13.50	322.0-407.0 304.0-381.0	386.0±11.80 352.0±13.75
Hepatosomatic index (H.S.I.)	0.88-1.24 1.04-2.18	1.06±0.04 1.75±0.08	0.88-1.51 1.56-2.04	1.19±0.16 1.70±0.22	1.72-2.73 2.34-3.14	2.21±0.24 2.66±0.18	1.46-3.12 1.85-3.56	2.49±0.55 2.87±0.72
Gastrosmatic index (Ga.S.I.)	5.80-7.07 6.36-7.68	6.75±0.16 7.34±0.15	6.17-11.12 6.78-11.83	8.33±1.52 8.92±2.04	7.67-10.43 8.25-10.91	9.04±0.71 9.65±0.83	7.15-10.90 7.72-11.64	9.70±1.22 10.33±1.62
Gonadosmatic index (G.S.I.)	0.42-0.99 0.75-1.28	0.68±0.10 0.88±0.11	0.48-1.25 0.69-1.32	0.95±0.16 1.17±0.18	0.75-1.24 1.06-1.84	1.13±0.07 1.45±0.11	1.55-2.38 1.82-2.67	1.98±0.21 2.26±0.43
Food index (F.I.)	0.56-0.85 0.75-1.06	0.72±0.07 0.93±0.08	1.12-1.77 1.30-1.92	1.41±0.15 1.67±0.16	1.55-2.04 1.74-2.27	1.96±0.05 2.18±0.11	1.87-2.54 1.94-2.22	2.13±0.20 2.27±0.18
Condition of fish flesh (C.F.F.)	0.72-1.53 0.85-1.62	1.01±0.24 1.14±0.28	0.86-1.66 0.94-1.81	1.19±0.32 1.32±0.41	1.08-2.11 1.21-2.36	1.65±0.27 1.83±0.34	1.34-2.37 1.56-2.63	1.86±0.51 2.00±0.48
Condition factor (C.F.)	1.14-1.58 1.16-2.60	1.31±0.13 1.60±1.19	1.22-1.92 1.38-2.15	1.50±0.39 1.64±0.77	1.07-2.24 1.60-2.33	1.83±0.61 2.12±0.26	1.53-2.81 1.43-2.94	1.95±0.24 2.37±0.43

Fig (31): Biological conditions of males and females ***H. molitrix*** reared in earthen ponds at different initial sizes (period of 244 days).

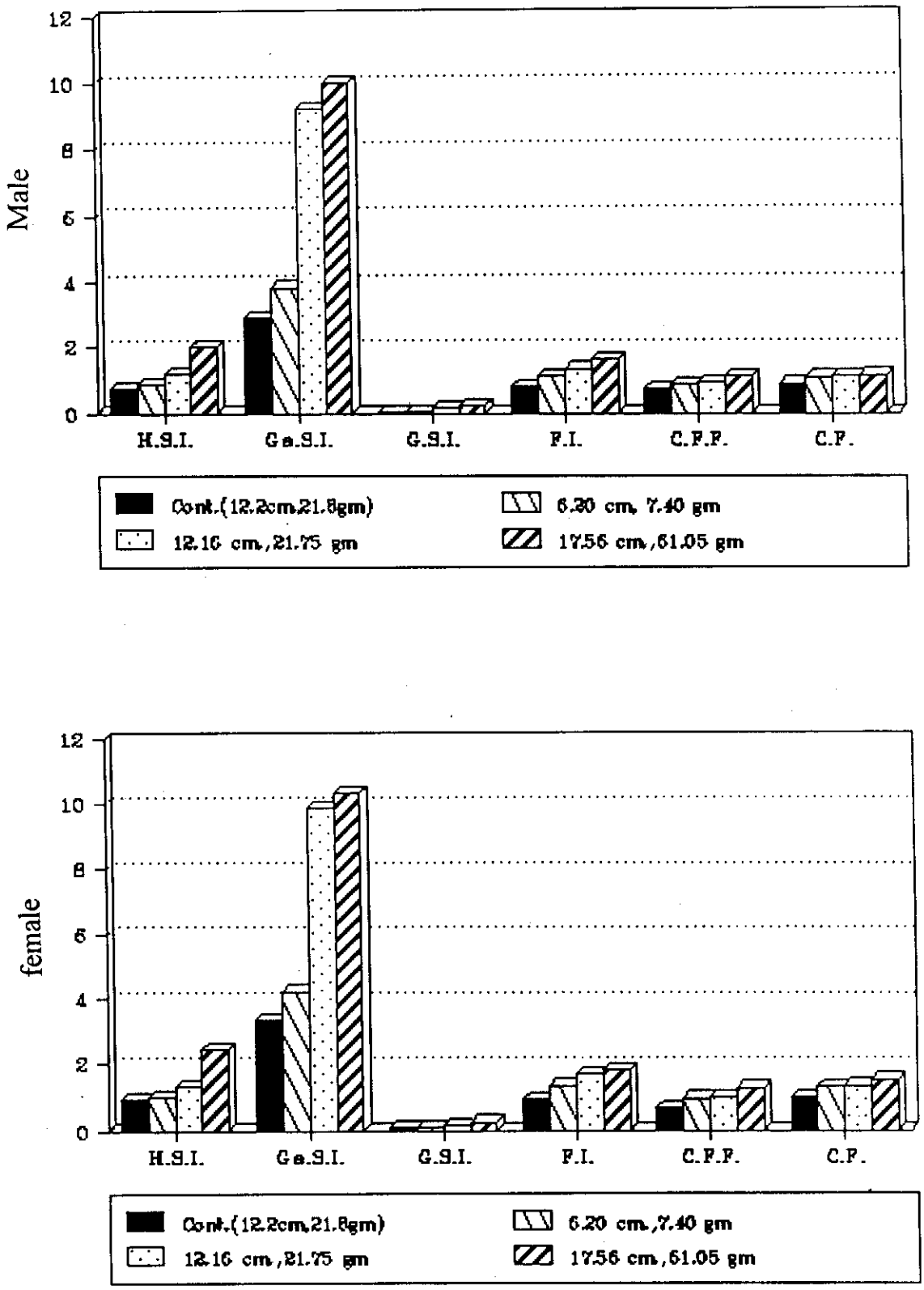
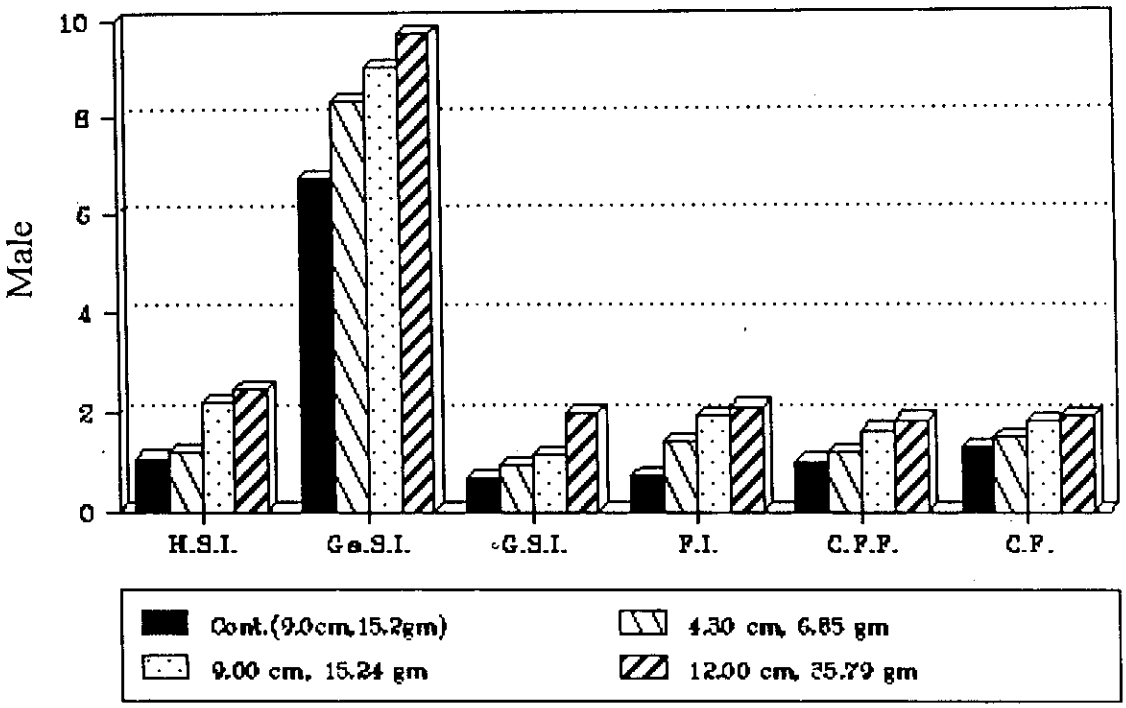
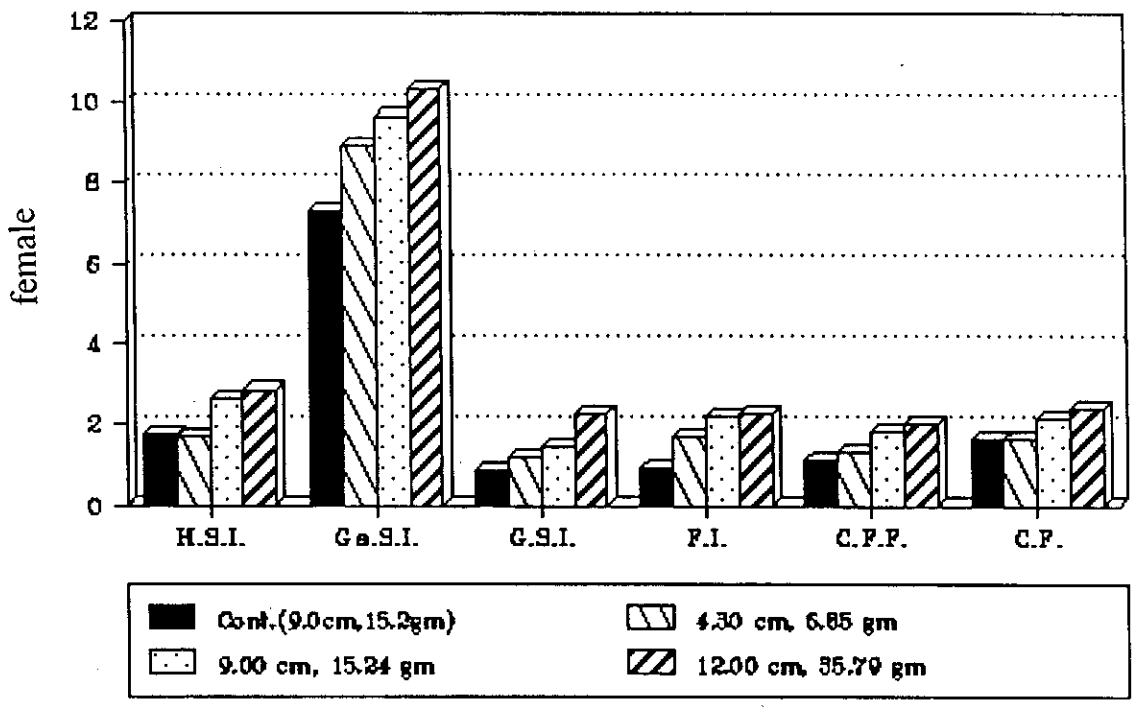


Fig (32): Biological conditions of males and females ***O.niloticus*** reared in earthen ponds at different initial sizes (period of 244 days).





As shown in tables (50, 51) and figures (33, 34) the fishes fed with 5% food ration showed highest values of Ga.S.I. (11.02 ± 1.06, 11.36 ± 1.12 and 9.62 ± 1.55, 10.27 ± 1.82 for males and females of ***H. molitrix*** and ***O. niloticus*** respectively). While its lowest values (4.30 ± 1.05, 4.62 ± 1.17 and 8.51 ± 1.73, 9.22 ± 1.88 respectively) were observed in fishes fed with 1% ration.

In both rearing fish (carp and tilapia) the Ga.S.I. values were higher in female than that in male fishes and control groups gave a values of 2.88 ± 0.10, 3.34 ± 0.15 and 6.75 ± 0.16, 7.34 ± 0.15 for males and females of silver carp and Nile tilapia respectively.

1-3- Gonadosomatic index (G.S.I.) :

The present data indicate that, there are no significant differences between G.S.I. values of either males and or females of silver carp at different stocking densities. While in Nile tilapia the G.S.I. values of males and females slightly increased with the increase of stocking density, its maximum values (1.90 ± 0.14, 2.13 ± 0.25 for male and female respectively) were recorded at lowest stock (one fish/m^2) and the minimum values (0.99 ± 0.04 and 1.12 ± 0.08 respectively) were observed at highest stock (three fish/m^2), tables (44, 45) and figures (27, 28).

Likewise, at different dietary protein level also there are no significant differences between the G.S.I. values of males and females

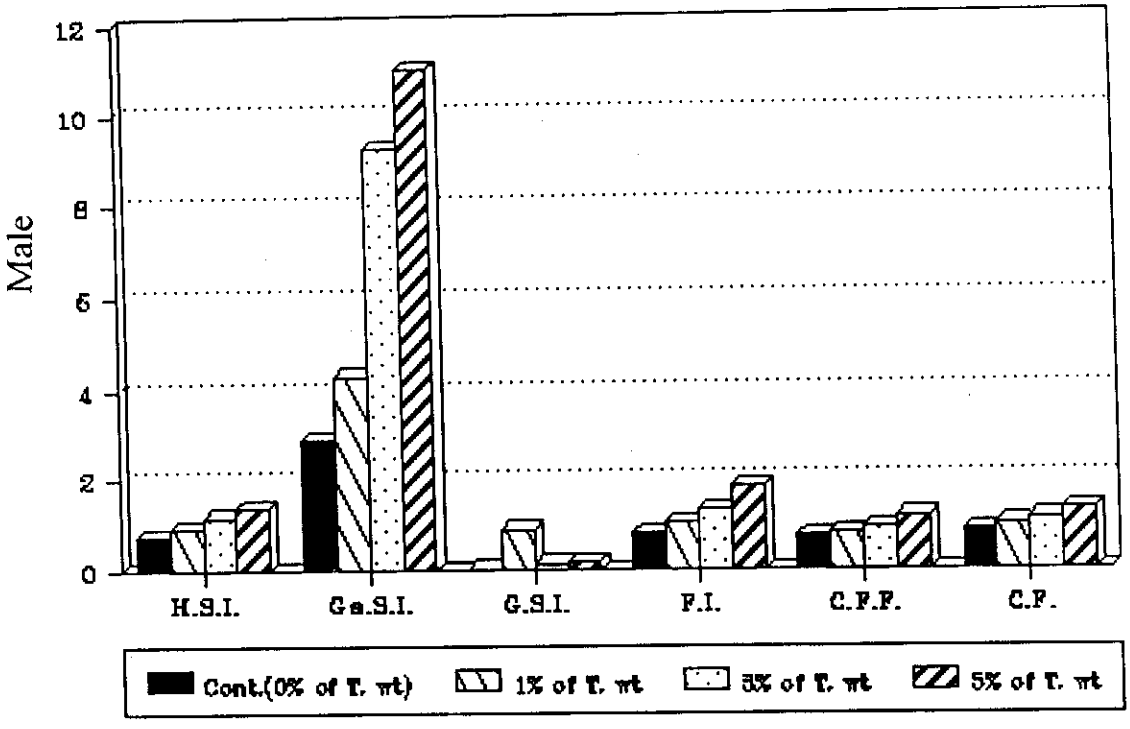
Table (50) : Effect of food ration on biological conditions of males and females silver carp (***H.molitrix***) reared in earthen ponds for 244 days (Numerator is the value of male and denomirator is value of female).

Food ration	Control (0 % of T.wt)		1 % of T.wt		3 % of T.wt		5 % of T .wt	
Item	Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
Total length	24.15-29.70	25.12±1.38	28.76-33.20	32.50±1.21	32.12-38.02	37.66±1.18	37.75-43.11	39.35±1.68
(T.l)	24.21-28.33	25.27±1.25	28.24-32.65	31.40±1.36	32.30-37.14	36.00±0.57	35.26-41.55	38.21±1.72
Total weight	135.0-190.0	142.0±23.50	312.0-376.0	345.0±15.50	570.0-632.0	601.0±15.50	765.0-831.0	798.0±16.50
(T.wt)	149.0-200.0	160.0±20.72	332.0-418.0	376.0±22.35	581.0-650.0	625.0±12.81	764.0-865.0	814.0±25.50
Gutted weight	105.0-165.0	118.0±23.50	255.0-311.0	270.0±23.50	445.0-535.0	490.0±22.50	725.0-752.0	727.0±13.50
(G.wt)	98.5-160.0	111.5±25.00	260.5-321.0	275.0±21.00	424.0-517.0	472.0±23.21	704.0-734.0	705.0±11.20
Hepatosomatic	0.70-0.82	0.75±0.04	0.72-1.12	0.92±0.22	0.92-1.40	1.18±0.11	0.71-1.51	1.39±0.23
index (H.S.I.)	0.82-1.13	0.90±0.08	0.83-1.25	1.06±0.31	1.05-1.60	1.33±0.09	0.92-1.75	1.58±0.35
Gastrosmatic	2.68-3.08	2.88±0.10	3.15-6.42	4.30±1.05	8.00-9.52	9.23±0.15	9.72-13.17	11.02±1.06
index (Gs.S.I.)	3.21-3.50	3.34±0.15	3.46-6.73	4.62±1.17	8.82-10.24	9.87±0.17	10.02-13.48	11.36±1.12
Gonadosmatic	0.02-0.10	0.03±0.02	0.04-0.15	0.09±0.03	0.07-0.24	0.15±0.07	0.12-0.24	0.18±0.05
index (G.S.I.)	0.05-0.18	0.08±0.02	0.09-0.24	0.14±0.08	0.11-0.28	0.18±0.05	0.16-0.28	0.22±0.07
Food index	0.72-1.34	0.80±0.19	0.91-1.45	1.03±0.25	0.78-1.81	1.34±0.14	0.82-1.45	1.83±0.22
(F.I.)	0.85-1.38	0.91±0.22	1.18-1.67	1.36±0.32	0.94-1.86	1.68±0.18	1.37-2.28	1.96±0.25
Condition of fish	0.54-1.13	0.74±0.16	0.56-1.18	0.79±0.14	0.71-1.32	0.92±0.21	0.86-1.44	1.19±0.33
flesh (C.F.F.)	0.42-1.02	0.69±0.21	0.62-1.31	0.89±0.22	0.78-1.53	1.01±0.17	0.93-1.61	1.26±0.42
Condition factor	0.73-0.96	0.89±0.03	1.03-1.32	1.01±0.07	0.90-1.22	1.13±0.13	1.14-1.58	1.31±0.09
(C.F.)	0.82-1.24	0.99±0.05	1.05-1.47	1.21±0.08	0.27-1.72	1.34±0.19	1.25-1.76	1.46±0.05

Table (51) : Effect of food ration on biological conditions of males and females Nile tilapia (*O. niloticus*) reared in earthen ponds for 244 days (Numerator is the value of male and denomirator is value of female).

Food ration	Control (0 % of T.wt)		1 % of T.wt		3 % of T.wt		5 % of T.wt	
Item	Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
Total length	17.30-22.50	19.36±1.57	21.23-25.41	25.00±1.22	24.00-28.30	26.00±1.15	25.41-29.65	26.27±1.88
(T.l)	17.00-23.00	19.41±2.81	18.74-23.67	24.43±1.38	22.20-26.00	24.72±1.23	24.02-28.41	25.00±1.72
Total weight	82.0-130.0	95.0±17.50	235.0-297.0	268.0±15.11	310.0-360.0	321.0±19.50	305.0-376.0	344.0±17.55
(T.wt)	86.0-141.0	117.0±12.32	254.0-336.0	291.0±21.02	330.0-391.0	344.0±24.11	317.0-392.0	357.0±20.32
Gutted weight	55.0-95.0	73.0±11.00	225.0-274.0	236.0±14.00	265.0-326.0	290.0±17.50	270.0-333.0	300.0±16.50
(G.wt)	52.0-87.0	69.0±12.50	218.0-268.0	230.0±12.50	260.0-318.0	277.0±13.50	361.0-310.0	295.0±14.20
Hepatosomatic	0.88-1.24	1.06±0.04	1.25-1.18	1.76±0.21	1.72-2.73	2.21±0.24	1.66-3.82	2.55±0.75
index (H.S.I.)	1.04-2.18	1.75±0.08	1.86-2.75	2.08±0.36	2.34-3.14	2.66±0.18	2.02-4.21	3.01±1.21
Gastrosmatic	5.80-7.07	6.75±0.16	6.83-11.00	8.51±1.73	7.67-10.43	9.04±0.71	8.75-12.22	9.62±1.55
index (Ga.S.I.)	6.36-7.68	7.34±0.15	7.45-11.62	9.22±1.88	8.25-10.91	9.65±0.83	9.37-12.81	10.27±1.82
Gonadosmatic	0.42-0.99	0.68±0.10	0.52-1.34	0.95±0.20	0.75-1.24	1.13±0.07	1.51-2.33	1.94±0.18
index (G.S.I.)	0.75-1.28	0.88±0.11	0.75-1.56	1.27±0.28	1.06-1.84	1.45±0.11	1.83-2.65	2.27±0.26
Food index	0.56-0.85	0.72±0.07	1.08-1.65	1.38±0.15	1.55-2.04	1.96±0.05	1.71-2.46	2.15±0.32
(F.I.)	0.75-1.06	0.93±0.08	1.35-2.02	1.74±0.18	1.74-2.27	2.18±0.11	1.80-2.52	2.39±0.82
Condition of fish	0.72-1.53	1.01±0.24	0.98-1.86	1.51±0.31	1.08-2.11	1.65±0.27	1.10-2.14	1.65±0.28
flesh (C.F.F.)	0.85-1.62	1.14±0.28	1.02-1.91	1.58±0.36	1.21-2.36	1.83±0.34	1.28-2.45	1.89±1.41
Condition factor	1.14-1.58	1.31±0.13	1.38-2.15	1.71±0.19	1.07-2.24	1.83±0.61	1.45-2.46	1.91±0.13
(C.F.)	1.16-2.60	1.60±0.19	1.53-2.56	1.99±0.92	1.60-2.33	2.12±0.26	1.68-2.73	2.28±0.24

Fig (33): Biological conditions of males and females ***H. molitrix*** reared in earthen ponds at different food rations (period of 244 days).



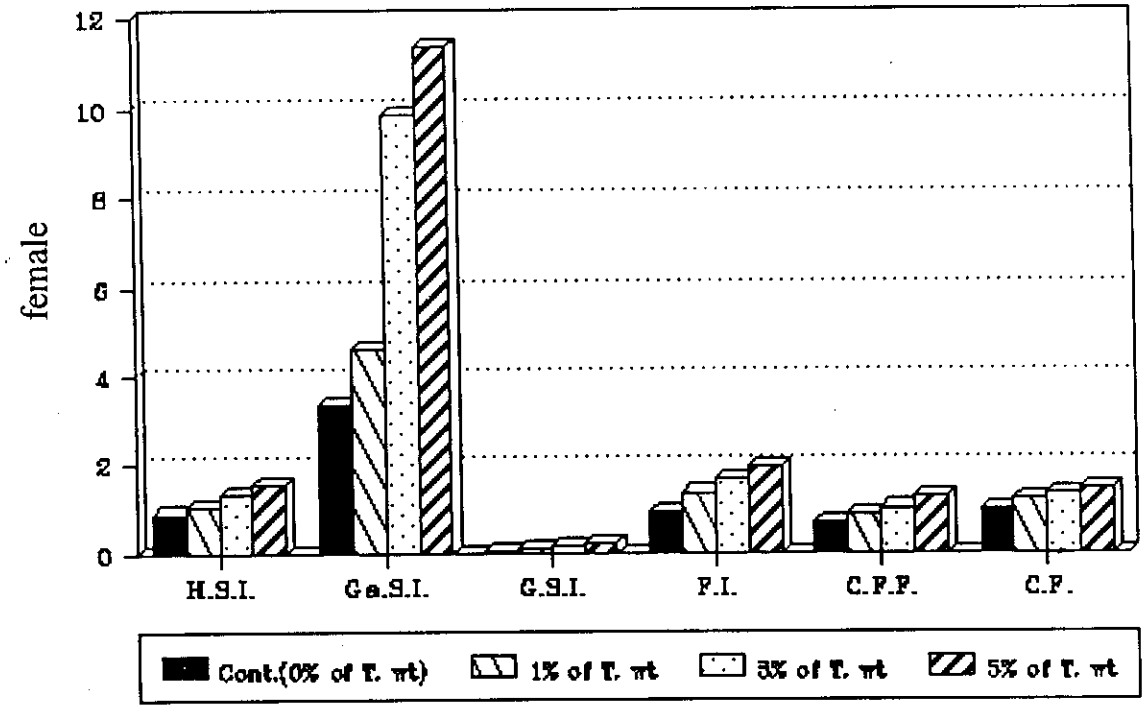
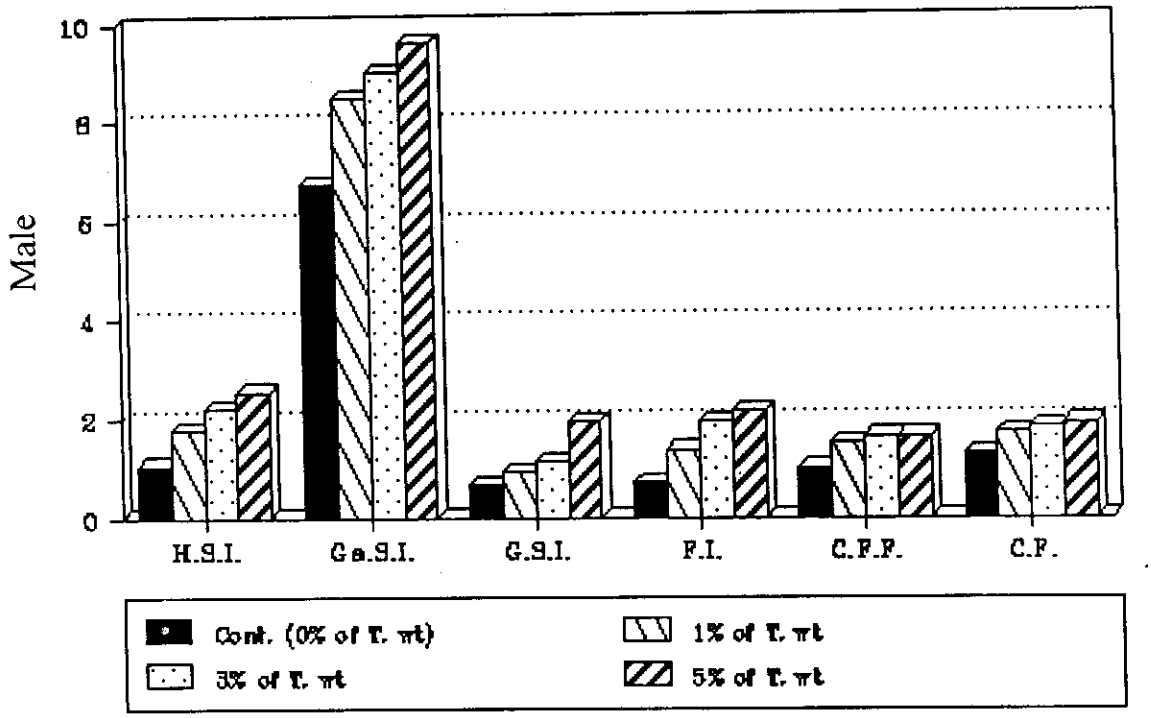
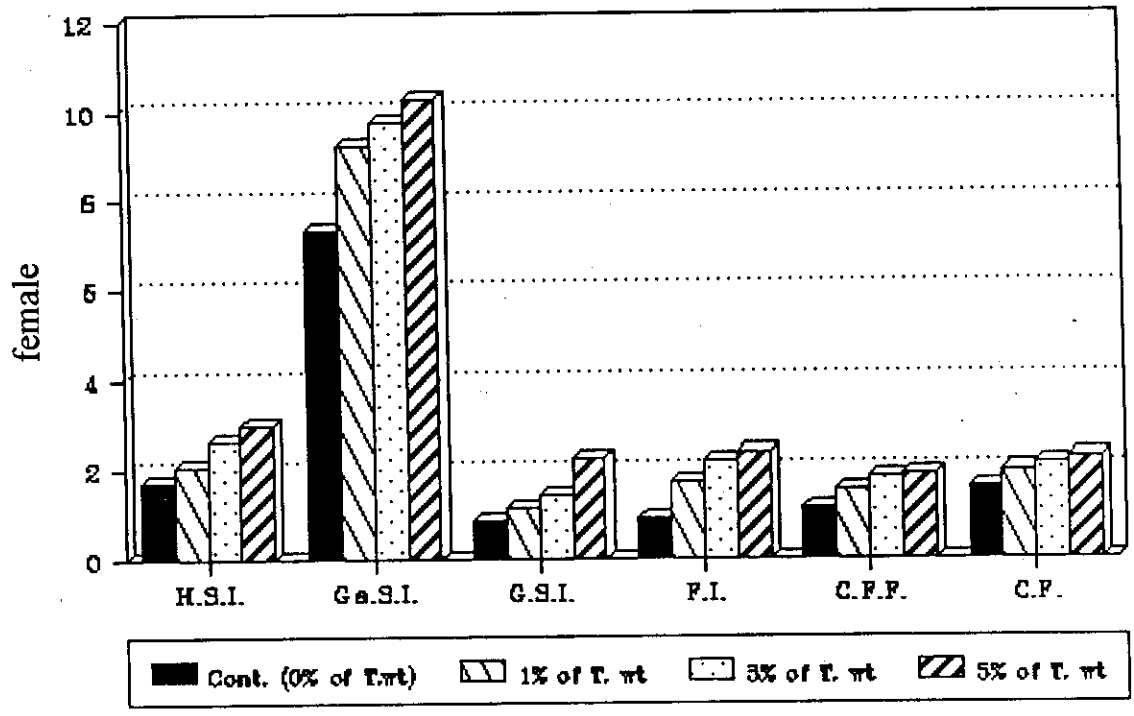


Fig (34): Biological conditions of males and females ***O.niloticus*** reared in earthen ponds at different food rations (period of 244 days).





H. molitrix. While the G.S.I. values of males and females ***O. niloticus*** increased gradually with the increased protein level in the diet, fishes fed on diet of 40% protein gave highest G.S.I. values (1.99 ± 0.42, 2.21 ± 0.56 for male and female respectively) whereas, fishes fed on diet of 20% protein showed lowest G.S.I. values (Tables 46, 47 and Figuers 29, 30).

The gonadosomatic index of males and females of silver carp and Nile tilapia increased gradually with the increased initial size. The maximum G.S.I. values (0.20 ± 0.06, 0.25 ± 0.11 and 1.98 ± 0.21, 2.26 ± 0.43 for males and females of carp and tilapia respectively) were recorded at large initial size (17.56 cm, 61.05 gm for carp and 12.00 cm, 35.79 gm for tilapia). These values slightly decreased at the middle initial size until it reached its minimum values (0.04 ± 0.02, 0.11 ± 0.08 and 0.95 ± 0.16, 1.17 ± 0.18 respectively) at the smallest initial size (6.20 cm, 7.40 gm for carp and 4.30 cm, 6.85 gm for tilapia) as indicated in tables (48, 49) and figuers (31, 32).

From tables (50, 51) and figures (33, 34) it is noticed that, there are no significant differences between the G.S.I. values of males and females of silver carp fed with different food ration. But in case of Nile tilapia, the highest food ration (5% of body weight) showed G.S.I. values of 1.94 ± 0.18, 2.27 ± 0.26 for males and females respectively, while lowest food ration (1% of body weight) gave low values of 0.95 ± 0.20 for male and 1.27 ± 0.28 for female fishes.

1-4- Food index (F.I.) :

From the present study it was cleared that, the average values of food index of males and females ***H. molitrix*** and ***O. niloticus*** slightly lowered with the increase of stocking density. Its maximum values (1.93 ± 0.74, 2.21 ± 0.85 and 2.25 ± 0.12, 2.47 ± 0.18 for males and females of carp and tilapia respectively) were recorded at the lowest stock (one fish/m^2), while the minimum values (1.10 ± 0.12, 1.27 ± 0.15 and 1.34 ± 0.26, 1.66 ± 0.37 for male and female of the two fishes respectively) were observed at the highest stock (Tables 44, 45 and Figuers 27, 28).

On the other hand, the food index values of male and female of silver carp and Nile tilapia, varied also with respect to the different dietary protein levels, carp fed on diet with 40% protein give highest F.I. values (1.75 ± 0.21, 1.94 ± 0.28 for male and female fishes respectively), whereas tilapia showed the highest F.I. value (1.96 ± 0.05 for males and 2.18 ± 0.11 for females) at 30% dietary protein level. Fishes fed on diet contain 20% protein showed a lowest F.I. values (1.25 ± 0.18, 1.46 ± 0.22 and 1.33 ± 0.21, 1.45 ± 0.24 for male and female carp and tilapia respectively) as indicates in tables (46, 47) and figures (29, 30).

Similarly, the food index of males and females carp and tilapia (Tables 48, 49 and Figuers 31, 32) increased gradually with the increased initial size of rearing fish. The maximum values (1.64 ± 0.18,

1.82 ± 0.21 and 2.13 ± 0.20, 2.27 ± 0.18 for males and females of silver carp and Nile tilapia respectively) were recorded with large initial size (17.56 cm, 61.05 gm for carp and 12.00 cm, 35.79 gm for tilapia). These values slightly decreased at the second initial size until it reach its minimum values (1.12 ± 0.21, 1.34 ± 0.35 and 1.41 ± 0.15, 1.67 ± 0.16 respectively) at small one (6.20 cm, 7.40 gm for carp and 4.30 cm, 6.85 gm for tilapia).

As shown in tables (50, 51) and figures (33, 34) the fishes reared with 5% food ration showed highest values of F.I. (1.83 ± 0.22, 1.96 ± 0.25 and 2.15 ± 0.32, 2.39 ± 0.28 for males and females of ***H. molitrix*** and ***O. niloticus*** respectively). While its lowest values (1.03 ± 0.25, 1.36 ± 0.32 and 1.38 ± 0.15, 1.74 ± 0.18 respectively) were observed in fishes fed with 1% food ration.

In both rearing fish (silver carp and Nile tilapia) the food index values were higher in female than that in male. Control groups showed F.I. values of 0.80 ± 0.19, 0.91 ± 0.22 and 0.72 ± 0.07, 0.93 ± 0.08 for males and females of carp and tilapia respectively.

1-5- Condition of fish flesh (C.F.F.) :

From the present study it was noticed that, the average values of condition of fish flesh of males and females of ***H. molitrix*** and ***O.niloticus*** slightly lowered with the increase of stocking density. Its maximum values (0.97 ± 0.18, 1.07 ± 0.15 and 1.70 ± 0.36, 1.86 ±

0.42 for males and females of carp and tilapia respectively) were recorded at lowest stock (one fish/m^2), while the minimum values (0.84 ± 0.13, 0.73 ± 0.22 and 1.50 ± 0.24, 1.53 ± 0.27 for male and female fishes respectively) were observed at highest stock (three fish/m^2) as showen in tables (44, 45) and figures (27, 28).

On the other hand, the condition of fish flesh values of male and female silver carp was raised gradually with the increased dietary protein level, while in Nile tilapia these values increased from diet with 20% to 30% protein level then decrease at 40% protein. Carp fed on 40% protein and tilapia fed on 30% protein gave the highest C.F.F. values (1.45 ± 0.24, 1.43 ± 0.23 and 1.65 ± 0.27, 1.83 ± 0.34 for males and females of carp and tilapia respectively), whereas fishes fed on diet contain 20% protein showed a lowest C.F.F. values (0.74 ± 0.18, 0.91 ± 0.24 and 1.35 ± 0.41, 1.38 ± 0.45 for the both species respectively), tables (46, 47) and figuers (29, 30).

Similarly, the condition of fish flesh of males and females carp and tilapia was elevated gradually with the increased initial size of both rearing fish. The maximum values (1.09 ± 0.37, 1.27 ± 0.35 and 1.86 ± 0.51, 2.00 ± 0.48 for males and females of silver carp and Nile tilapia respectively) were recorded at largest initial size. The condition of fish flesh slightly decreased at the second initial size until it reach its minimum values (0.87 ± 0.22, 0.95 ± 0.26 and 1.19 ± 0.32, 1.32 ± 0.41 respectively) at small initial size (Tables 48, 49 and Figuers 31, 32).

The condition of fish flesh of males and females ***H. molitrix*** and ***O. niloticus*** also varies with different food ration. Fishes fed with 5% ration showed the highest C.F.F. values (1.19 ± 0.33, 1.26 ± 0.42 and 1.65 ± 0.28, 1.89 ± 0.41 for males and females carp and tilapia respectively). While fishes fed with 1% ration gave the lowest C.F.F. values (0.79 ± 0.14, 0.89 ± 0.22 and 1.51 ± 0.31, 1.58 ± 0.36 respectively) as cleared in tables (50, 51) and figures (33, 34). Generally, the C.F.F. values were high in females than that in males. Control groups showed a values of 0.74 ± 0.16, 0.69 ± 0.21 and 1.01 ± 0.24, 1.14 ± 0.28 for males and females carp and tilapia respectively.

1-6- Condition factor (C.F.) :

From the present study it was found that, the average values of condition factor of males and females ***H. molitrix*** and ***O. niloticus*** slightly declined with the increase of stocking density. Its maximum values (1.18 ± 0.17, 1.35 ± 0.22 and 1.85 ± 0.15, 2.37 ± 0.24 for males and females of carp and tilapia respectively) were recorded at lowest stock (one fish/m^2), while the minimum values (1.05 ± 0.16, 1.11 ± 0.13 and 1.79 ± 0.23, 1.98 ± 0.68 for male and female of both fishes respectively) were observed at highest stock (Tables 44, 45 and Figuers 27, 28).

On the other hand, at different dietary protein levels the silver carp fed on diet with 40% protein showed highest values of C.F. (1.53 ±

0.06, 1.59 ± 0.05 for males and females respectively) and fishes fed on diet with 20% protein gave the lowest values (0.92 ± 0.13, 1.24 ± 0.02). In case of Nile tilapia, the maximum values of C.F. (1.83 ± 0.61 , 2.12 ± 0.26 for male and female fishes repectively) were recorded in fish fed on diet contain 30% protein, while the minimum values (1.68 ± 0.56, 1.77 ± 0.21 for male and female fishes respectively) were observed in fish fed on diet with 20% protein (Table 47 and Figure 30).

Similarly, the condition factor of males and females silver carp and Nile tilapia increased gradually with the increased initial size of fish. Its maximum values (1.15 ± 0.09, 1.53 ± 0.11 and 1.95 ± 0.24, 2.37 ± 0.43 for male and female carp and tilapia respectively) were recorded at the largest initial size (17.56 cm, 61.05 gm for carp and 12.00 cm, 35.79 gm for tilapia). While the minimum values (1.08 ± 0.12, 1.29 ± 0.17 and 1.50 ± 0.39, 1.64 ± 0.77 for males and females of both fishes respectively) were obesrved at small initial size (Tables 48, 49 and Figures 31, 32).

As shown in tables (50, 51) and figures (33, 34) the fishes fed on 5% food ration showed maximum values of condition factor (1.31 ± 0.09, 1.46 ± 0.05 and 1.91 ± 0.13, 2.28 ± 0.24 for males and females carp and tilapia respectively). While fishes fed on 1% ration gave minimum values of condition factor (1.01 ± 0.07, 1.21 ± 0.08 and 1.71 ± 0.19, 1.99 ± 0.92 for males and females of both species respectively).

In both fish species at all experimental treatments, the condition factor in female were higher than that in male fishes. Control groups showed a values of 0.89 ± 0.03, 0.99 ± 0.05 and 1.31 ± 0.13, 1.60 ± 0.19 for male and female carp and tilapia respectively.

2. Stomach analysis :

The present investigations indicated that silver carp ***(H. molitrix)*** is phytophagous fish, prefere the phytoplankton organisms in its food. While Nile tilapid ***(O. niloticus)*** is omnivorous fish, eating both animal and plant materials as a plankton. In each rearing pond, about 80 alimentary canals (40 silver carp and 40 Nile tilapia) were examined.

The plant organisms recorded in the alimentary canals of carp and tilapia were, chrysophyta ***(Navicula sp., Cyclotella sp.*** and ***Melosira sp.),*** chlorophyta ***(Pediastrum sp., Scenedesmus sp., Staurastrum sp., Spyrogyra sp.*** and ***Euglinomorpha sp.)*** and cyanophyta ***(Merismopedia sp.*** and ***Nostoc sp.).*** While the animal organisms include ; cilliophora (cilliata spp.), rotifera ***(Brachionus sp.),*** cladocera ***((Daphnia sp.),*** copepoda ***(Cyclops sp.),*** chironomidae (chironomid larvae) and oligochaeta (tubifex warm).

In addition to the plant and animal organisms, the artificial food was also represented in the guts of both fish species with suitable quantities of detrital materials.

2-1- At different stocking densities :

From the present data it was noticed that, in the gut of silver carp ***(H. molitrix)*** and Nile tilapia ***(O. niloticus)*** the phytoplankton, zooplankton and bottom fauna organisms were slightly increased with the increased stocking density. While the artificial food and detrital materials decreased. The frequency occurrence and percentage composition of phyto and zooplankton were 32.57%, 24.26% and 12.12%, 4.95% respectively but the bottom fauna was not represented collectively in gut of silver carp at lowest stock (one fish/m^2). While the same parameters were 81.82% , 61.04% and 70.45% , 9.75% for the artificial food and detrital material respectively.

Nevertheless, at the highest stock (three fish/m^2) these values became 55.28% , 39.71% ; 29.88% , 7.11% and 12.20%, 0.80% for the natural food materials respectively. But 68.18%, 48.03% and 34.15% , 5.24% for the artificial food and detrites respectively (Table 52 and figure 35).

In gut of Nile tilapia ***(O. niloticus)*** the frequency occurrence and percentage composition of the food items were 16.66% , 23.33% ; 20.06% , 6.82% ; 12.50% , 0.82% ; 83.33% , 58.39% and 69.44%, 10.60% at stock of one fish/m^2. While at stock of three fish/m^2 the values became 47.37% , 37.61% ; 47.37%, 11.80% ; 31.57%, 1.57% ; 66.67% , 44.16% and 42.10%, 4.86% for various food items in gut of Nile tilapia respectively (Table 53 and Figure 36).

Table (52) : Effect of stocking density of stomach analysis of silver carp ***(H.molitrix)*** reared in earthen freshwater ponds, at a period of 244 days (from 1 April to 30 November, 1991)

Stocking density	Control (100 fish/pond)				100 fish / pond				200 fish / pond				300 fish / pond			
Food item	FO	NO	PC	SI	FO	NO	PC	SI	FO	NO	PC	SI	FO	NO	PC	SI
Phytoplankton :																
Chrysophyta	71.05	526	19.98	-0.25	36.36	226	5.92	-0.70	46.51	350	8.98	-0.57	63.41	482	11.80	-0.48
Chlorophyta	84.24	1207	45.84	+0.33	50.00	532	13.94	-0.51	60.46	742	19.04	-0.39	73.17	854	20.91	-0.35
Cyanophyta	42.10	335	12.72	-0.02	11.36	168	4.40	-0.50	18.60	240	6.16	-0.36	29.27	286	7.00	-0.30
Total	—	2068	78.48	-0.07	—	926	24.26	-0.57	—	1332	34.18	-0.45	—	1622	39.71	-0.37
Mean	65.80	—	—	—	32.57	—	—	—	41.86	—	—	—	55.28	—	—	—
Zooplankton :																
Cilliata	39.47	163	6.19	+0.25	18.18	92	2.41	-0.10	25.58	115	2.95	+0.00	36.58	124	3.04	-0.02
Rotifera	31.58	103	3.91	+0.21	6.82	65	1.70	-0.10	16.28	72	1.85	-0.06	29.27	82	2.01	-0.01
Cladocera	36.31	62	2.35	+0.15	11.36	32	0.84	-0.34	20.93	40	1.03	-0.25	34.15	57	1.40	-0.10
Copepoda	26.31	36	1.37	+0.03	—	—	—	—	11.63	21	0.54	-0.41	19.51	27	0.66	-0.32
Total	—	364	13.82	+0.27	—	189	4.95	-0.24	—	248	6.37	-0.12	—	228	7.11	-0.06
Mean	33.55	—	—	—	12.12	—	—	—	18.61	—	—	—	29.88	—	—	—
Bottom fauna :																
Chironomidae	15.79	12	0.46	-0.50	—	—	—	—	6.98	6	0.15	-0.80	14.63	30	0.73	-0.31
Oligochaeta	10.53	7	0.27	-0.53	—	—	—	—	—	—	—	—	9.76	3	0.07	-0.25
Total	—	19	0.73	-0.51	—	—	—	—	—	6	0.15	-0.80	—	33	0.80	-0.48
Mean	13.16	—	—	—	—	—	—	—	6.98	—	—	—	12.20	—	—	—
Artificial food	—	—	—	—	81.82	2330	61.04	+ 1	77.27	2043	52.41	+ 1	68.18	1962	48.03	+ 1
Detrital material	34.21	182	6.91	+ 1	70.45	372	9.75	+ 1	51.16	269	6.90	+ 1	34.15	2014	5.24	+ 1

* FO = Frequency occurrence.
* NO = Average number.
* PC = Percentage composition.
* SI = Selectivity index (calculated from the total values).

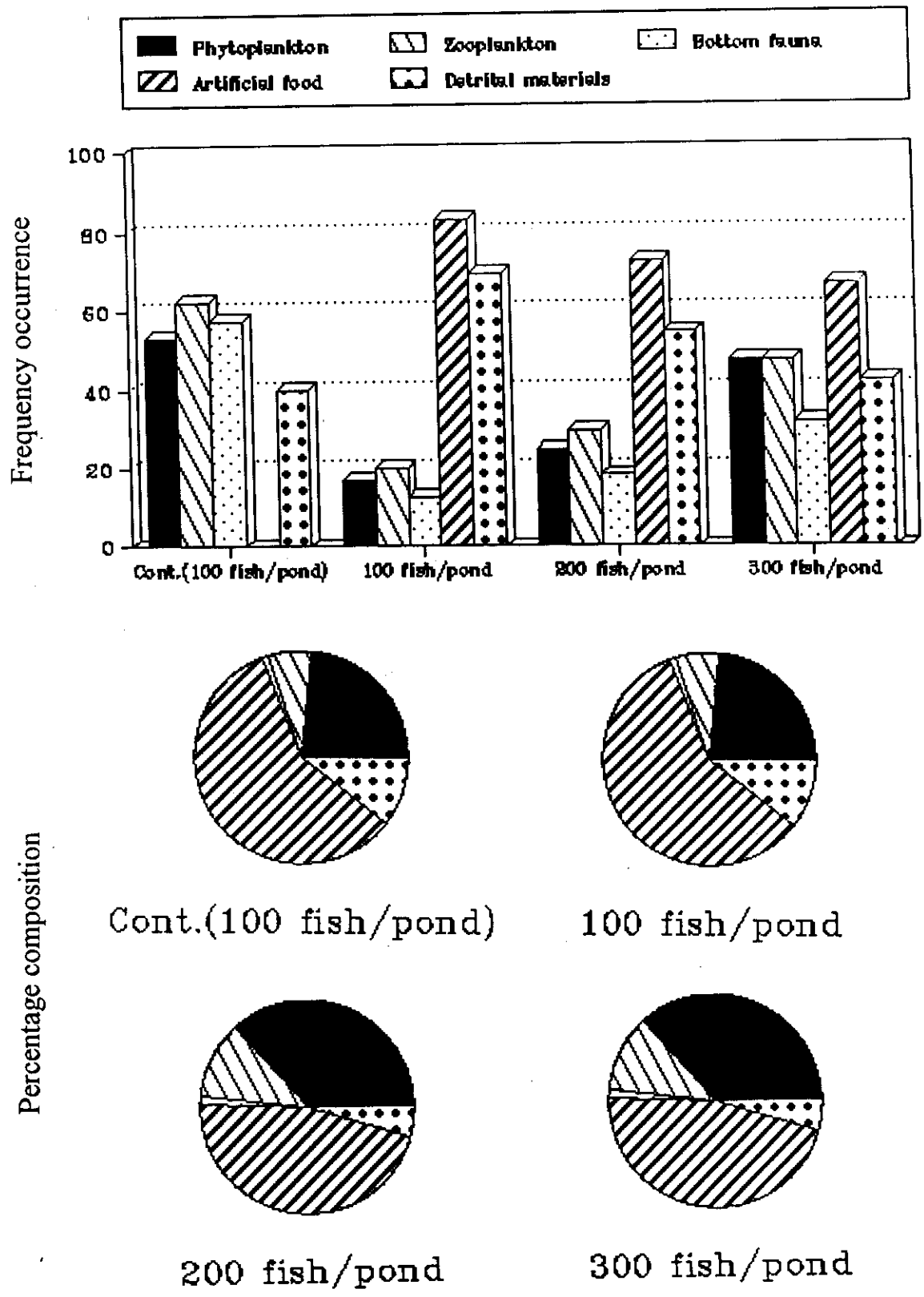


Fig. (36) : Frequency occurrence and percentage composition of various food items in guts of Nile tilapia*(O. niloticus)* reared in earthen pond at different stocking densities.

Fig. (37) : Selectivity index of various food items in guts of silver carp ***(H.molitrix)*** reared in earthen pond at different stocking densities.

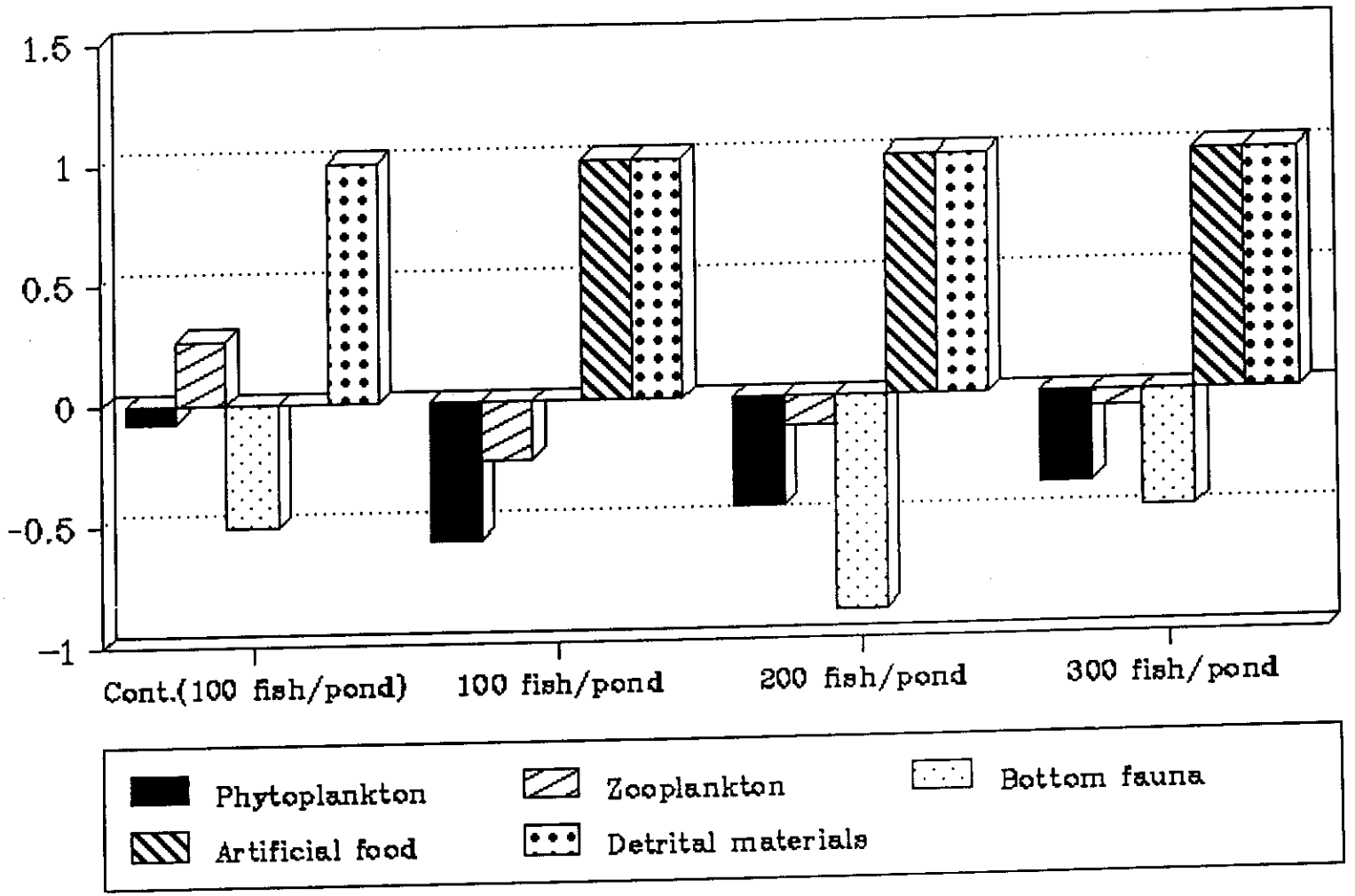
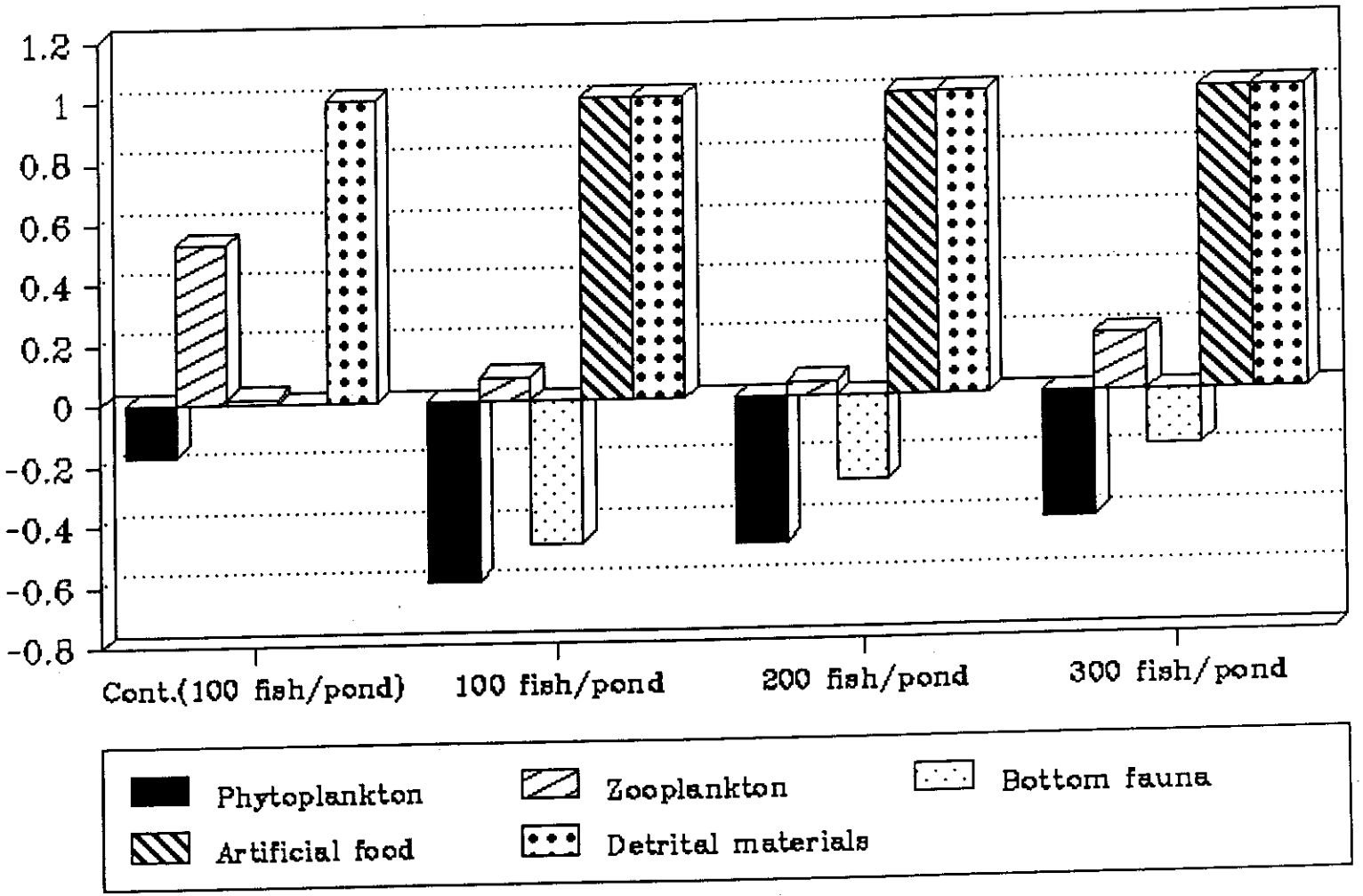


Fig. (38) : Selectivity index of various food items in guts of Nile tilapia ***(O.niloticus)*** reared in earthen pond at different stocking densities.



With respect of selectivity degree (selectivity index), it was found that the preference of carp and tilapia for phytoplankton, zooplankton and bottom fauna was slightly increased with the increased stocking density. Its values were - 0.57, - 0.24 and 0.00 at one fish/m^2 ; - 0.37 , - 0.06 and - 0.48 at three fish/m^2 in silver carp. While in Nile tilapia the SI values were - 0.59 , - 0.08 and - 0.47 at lowest stock ; - 0.41 , + 0.19 and - 0.18 at highest stock (Tables 52,53 and Figures 37,38).

Generally, in control carp and tilapia the frequencey occurrence and percentage composition of various natural food items were higher than that in the three stocking densities. This is due to the collectively dependance of both fish on the natural food, hence they did not given artificial food.

2-2- At different dietary protein levels :

As shown in table (52) and figure (39), in gut of silver carp ***(H. molitrix)*** the quantites phytoplankton, zooplankton and bottom fauna organisms were lowered gradually with the increased protein level in the diet. While the artificial food and detrital materials increased. Their frequency occurrence and percentage composition were 51.39% , 37.35% ; 25.00% , 7.32% ; 7.50% , 0.28 ; 65.22% , 45.77% and 40.00% , 9.27% at diet with 20% protein. While at diet contain 40% protein these values became 28.83%, 18.67% ; 7.50% ; 3.45% ; 0.0,0.0 ; 87.50% , 63.64% and 65.00% , 14.75% for various food items in gut of silver carp respectively. The selectivity degree of the natural

food organism was decreased for silver carp with the increased of dietary protein level, its values were - 0.41 , - 0.05 & - 0.78 at 20% protein level and - 0.66 , - 0.40 & 0.0 at 40% protein level (Table 54 and Figure 41).

In gut of Nile tilapia ***(O. niloticus)*** the frequency occurrence and percentage composition of the fore mentioned food items were flactuated. They were 39.05% , 28.32% ; 45.71% , 12.00% ; 44.28% , 1.38% ; 74.28% , 44.73% and 45.71% , 13.60% respectively at 20% dietary protein level. While at 40% protein level these values became 46.34% , 27.64% ; 47.56% , 14.76% ; 36.58% , 1.52% ; 68.57% , 43.41% and 31.71% , 12.65% for phytoplankton, zooplankton, bottom fauna, artificial food and detrital material in the gut of Nile tilapia respectively. Only the artificial food and detrital material had regular trend of decrease with the increase of protein level (Table 55 and Figure 40). The perference of tilapia for the natural food organisms were declined from the case of 20% dietary protein level (+ 0.20 for zooplankton) to 30% protein level (+ 0.05) then increased (+ 0.30) at 40% protein level (Table 55 and Figure 42).

2-3- At different initial sizes :

The present data tabulated in tables (56,57) and figures (43,44) indicated that, in gut of ***H. molitrix*** and ***O. niloticus*** the phytoplankton, zooplankton and bottom fauna organisms slightly decreased with the increased initial size of rearing fish, while the artificial food and detrital

Table (54) : Effect of dietary protein level on stomach analysis of silver carp ***(H.molitrix)*** reared in earthen freshwater ponds, at a period of 244 days (from 1 April to 30 November, 1991)

Protein levels	Control (0 % protein)				20 % protein				30 % protein				40 % protein			
Food item	FO	NO	PC	SI	FO	NO	PC	SI	FO	NO	PC	SI	FO	NO	PC	SI
Phytoplankton :																
Chrysophyta	71.05	526	19.98	-0.25	56.67	413	10.61	-0.52	46.51	350	8.98	-0.57	30.21	270	6.91	-0.66
Chlorophyta	84.24	1207	45.84	+0.33	70.00	746	19.16	-0.37	60.46	742	19.04	-0.39	43.82	354	9.07	-0.65
Cyanophyta	42.10	335	12.72	-0.02	27.50	295	7.58	-0.27	18.60	240	6.16	-0.36	12.45	105	2.69	-0.66
Total	—	2068	78.48	-0.07	—	1454	37.35	-0.41	—	1332	34.18	-0.45	—	729	18.67	-0.66
Mean	65.80				51.39	—	—	—	41.86	—	—	—	28.83	—	—	—
Zooplankton :																
Ciliata	39.47	163	6.19	+0.25	35.00	126	3.84	-0.05	25.58	115	2.95	+0.00	—	—	—	—
Rotifera	31.58	103	3.91	+0.21	20.00	84	2.16	-0.02	16.28	72	1.85	-0.06	5.00	65	1.66	-0.11
Cladocera	36.31	62	2.35	+0.15	30.00	50	1.28	-0.14	20.93	40	1.03	-0.25	10.00	70	1.79	-0.02
Copepoda	26.31	36	1.37	+0.03	15.00	25	0.64	-0.33	11.63	21	0.54	-0.41	—	—	—	—
Total	—	364	13.82	+0.27	—	285	7.32	-0.05	—	248	6.37	-0.12	—	135	3.45	-0.40
Mean	33.55	—	—	—	25.00	—	—	—	18.61	—	—	—	7.50	—	—	—
Bottom fauna :																
Chironomidae	15.79	12	0.46	-0.50	10.00	9	0.23	-0.71	6.98	6	0.15	-0.80	—	—	—	—
Oligochaeta	10.53	7	0.27	-0.53	5.00	2	0.05	-0.89	—	—	—	—	—	—	—	—
Total	—	19	0.73	-0.51	—	11	0.28	-0.78	—	6	0.15	-0.80	—	—	—	—
Mean	13.16	—	—	—	7.50	—	—	—	6.98	—	—	—	—	—	—	—
Artificial food	—	—	—	—	65.22	1782	45.77	+ 1	77.27	2043	52.41	+ 1	87.50	2485	63.64	+ 1
Detrital material	34.21	182	6.91	+ 1	40.00	361	9.27	+ 1	51.16	269	6.90	+ 1	65.00	576	14.75	+ 1

* FO = Frequency occurrence.
* NO = Average number.
* PC = Percentage composition.
* SI = Selectivity index (calculated from the total values).

Table (55) : Effect of dietary protein on stomach analysis of Nile tilapia ***(O.niloticus)*** reared in earthen freshwater ponds, at a period of 244 days (from 1 April to 30 November, 1991)

Protein level	Control (0 % protein)				20 % protein				30 % protein				40 % protein			
Food item	FO	NO	PC	SI	FO	NO	PC	SI	FO	NO	PC	SI	FO	NO	PC	SI
Phytoplankton :																
Chrysophyta	52.50	440	13.43	-0.42	40.00	366	8.04	-0.61	25.00	303	7.53	-0.63	46.34	343	8.00	-0.61
Chlorophyta	60.00	1330	40.60	-0.03	45.71	736	16.12	-0.46	29.54	884	20.97	-0.35	51.22	644	15.02	-0.49
Cyanophyta	47.50	295	9.00	-0.19	31.43	190	4.16	-0.52	20.45	137	3.40	-0.59	41.46	198	4.62	-0.48
Total	—	2065	63.03	-0.17	—	1292	28.32	-0.52	—	1284	31.90	-0.48	—	1185	27.64	-0.53
Mean	53.33	—	—	—	39.05	—	—	—	25.00	—	—	—	46.34	—	—	—
Zooplankton :																
Cilliata	70.00	376	11.48	+0.59	56.71	241	5.28	+0.28	45.45	120	2.98	-0.01	65.85	288	6.72	+0.39
Rotifera	55.00	250	7.63	+0.57	34.28	112	2.45	+0.08	20.45	90	2.24	-0.04	43.90	136	3.17	+0.21
Cladocera	65.00	132	4.03	+0.40	42.86	115	2.52	+0.19	27.27	76	1.89	+0.05	48.78	121	2.82	+0.24
Copepoda	60.00	100	3.05	+0.41	40.00	80	1.75	+0.15	25.00	68	1.69	+0.13	31.71	88	2.05	+0.23
Total	—	858	26.19	+0.53	—	584	12.00	+0.20	—	354	8.80	+0.05	—	633	14.76	+0.30
Mean	62.50	—	—	—	45.71	—	—	—	29.54	—	—	—	47.56	—	—	—
Bottom fauna :																
Chironomidae	65.00	51	1.56	+0.06	51.43	40	0.88	-0.22	25.00	32	0.80	-0.27	43.90	44	1.03	-0.15
Oligochaeta	50.00	26	0.79	-0.05	37.14	23	0.50	-0.28	11.36	19	0.47	-0.30	29.27	21	0.49	-0.28
Total	—	77	2.35	+0.02	—	63	1.38	-0.24	—	51	1.27	-0.28	—	65	1.52	-0.20
Mean	57.50	—	—	—	44.28	—	—	—	18.18	—	—	—	36.58	—	—	—
Artificial food	—	—	—	—	74.28	2043	44.73	+ 1	72.22	2060	51.18	+ 1	68.57	1860	43.41	+ 1
Detrital material	40.00	275	8.39	+ 1	45.71	621	13.60	+ 1	54.55	276	6.86	+ 1	31.71	542	12.65	+ 1

* FO = Frequency occurrence.
* NO = Average number.
* PC = Percentage composition.
* SI = Selectivity index (calculated from the total values).

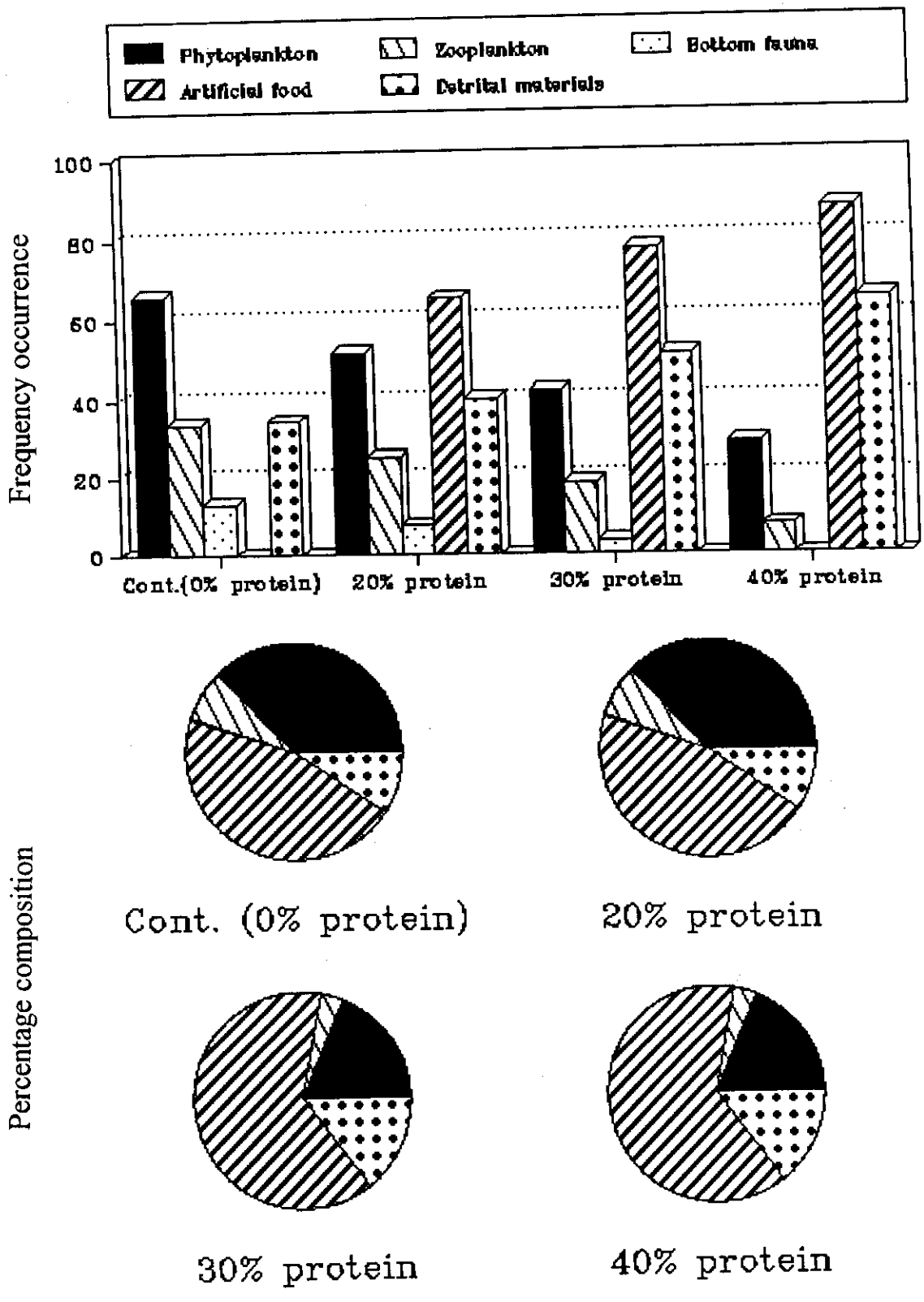


Fig. (39) : Frequency occurrence and percentage composition of various food items in guts of silver carp *(H.molitrix)* reared in earthen pond at different diatery protein levels.

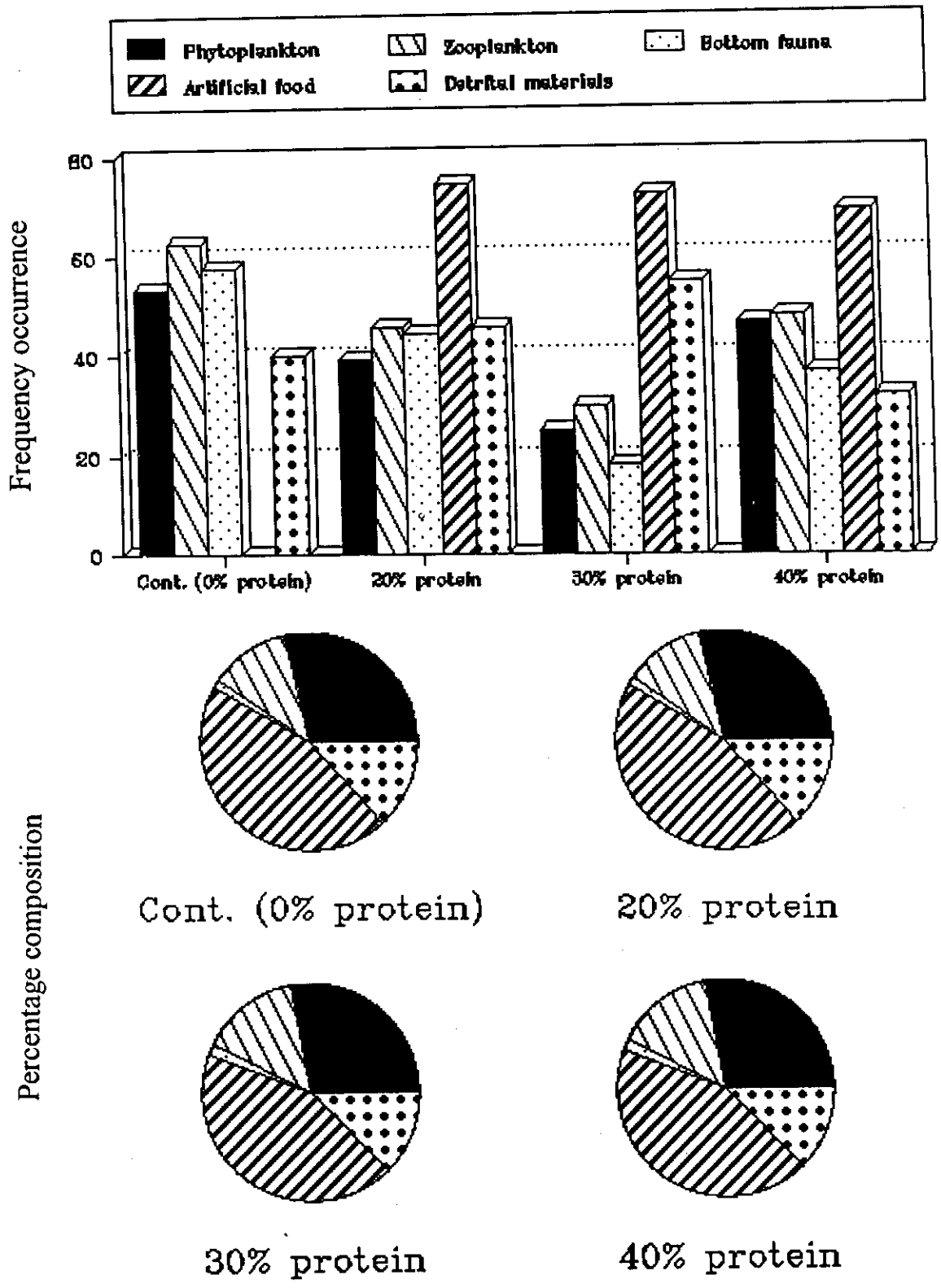
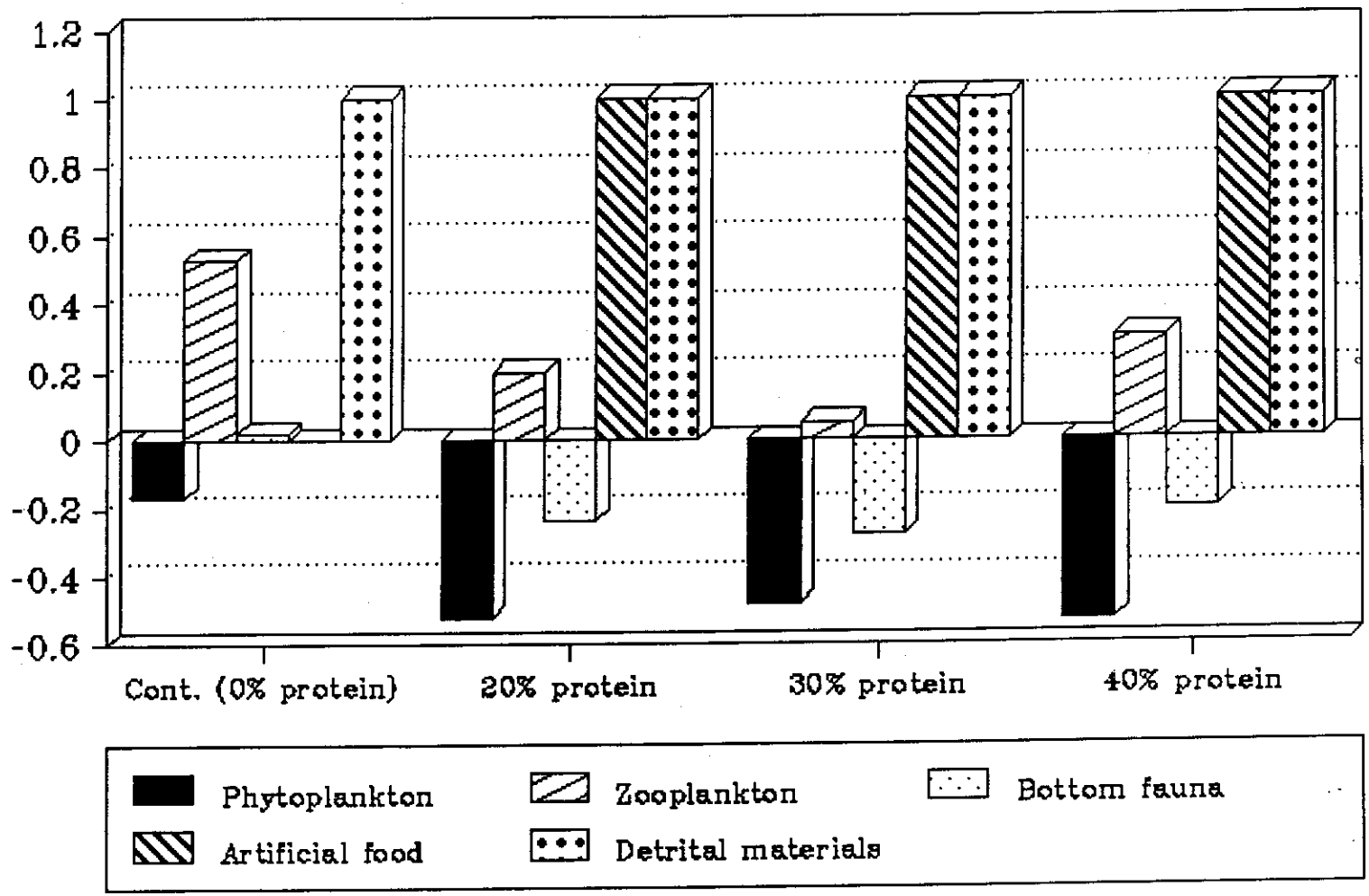


Fig. (40) : Frequency occurrence and percentage composition of various food items in guts of Nile tilapia *(O.niloticus)* reared in earthen pond at different diatery protein levels.

Fig. (42) : Selectivity index of various food items in guts of Nile tilapia ***(O.niloticus)*** reared in earthen pond at different diatery protein levels.



materials increased in fish gut. Their frequency occurrence and percentage composition in the gut of silver carp were 48.78% , 37.31% ; 25.00% , 6.89% ; 10.98% , 0.37% ; 63.41%, 45.83% and 43.90%, 9.60% in gut of carp at initial size of 6.20 cm, 7.40 gm. While at large initial size (17.56 cm, 61.05 gm) these values became 29.63% , 18.86% ; 13.88% , 5.06% ; 2.78% , 0.08% ; 80.55% , 61.89% and 58.33% , 14.12% for various food items respectively.

In gut of Nile tilapia ***(O. niloticus)*** the frequency occurrence, and percentage composition of the previous food items were 38.74% , 26.70% ; 47.29% , 17.31% ; 40. 54% , 1.98% ; 67. 57% , 40.99% and 43.24% , 13.02% at the smallest initial size (4.30 cm, 6.85gm). While at large initial size (12.00 cm 35.79 gm) these values became 17.14% , 13.73% ; 20.71% , 7.71% ; 12.85% , 1.04% ; 80.00% , 56.49% and 65.71% , 19.85% for various food items in gut of Nile tilapia respectively.

With respect to the selectivity index of phytoplankton, zooplankton and bottom fauna it was slightly decreased with the increased initial size of rearing fish. Its values were - 0.41 , - 0.08 & - 0.72 in gut of carp at lowest initial size and - 0.65 , - 0.23 & - 0.93 at highest one, while in tilapia these values were - 0.54 , + 0.37 & - 0.07 at the smallest initial size and - 0.73, - 0.02 & - 0.37 at the largest one (Tables 56, 57 and Figures 45, 46).

Table (56) : Effect of initial size on stomach analysis of silver carp ***(H.molitrix)*** reared in earthen freshwater ponds, at a period of 244 days (from 1 April to 30 November, 1991)

Initial size	Cont.(12.16 cm,21.75gm)				6.20 cm , 7.40 gm				12.16 cm , 21.75 gm				17.56 cm , 61.05 gm			
Food item	FO	NO	PC	SI	FO	NO	PC	SI	FO	NO	PC	SI	FO	NO	PC	SI
Phytoplankton :																
Chrysophyta	71.05	526	19.98	-0.25	51.22	447	11.12	-0.50	46.51	350	8.98	-0.57	33.33	232	6.20	-0.69
Chlorophyta	84.24	1207	45.84	+0.33	70.73	751	18.68	-0.40	60.46	742	19.04	-0.39	41.67	381	10.19	-0.62
Cyanophyta	42.10	335	12.72	-0.02	23.39	302	7.51	-0.27	18.60	240	6.16	-0.36	13.89	92	2.46	-0.68
Total	—	2068	78.48	-0.07	—	1500	37.31	-0.41	—	1332	34.18	-0.45	—	705	18.86	-0.65
Mean	65.80				48.78	—	—	—	41.86	—	—	—	29.63	—	—	—
Zooplankton :																
Cilliata	39.47	163	6.19	+0.25	21.95	122	3.03	+0.01	25.58	115	2.95	+0.00	19.44	81	2.17	-0.15
Rotifera	31.58	103	3.91	+0.21	26.83	80	1.99	-0.02	16.28	72	1.85	-0.06	16.67	64	1.71	-0.10
Cladocera	36.31	62	2.35	+0.15	31.71	51	1.27	-0.15	20.93	40	1.03	-0.25	11.11	28	0.75	-0.39
Copepoda	26.31	36	1.37	+0.03	19.51	24	0.60	-0.36	11.63	21	0.54	-0.41	8.33	16	0.43	-0.50
Total	—	364	13.82	+0.27	—	277	6.89	-0.08	—	248	6.37	-0.12	—	189	5.06	-0.23
Mean	33.55	—	—	—	25.00	—	—	—	18.61	—	—	—	13.88	—	—	—
Bottom fauna :																
Chironomidae	15.79	12	0.46	-0.50	12.20	10	0.25	-0.69	6.98	6	0.15	-0.80	2.78	3	0.08	-0.89
Oligochaeta	10.53	7	0.27	-0.53	9.76	5	0.12	-0.76	—	—	—	—	—	—	—	—
Total	—	19	0.73	-0.51	—	15	0.37	-0.72	—	6	0.15	-0.80	—	3	0.08	-0.93
Mean	13.16	—	—	—	10.98	—	—	—	6.98	—	—	—	2.78	—	—	—
Artificial food	—	—	—	—	63.41	1843	45.83	+ 1	77.27	2043	52.41	+ 1	80.55	2314	61.89	+ 1
Detrital material	34.21	182	6.91	+ 1	43.90	386	9.60	+ 1	51.16	269	6.90	+ 1	58.33	528	14.12	+ 1

* FO = Frequency occurrence.
* NO = Average number.
* PC = Percentage composition.
* SI = Selectivity index (calculated from the total values).

Table (57) : Effect of initial size on stomach analysis of Nile tilapia ***(O.niloticus)*** reared in earthen freshwater ponds, at a period of 244 days (from 1 April to 30 November, 1991)

Initial size	Cont.(9.00 cm,15.24 gm)				4.30 cm , 6.85 gm				9.00 cm, 15.24 gm				12.0 cm , 35.79 gm			
Food item	FO	NO	PC	SI	FO	NO	PC	SI	FO	NO	PC	SI	FO	NO	PC	SI
Phytoplankton :																
Chrysophyta	52.50	440	13.43	-0.42	35.13	392	8.37	-0.60	25.00	303	415	10.04	17.14	215	5.04	-0.74
Chlorophyta	60.00	1330	40.60	-0.03	48.65	625	13.34	-0.53	29.54	884	20.97	-0.35	20.00	276	6.47	-0.74
Cyanophyta	47.50	295	9.00	-0.19	32.43	234	4.99	-0.45	20.45	137	3.40	-0.59	14.28	95	2.23	-0.71
Total	—	2065	63.03	-0.17	—	1251	26.70	-0.54	—	1284	31.90	-0.48	—	586	13.73	-0.73
Mean	53.33	—	—	—	38.74	—	—	—	25.00	—	—	—	17.14	—	—	—
Zooplankton :																
Cilliata	70.00	376	11.48	+0.59	51.75	304	6.49	+0.38	45.45	120	2.98	-0.01	31.43	91	2.13	-0.16
Rotifera	55.00	250	7.63	+0.57	43.24	127	2.71	+0.13	20.45	90	2.24	-0.04	14.28	73	1.71	-0.08
Cladocera	65.00	132	4.03	+0.40	48.65	206	4.40	+0.44	27.27	76	1.89	+0.05	20.00	86	2.02	+0.08
Copepoda	60.00	100	3.05	+0.41	45.94	174	3.71	+0.48	25.00	68	1.69	+0.13	17.14	79	1.85	+0.18
Total	—	858	26.19	+0.53	—	811	17.31	+0.37	—	354	8.80	+0.05	—	329	7.71	-0.02
Mean	62.50	—	—	—	47.29	—	—	—	29.54	—	—	—	20.71	—	—	—
Bottom fauna :																
Chironomidae	65.00	51	1.56	+0.06	48.65	62	1.32	-0.02	25.00	32	0.80	-0.27	20.00	28	0.66	-0.35
Oligochaeta	50.00	26	0.79	-0.05	32.43	31	0.66	-0.14	11.36	19	0.47	-0.30	5.71	16	0.38	-0.40
Total	—	77	2.35	+0.02	—	93	1.98	-0.07	—	51	1.27	-0.28	—	44	1.04	-0.37
Mean	57.50	—	—	—	40.54	—	—	—	18.18	—	—	—	12.85	—	—	—
Artificial food	—	—	—	—	67.57	1921	40.99	+ 1	72.22	2060	51.18	+ 1	80.00	2410	56.49	+ 1
Detrital material	40.00	275	8.39	+ 1	43.24	610	13.02	+ 1	54.55	276	6.86	+ 1	65.71	847	19.85	+ 1

* FO = Frequency occurrence.
* NO = Average number.
* PC = Percentage composition.
* SI = Selectivity index (calculated from the total values).

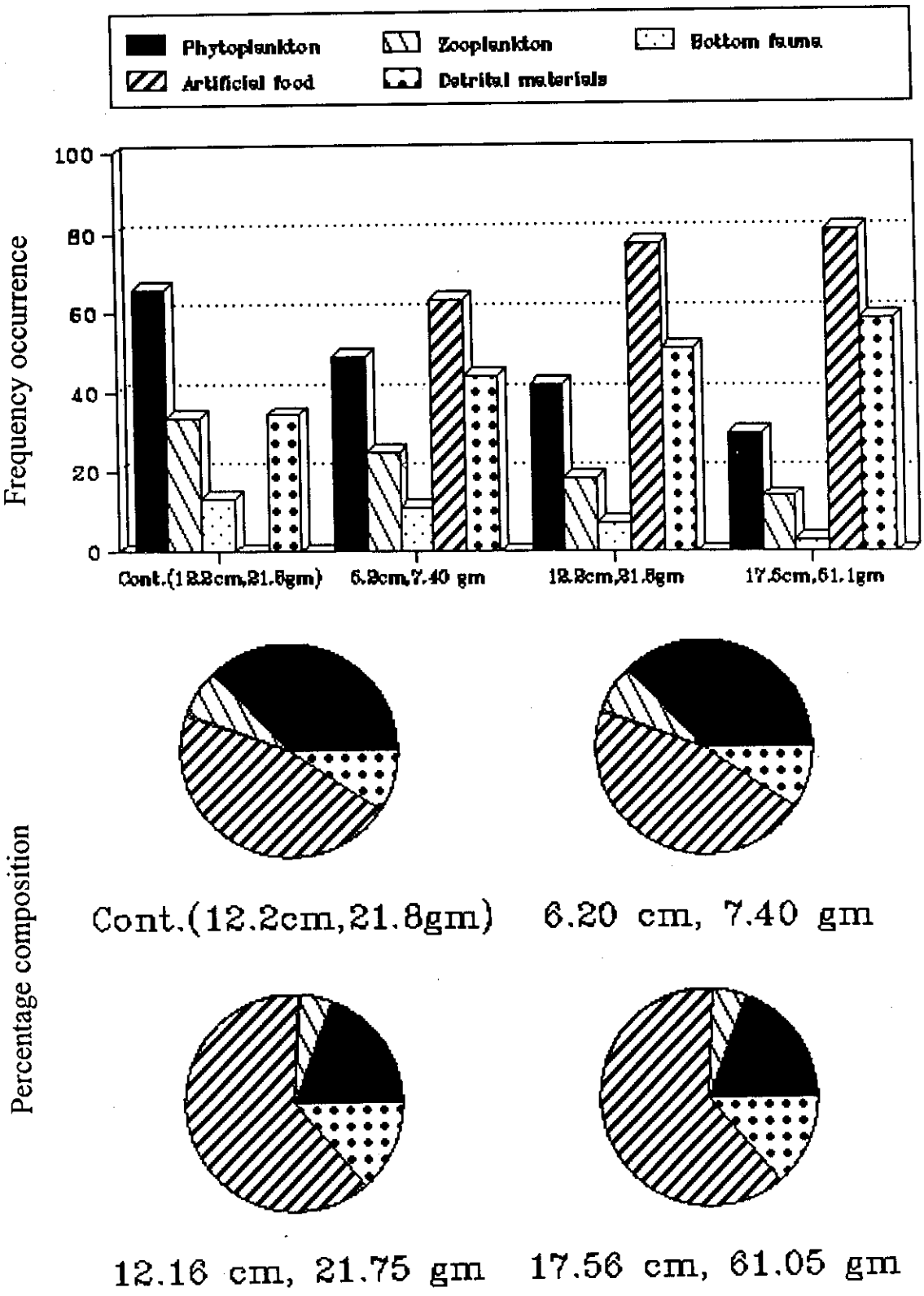


Fig. (43) : Frequency occurrence and percentage composition of various food items in guts of silver carp *(H.molitrix)* reared in earthen pond at different initial sizes.

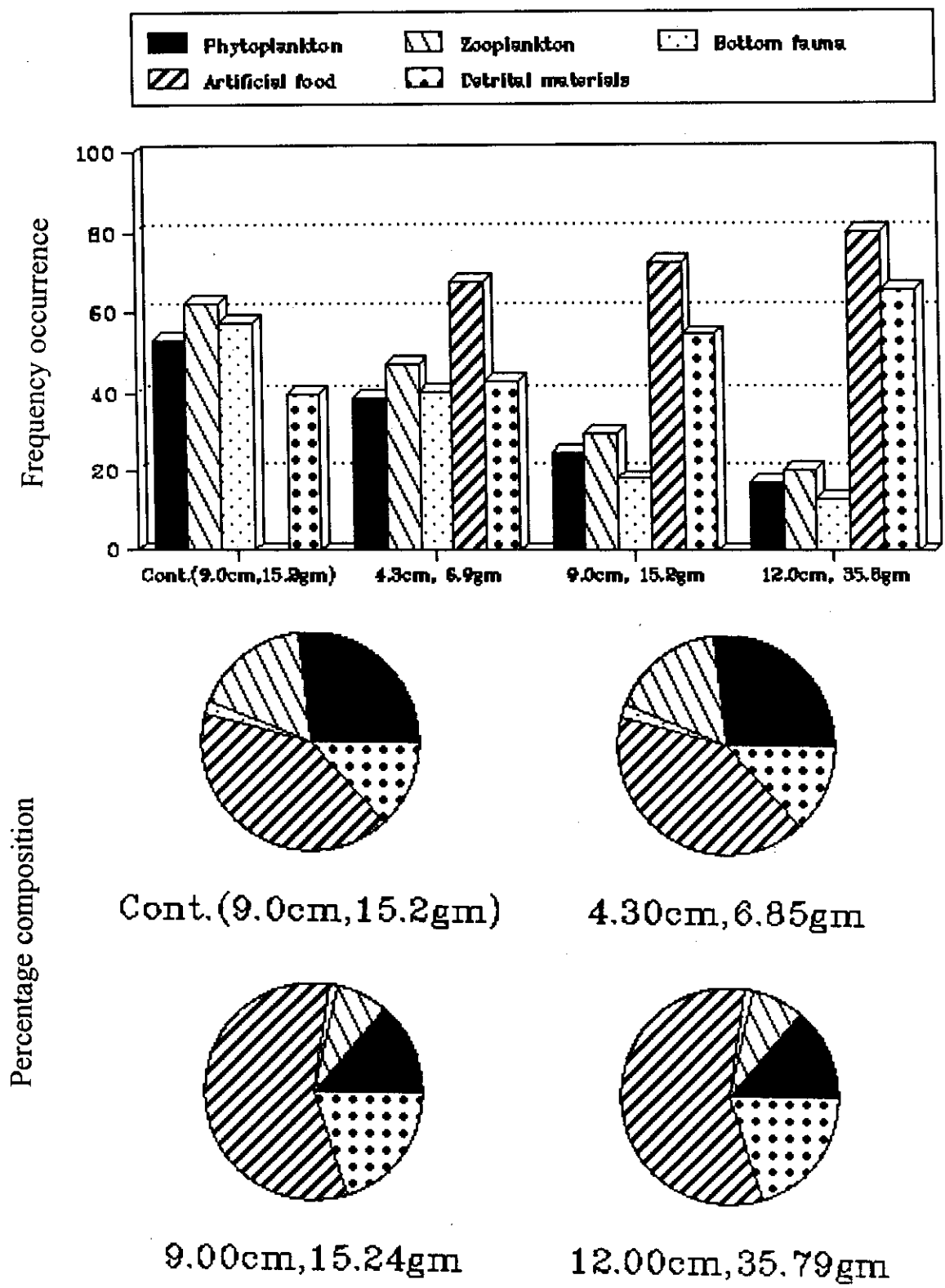


Fig. (44) : Frequency occurrence and percentage composition of various food items in guts of Nile tilapia *(O.niloticus)* reared in earthen pond at different initial sizes.

Fig. (45) : Selectivity index of various food items in guts of silver carp ***(H.molitrix)*** reared in earthen pond at different initial sizes.

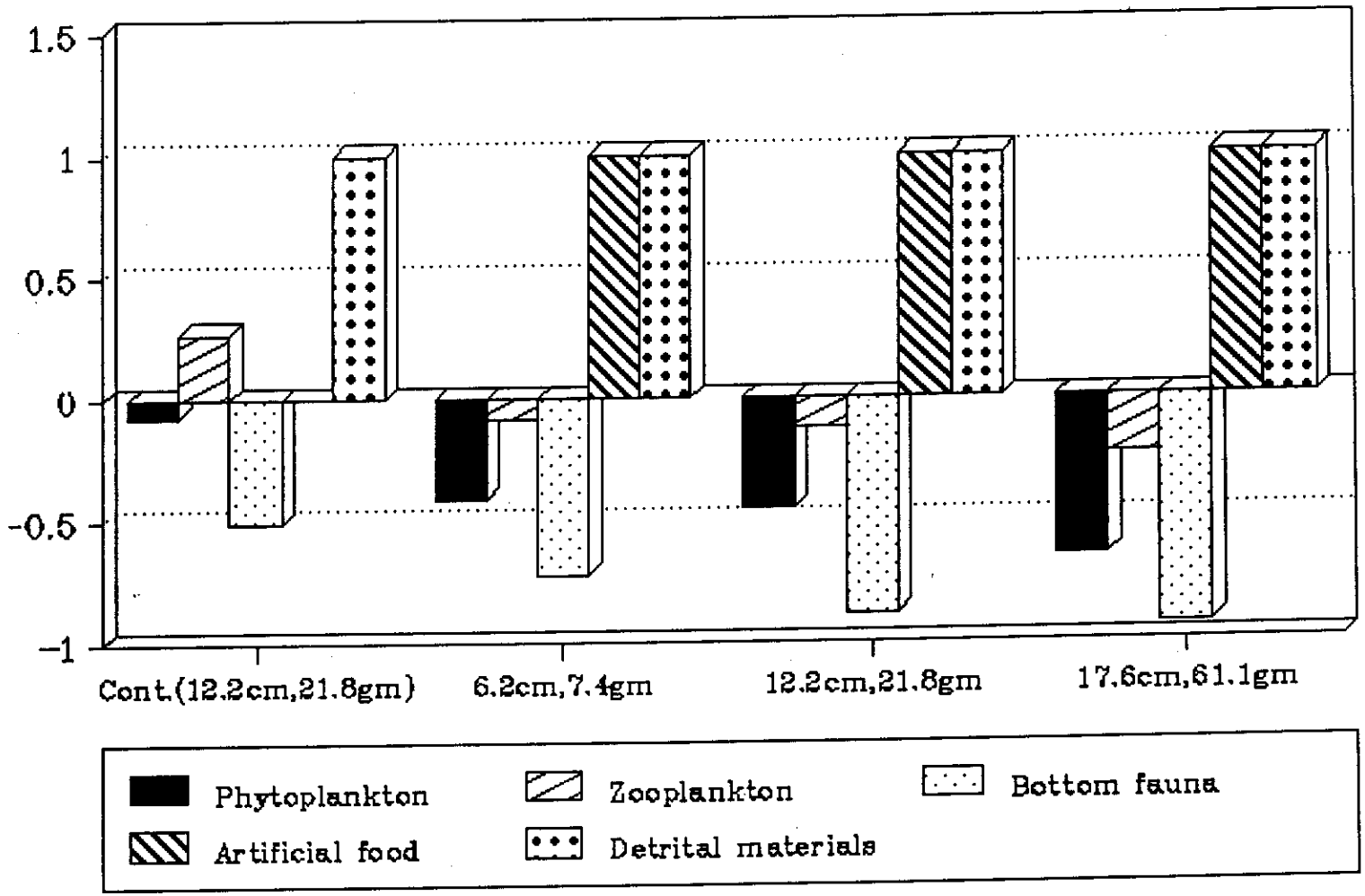
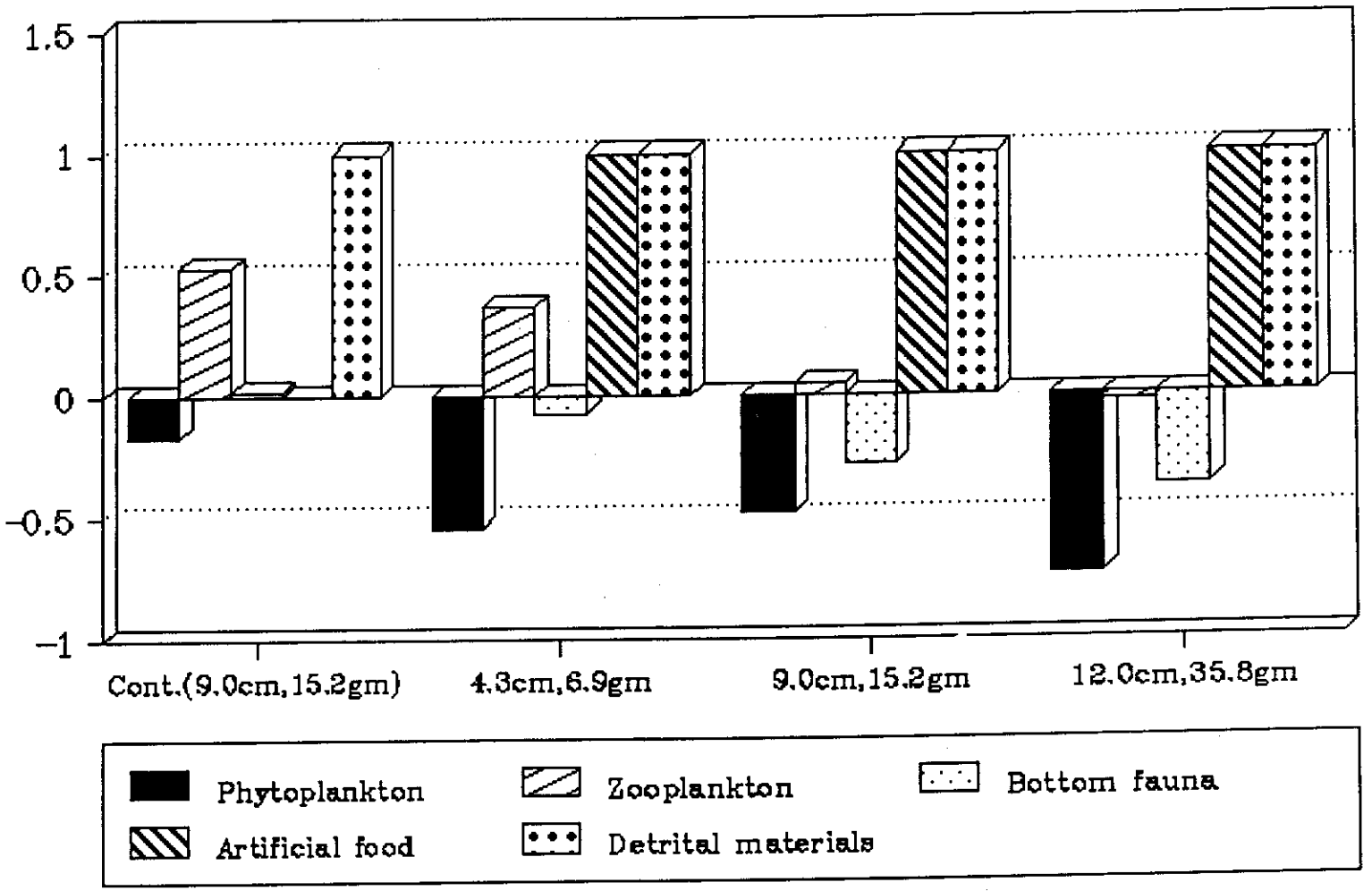


Fig. (46) : Selectivity index of various food items in guts of Nile tilapia ***(O.niloticus)*** reared in earthen pond at different initial sizes.



On the other hand, the values of frequency occurrence, percentage composition and selectivity degree of the various food item in gut of silver carp and Nile tilapia were higher in control groups than that in the fish at other initial sizes.

2-4- At different food rations :

At different food ration, the abundance of phytoplankton, zooplankton and bottom fauna in gut of silver carp ***(H. molitrix)*** and Nile tilapia ***(O. niloticus)*** were decreased gradually with the increased of food ration, while the artificial food and detrital materials were increased in fish gut. Their frequency occurrence and percentage composition were 51. 58% , 31.71% ; 25.60% , 7.05% ; 8.33% , 0.33% ; 64.29% , 47.94% and 38.10% , 13.00% in the gut of carp species at lowest food ration (1% of total body weight). While at highest food ration (5% of total body weight) these values became 29.71% , 10.35% ; 10.87% , 5.17% ; 0.0, 0.0 ; 82.61% , 64.59% and 61.90% , 19.90% for various food items respectively (Table 58 and Figure 47).

In gut of Nile tilapia ***(O. niloticus)*** the frequency occurrence, and percentage composition of the previous food items were 35.90%, 28.82% ; 38.46% , 15.06% ; 32.05%, 1.47% ; 66.67% , 45.78% and 48.72% , 8.91at food ration of 1% of total body weight. While at food ration 5% the values were 16. 29% , 12.81% ; 19.44% , 7.04% ; 12.23% , 1.12% ; 84.44% , 64.13% and 62.22% , 14.80% for various food items respectively (Table 59 and Figure 48).

Table (58) : Effect of food ration on stomach analysis of silver carp ***(H.molitrix)*** reared in earthen freshwater ponds, at a period of 244 days (from 1 April to 30 November, 1991)

Food ration	Control (0 % T.wt)				1 % of T.wt				3 % of T.wt				5 % of T.wt			
Food item	FO	NO	PC	SI	FO	NO	PC	SI	FO	NO	PC	SI	FO	NO	PC	SI
Phytoplankton :																
Chrysophyta	71.05	526	19.98	-0.25	52.38	236	5.92	-0.70	46.51	350	8.98	-0.57	32.61	104	2.82	-0.84
Chlorophyta	84.24	1207	45.84	+0.33	71.34	732	18.37	-0.40	60.46	742	19.04	-0.39	45.65	195	5.28	-0.78
Cyanophyta	42.10	335	12.72	-0.02	30.95	294	7.38	-0.28	18.60	240	6.16	-0.36	10.87	83	2.25	-0.71
Total	—	2068	78.48	-0.07	—	1262	31.17	-0.48	—	1332	34.18	-0.45	—	382	10.35	-0.79
Mean	65.80	—	—	—	51.58	—	—	—	41.86	—	—	—	29.71	—	—	—
Zooplankton :																
Cilliata	39.47	163	6.19	+0.25	33.33	127	3.19	+0.04	25.58	115	2.95	+0.00	17.39	75	2.03	-0.18
Rotifera	31.58	103	3.91	+0.21	21.43	81	2.03	-0.01	16.28	72	1.85	-0.06	8.70	67	1.81	-0.07
Cladocera	36.31	62	2.35	+0.15	28.57	48	1.20	-0.18	20.93	40	1.03	-0.25	13.04	31	0.84	-0.34
Copepoda	26.31	36	1.37	+0.03	19.05	25	0.63	-0.34	11.63	21	0.54	-0.41	4.35	18	0.49	-0.45
Total	—	364	13.82	+0.27	—	281	7.05	-0.06	—	248	6.37	-0.12	—	191	5.17	-0.22
Mean	33.55	—	—	—	25.60	—	—	—	18.61	—	—	—	10.87	—	—	—
Bottom fauna :																
Chironomidae	15.79	12	0.46	-0.50	11.90	9	0.23	-0.71	6.98	6	0.15	-0.80	—	—	—	—
Oligochaeta	10.53	7	0.27	-0.53	4.76	4	0.10	-0.80	—	—	—	—	—	—	—	—
Total	—	19	0.73	-0.51	—	13	0.33	-0.75	—	6	0.15	-0.80	—	—	—	—
Mean	13.16	—	—	—	8.33	—	—	—	6.98	—	—	—	—	—	—	—
Artificial food	—	—	—	—	64.29	1910	47.94	+ 1	77.27	2043	52.41	+ 1	82.61	2386	64.59	+ 1
Detrital material	34.21	182	6.91	+ 1	38.10	518	13.00	+ 1	51.16	269	6.90	+ 1	61.90	735	19.90	+ 1

* FO = Frequency occurrence.
* NO = Average number.
* PC = Percentage composition.
* SI = Selectivity index (calculated from the total values).

Table (59) : Effect of food ration on stomach analysis of Nile tilapia ***(O.niloticus)*** reared in earthen freshwater ponds, at a period of 244 days (from 1 April to 30 November, 1991)

Food ration	Control (0 % of T.wt)				1 % of T.wt				3 % of T.wt				5 % of T.wt			
Food item	FO	NO	PC	SI	FO	NO	PC	SI	FO	NO	PC	SI	FO	NO	PC	SI
Phytoplankton :																
Chrysophyta	52.50	440	13.43	-0.42	33.33	286	6.77	-0.66	25.00	303	7.53	-0.63	15.55	132	3.45	-0.81
Chlorophyta	60.00	1330	40.60	-0.03	43.59	703	16.70	-0.44	29.54	884	20.97	-0.35	22.22	281	7.35	-0.71
Cyanophyta	47.50	295	9.00	-0.19	30.77	226	5.35	-0.42	20.45	137	3.40	-0.59	11.11	77	2.01	-0.63
Total	—	2065	63.03	-0.17	—	1215	28.82	-0.51	—	1284	31.90	-0.48	—	490	12.81	-0.75
Mean	53.33	—	—	—	35.90	—	—	—	25.00	—	—	—	16.29	—	—	—
Zooplankton :																
Cilliata	70.00	376	11.48	+0.59	51.28	336	7.96	+0.46	45.45	120	2.98	-0.01	31.11	103	2.69	-0.04
Rotifera	55.00	250	7.63	+0.57	28.21	111	2.63	+0.12	20.45	90	2.24	-0.04	8.89	72	1.88	-0.05
Cladocera	65.00	132	4.03	+0.40	38.46	107	2.53	+0.11	27.27	76	1.89	+0.05	20.00	56	1.46	-0.08
Copepoda	60.00	100	3.05	+0.41	35.90	82	1.94	+0.20	25.00	68	1.69	+0.13	17.78	42	1.01	-0.12
Total	—	858	26.19	+0.53	—	636	15.06	+0.30	—	354	8.80	+0.05	—	273	7.04	-0.07
Mean	62.50	—	—	—	38.46	—	—	—	29.54	—	—	—	19.44	—	—	—
Bottom fauna :																
Chironomidae	65.00	51	1.56	+0.06	38.46	40	0.95	-0.18	25.00	32	0.80	-0.27	17.78	26	0.68	-0.34
Oligochaeta	50.00	26	0.79	-0.05	25.64	22	0.52	-0.26	11.36	19	0.47	-0.30	6.67	17	0.44	-0.33
Total	—	77	2.35	+0.02	—	62	1.47	-0.21	—	51	1.27	-0.28	—	43	1.12	-0.34
Mean	57.50	—	—	—	32.05	—	—	—	18.18	—	—	—	12.23	—	—	—
Artificial food	—	—	—	—	66.67	1933	45.78	+ 1	72.22	2060	51.18	+ 1	84.44	2453	64.13	+ 1
Detrital material	40.00	275	8.39	+ 1	48.72	376	8.91	+ 1	54.55	276	6.86	+ 1	62.22	566	14.80	+ 1

* FO = Frequency occurrence.
* NO = Average number.
* PC = Percentage composition.
* SI = Selectivity index (calculated from the total values).

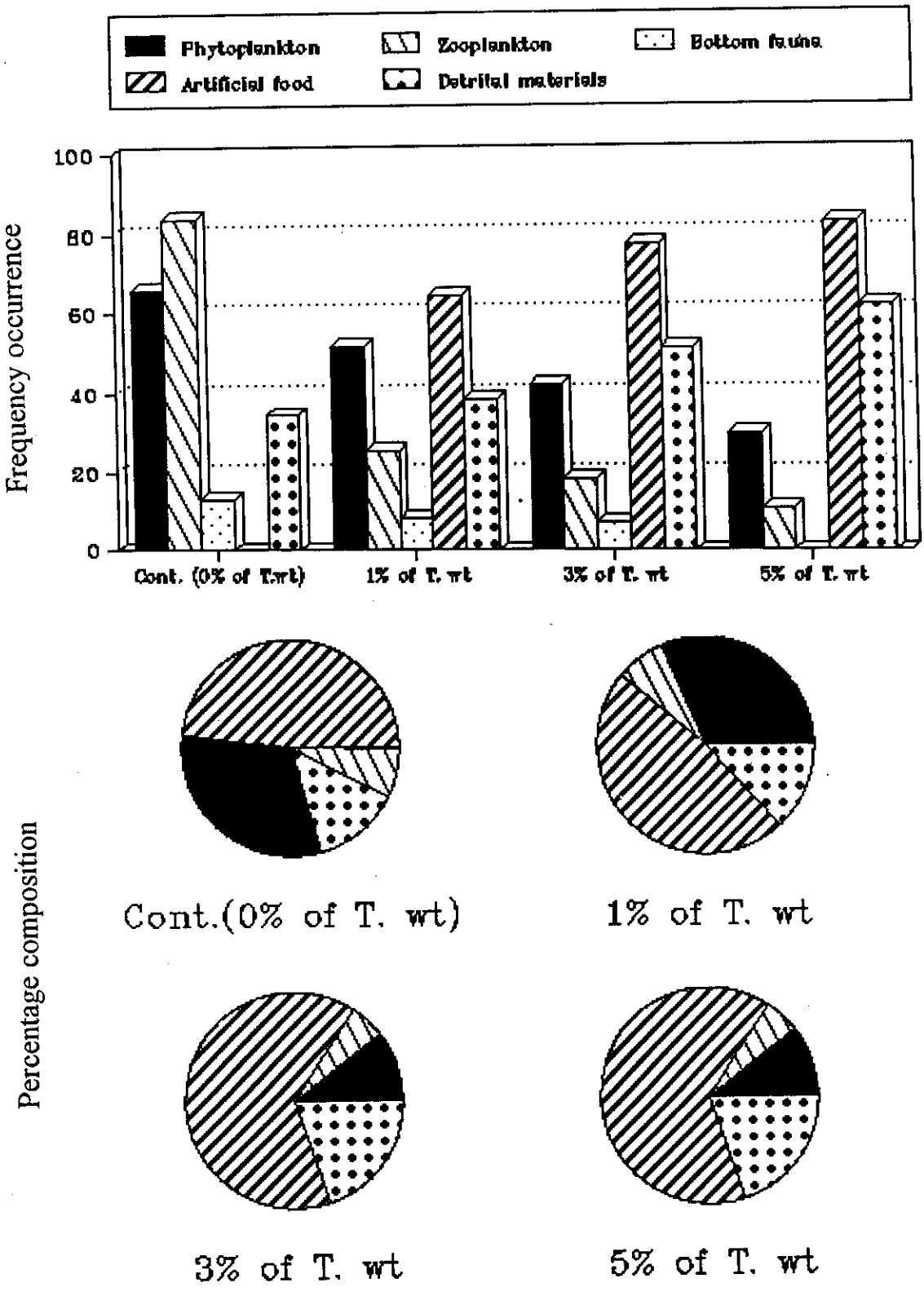


Fig. (47) : Frequency occurrence and percentage composition of various food items in guts of silver carp *(H.molitrix)* reared in earthen pond at different food rations.

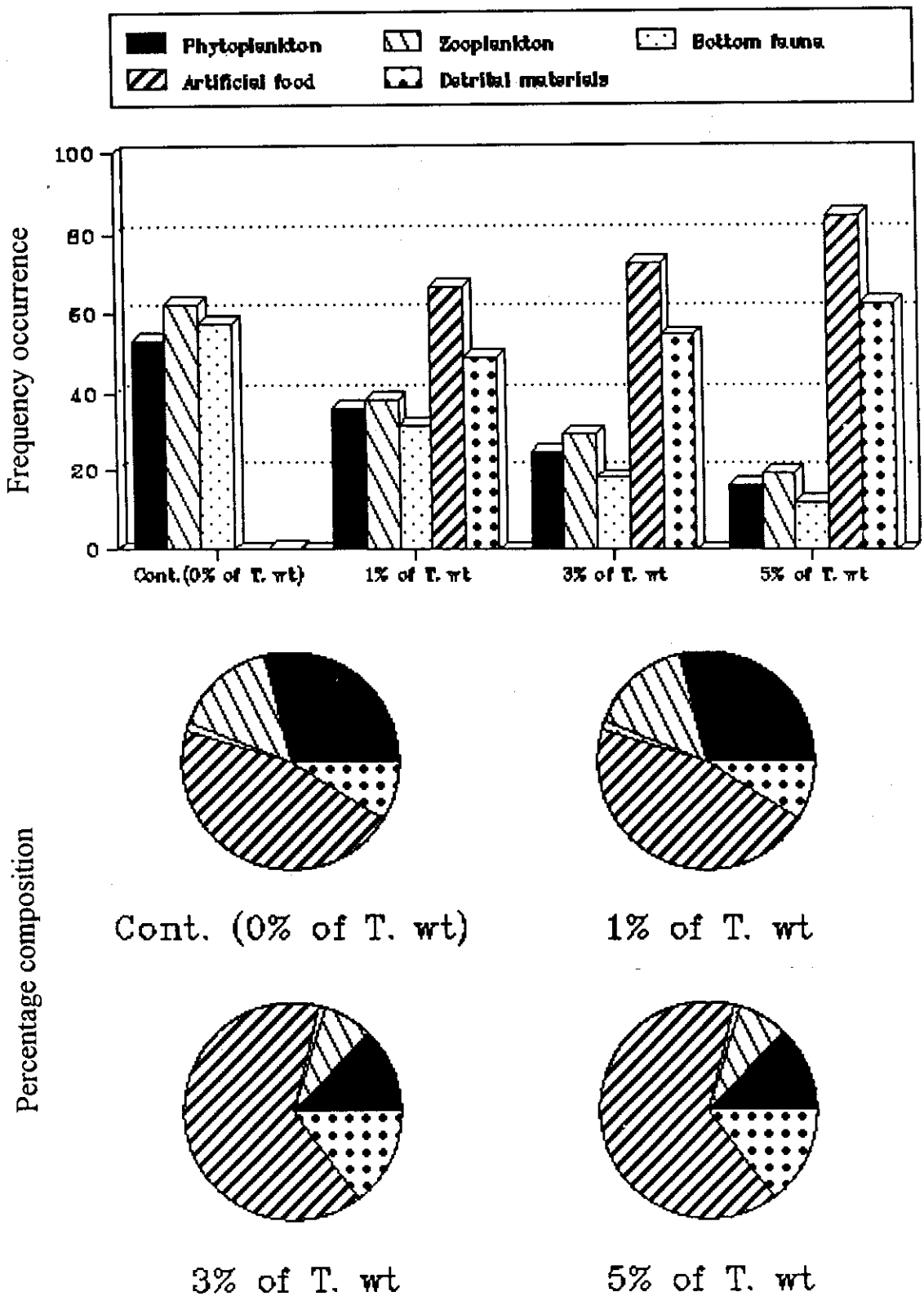


Fig. (48) : Frequency occurrence and percentage composition of various food items in guts of Nile tilapia *(O.niloticus)* reared in earthen pond at different food rations.

Fig. (49) : Selectivity index of various food items in guts of silver carp ***(H.molitrix)*** reared in earthen pond at different food rations.

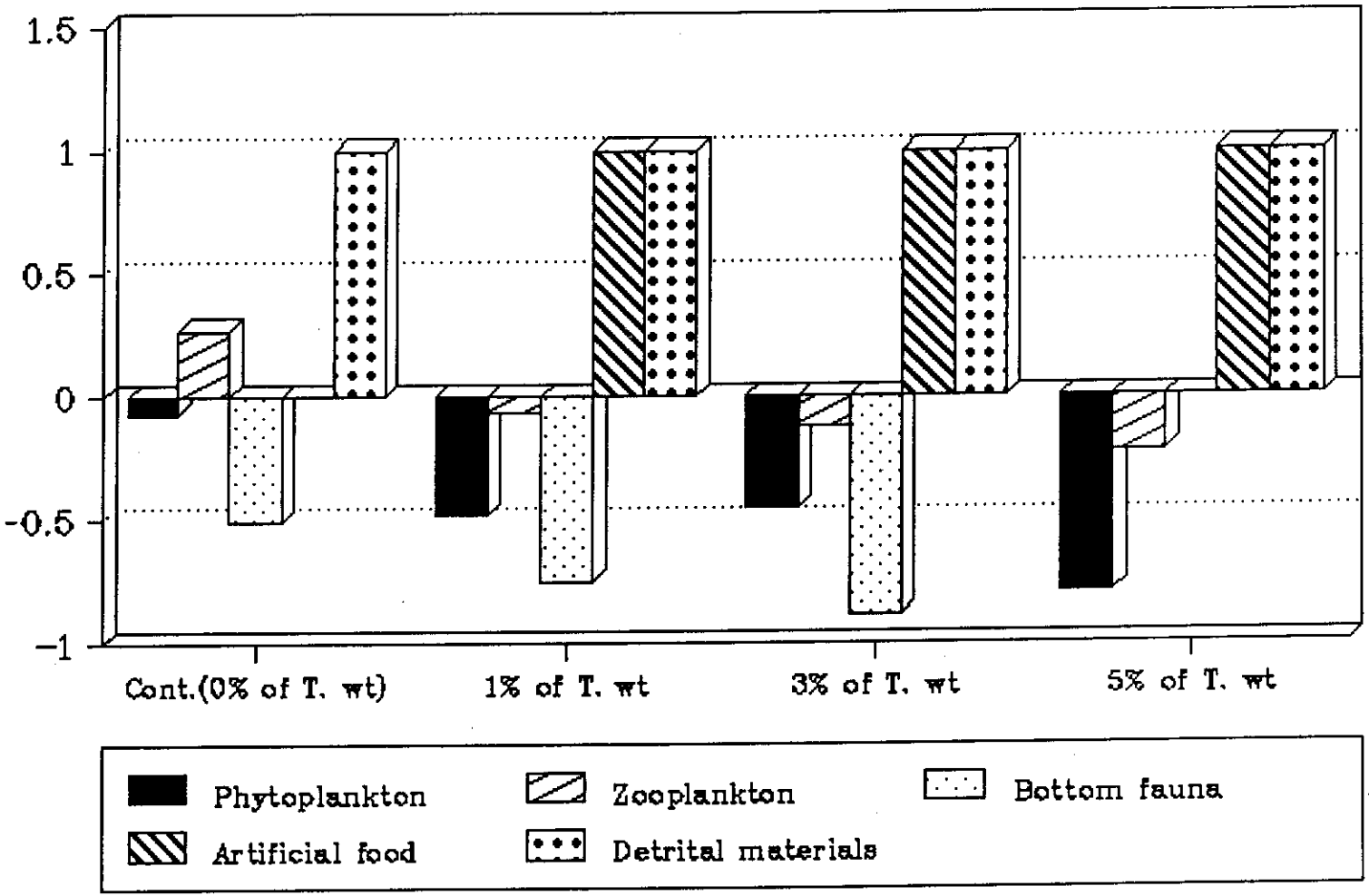
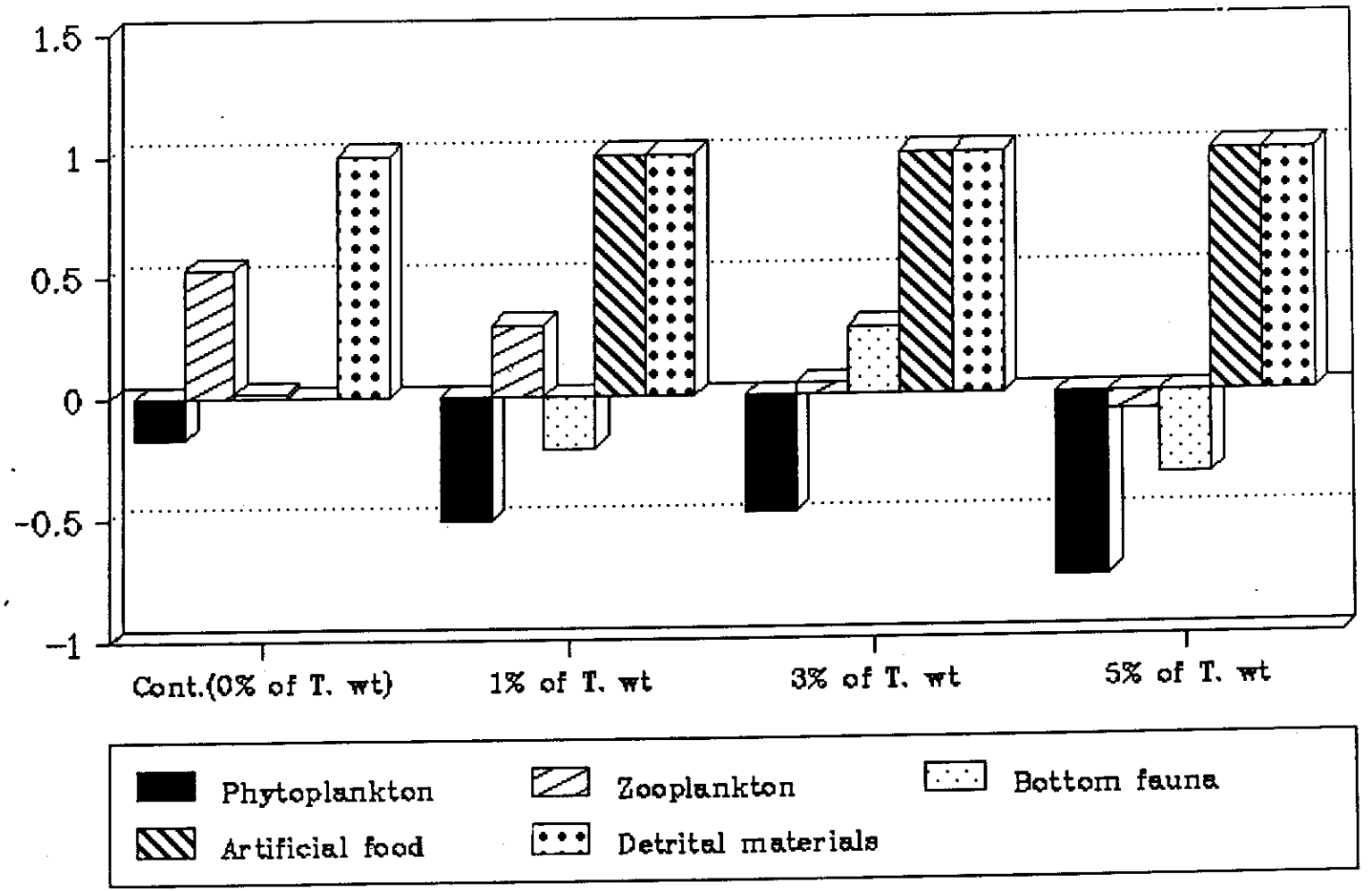


Fig. (50) : Selectivity index of various food items in guts of Nile tilapia ***(O.niloticus)*** reared in earthen pond at different food rations.



In both rearing fish (carp and tilapia) the perference for natural food organisms was decreased with the increase of food ration, this may be due to that the smallest fish perfer to eat phyto and zooplanktonic organisms (Tables 58,59 and Figures 49,50). The average values of frequency occurrence and percentage composition and selectivity index of natural food items in control carp and tilapia were higher than that in fishes fed with three food rations (1% , 3% and 5% of total body weight).

The selectivity degree of ***H. molitrix*** and ***O. niloticus*** for natural food organisms were higher in control groups than that fishes reared in other treatment ponds, this due to there is no artificial food in control ponds, therefore the rearing fish in control pond dependence collectively on the natural food items.

CHAPTER 4

BIOCHEMICAL ANALYSIS OF FISHES

The experiments were designed also to study the variations of some blood parameters as well as serum, liver and muscle analysis of silver carp ***(H. molitrix)*** and Nile tilapia ***(O. niloticus)*** in relation to the different experimental conditions.

1- Blood parameters :

1-1- Erythrocyte counts (RBCS) :

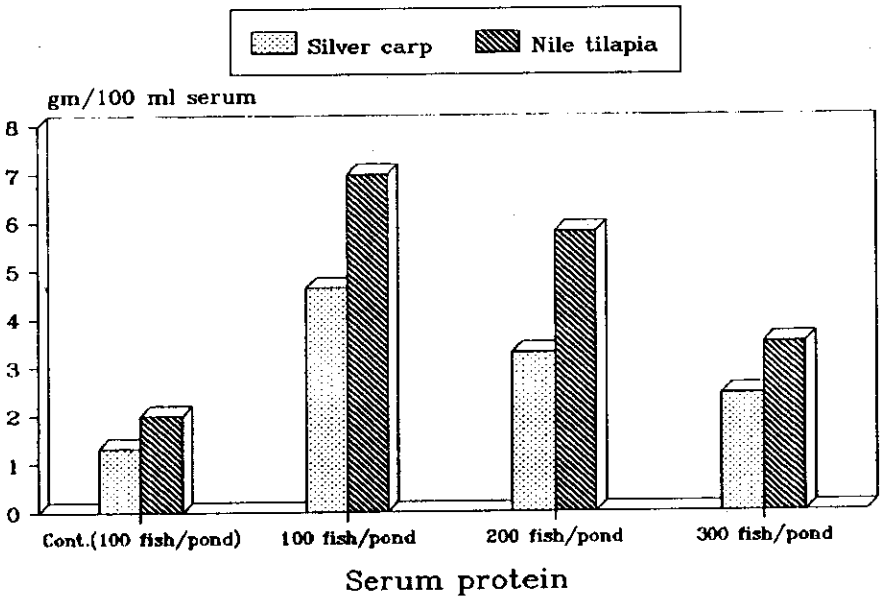
The average values of RBCS counts in both reared fish (carp and tilapia) slightly decreased with the increase of stocking density. Its maximum values (ranged from 1.703 to 1.924 million/mm^3 with an average 1.874 ± 0.481 million/mm^3 for carp and from 1.766 to 2.054 million/mm^3 with average 1.906 ± 0.462 million/mm^3 for tilapia) were recorded at stock of one fish/m^2. While the minimum values (the range and average were 0.521 - 1.210, 0.881 ± 0.170 and 0.732 - 1.261, 0.921 ± 0.161 million/mm^3 for carp and tilapia respectively) were observed at highest stocking density, three fish/m^2 (Table 60 and Figure 51).

The differences between the mean RBCS count of both fish species obtained from the ponds at different stocking densities and that attained from control groups, without supplementary food were highly significant ($P < 0.01$) as indicated in table (64).

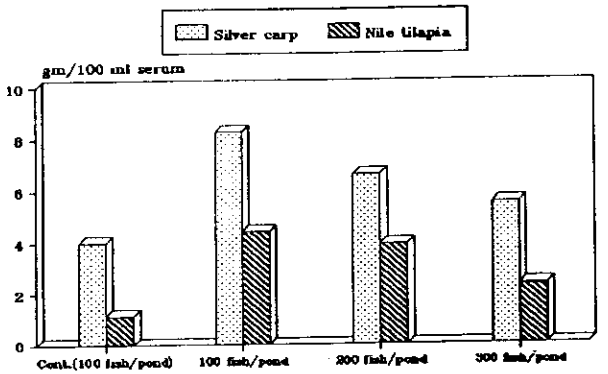
Table (60) : Effect of stocking density on blood parameters and serum analysis of silver carp ***(H.molitrix)*** and Nile tilapia ***(O.niloticus)*** reared in earthen freshwater ponds, at a period of 8 months.

Stocking density	Control(100 fish / pond)		100 fish / pond		200 fish / pond		300 fish / pond	
Item	Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
Silver carp								
Blood parameters								
Erythrocyte	0.502-0.916	0.641±0.163	1.703-1.924	1.874±0.481	0.711-1.742	1.320±0.211	0.521-1.210	0.881±0.170
Haematocrit	19.10-23.50	20.00±1.75	32.11-44.00	37.20±4.40	27.00-37.12	33.00±2.06	21.00-28.45	26.50±0.98
Haemoglobin	3.30-7.42	4.15±1.64	4.03-9.40	8.25±3.93	5.00-8.50	7.40±1.05	3.00-7.50	6.15±1.18
Serum analysis								
Protein	1.15-1.93	1.32±0.31	2.11-7.75	4.64±1.56	1.35-5.20	3.28±0.96	1.02-3.62	2.43±0.60
Lipid	3.51-5.70	4.00±0.85	6.15-10.21	8.27±1.97	4.00-8.50	6.62±0.94	3.15-7.45	5.53±1.01
Glucose	22.62-38.50	32.00±3.25	39.15-61.20	52.60±4.30	71.11-88.20	78.51±4.85	81.00-108.0	92.59±7.71
Nile tilapia								
Blood parameters								
Erythrocyte	0.523-0.941	0.752±0.108	1.766-2.054	1.906±0.462	1.512-1961	1.751±0.211	0.732-1.261	0.921±0.161
Haematocrit	19.11-23.31	21.15±1.08	35.20-46.32	41.00±2.66	34.00-42.50	38.00±2.25	26.00-29.15	27.20±0.73
Haemoglobin	3.17-7.12	5.10±1.00	6.50-10.65	9.00±4.33	6.11-9.76	8.15±2.00	6.10-8.12	7.00±1.56
Serum analysis								
Protein	1.02-3.15	2.00±0.58	4.25-10.55	6.98±1.79	3.51-7.62	5.80±0.91	2.42-5.65	3.48±1.09
Lipid	0.62-1.75	1.14±0.30	2.32-7.61	4.43±1.59	2.02-6.17	3.92±1.13	1.72-3.30	2.33±0.49
Glucose	46.21-75.00	60.00±7.50	60.13-86.20	75.51±4.85	73.00-90.15	81.00±4.58	91.00-116.2	103.6±3.55

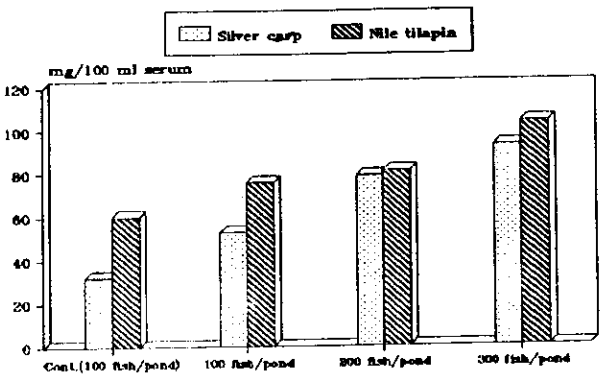
Fig.(52):Averages protein, lipid and glucose in serum of silver carp and Nile tilapia reared in earthen ponds at different stocking densities.



Serum protein



Serum lipid



Serum glucose

The erythrocyte count was also slightly increased from 0.641 ± 0.163 and 0.752 ± 0.108 million/mm³ for control carp and tilapia respectively to 0.803 ± 0.121 and 0.862 ± 0.120 million/mm³ (significant, $P < 0.05$) at diet contained 20% protein then to 1.320 ± 0.211 and 1.751 ± 0.211 million/mm³ (highly significant, $P < 0.01$) at diet with 30% protein and finally to 1.901 ± 0.463 and 1.651 ± 0.191 million/mm³ (highly significant, $P < 0.01$) respectively at diet contain 40% protein (Table 61 and Figure 53).

The present data, given in table (62) and figure (55), showed that the RBCS count of silver carp and Nile tilapia were gradually raised with the increased initial size of rearing fish. Its average values highly significant ($P < 0.01$) increased from that of control fish to 0.732 ± 0.161, 1.320 ± 0.211 and 1.861 ± 0.482 million/mm³ for carp and 0.772 ± 0.091 , 1.751 ± 0.211 and 1.981 ± 0.190 million/mm³ for tilapia at the three different experimental initial sizes respectively. Also, differences between the RBCS count of fishes reared with different initial size were highly significant ($P < 0.01$) as cleared in table (64).

It was noticed also that, the RBCS count of ***H. molitrix*** and ***O. niloticus*** also increase with the increased food ration. Its average values highly significant increased to 0.841 ± 0.112, 1.320 ± 0.211 and 1.860 ± 0.451 million/mm³ for carp and 0.921 ± 0.201, 1.751 ± 0.211 and 1.951 ± 0.452 million/mm³ for tilapia at 1%, 3% and 5% food rations respectively (Table 63 and Figure 57). Also the differences of

RBCS count between the rearing fishes fed on artificial food with different food ration were highly significant ($P < 0.01$), table (64).

1-2- Haematocrit value (Ht) :

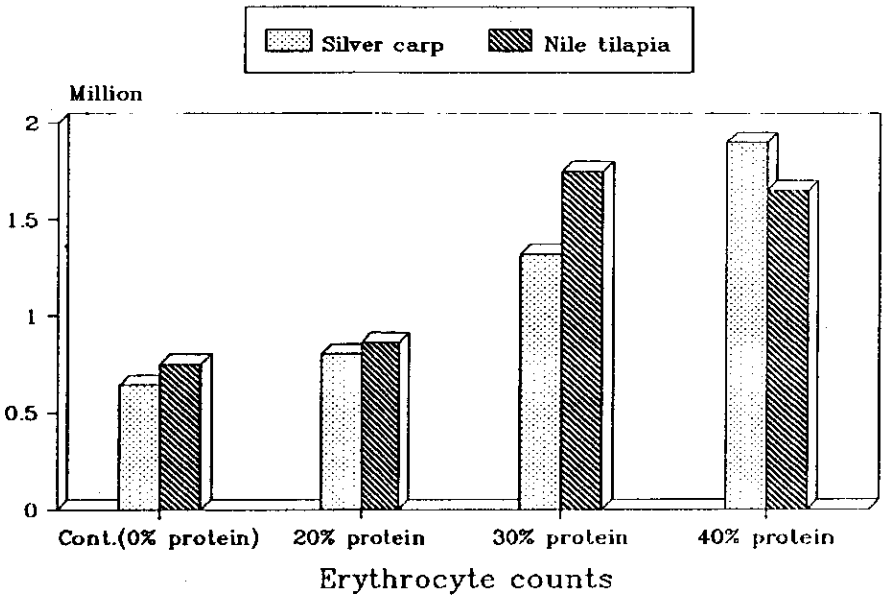
The present study (Table 60 and Figure 51) indicated that, at the lowest stocking density (one fish/m²) the Ht values of ***H. molitrix*** and ***O. niloticus*** ranged from 32.11 - 44.00% and 35.20 - 46.32% with average 37.20 ± 4.40% and 41.00 ± 2.66% respectively. These values were decreased at the stock of two fish/m² until it reach its minimum values (range of 21.00 - 28.45% and 26.00 - 29.15% and average of 26.50 ± 0.98% and 27.20 ± 0.73% for carp and tilapia respectively) at the highest stock (three fish/m²). The differences between the mean haematocrit values of silver carp and Nile tilapia reared at different stocking densities and control groups (lowest stock and maintained without supplementary food) were highly significant ($P < 0.01$).

At different dietary protein levels, the blood haematocrit showed average values of 20.00 ± 1.75% and 21.15 ± 1.08% for control carp and tilapia respectively. These values highly significant ($P < 0.01$) increased to 24.00 ± 1.08% , 33.00 ± 2.06%, and 48.00 ± 3.13% for silver carp ***(H. molitrix)*** and 25.10 ± 1.06% , 38.00 ± 2.25% and 32.00 ± 2.08% for Nile tilapia ***(O. niloticus)*** at 20%, 30% and 40% dietary protein levels respectively (Table 61 and Figure 53).

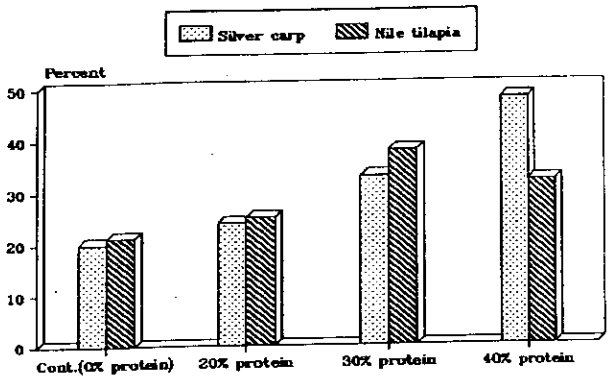
Table (61) : Effect of dietary protein on blood parameters and serum analysis of silver carp ***(H.molitrix)*** and Nile tilapia ***(O.niloticus)*** reared in earthen freshwater ponds, at a period of 8 months.

Protein level	Control (0% protein)		20 % protein		30 % protein		40 % protein	
Item	Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
Silver carp								
Blood parameters								
Erythrocyte	0.502-0.916	0.641±0.163	0.522-1.031	0.803±0.121	0.711-1.742	1.320±0.211	1.321-2.302	1.901±0.463
Haematocrit	19.10-23.50	20.00±1.75	21.12-26.15	24.00±1.08	27.00-37.12	33.00±2.06	45.15-54.25	48.00±3.13
Haemoglobin	3.30-7.42	4.15±1.64	2.75-3.73	5.80±0.96	5.00-8.50	7.40±1.05	7.50-11.50	9.00±3.75
Serum analysis								
Protein	1.15-1.93	1.32±0.31	1.06-4.51	2.85±0.33	1.35-5.20	3.28±0.96	3.75-8.21	4.82±1.70
Lipid	3.51-5.70	4.00±0.85	3.92-6.65	4.80±0.57	4.00-8.50	6.62±0.94	5.00-9.50	7.15±1.68
Glucose	22.62-38.50	32.00±3.25	77.35-98.12	86.55±7.29	71.11-88.20	78.51±4.85	55.21-68.72	62.23±1.50
Nile tilapia								
Blood parameters								
Erythrocyte	0.523-0.941	0.752±0.108	0.723-1.101	0.862±0.120	1.512-1961	1.751±0.211	1.250-2.031	1.651±0.191
Haematocrit	19.11-23.31	21.15±1.08	24.00-27.22	25.10±1.06	34.00-42.50	38.00±2.25	28.00-36.11	32.00±2.08
Haemoglobin	3.17-7.12	5.10±1.00	5.02-8.21	6.00±1.11	6.11-9.76	8.15±2.00	4.72-8.35	6.61±0.92
Serum analysis								
Protein	1.02-3.15	2.00±0.58	2.15-8.55	3.00±1.00	3.51-7.62	5.80±0.91	2.72-6.35	4.52±0.92
Lipid	0.62-1.75	1.14±0.30	1.62-3.00	2.00±0.50	2.02-6.17	3.92±1.13	1.85-4.34	3.63±0.86
Glucose	46.21-75.00	60.00±7.50	85.32-112.2	97.28±2.44	73.00-90.15	81.00±4.58	74.00-95.25	84.02±5.62

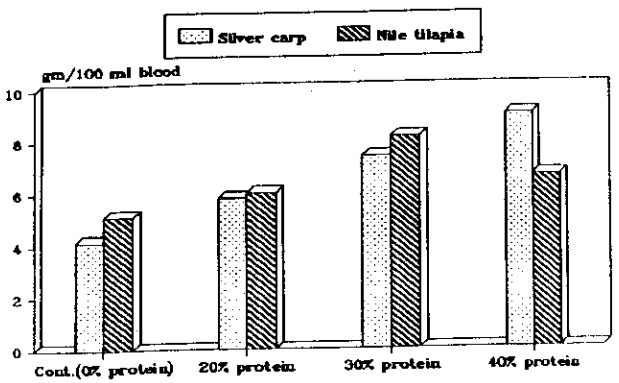
Fig(53): Averages erythrocyte, haematocrit and haemoglobin in blood of silver carp and Nile tilapia reared in earthen ponds at different dietary protein levels.



Erythrocyte counts

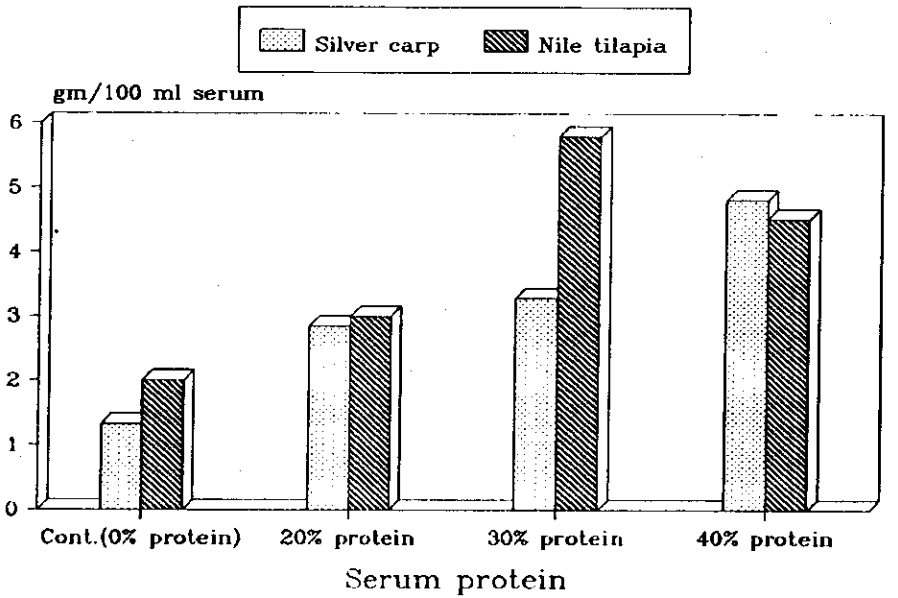


Haematocrit values

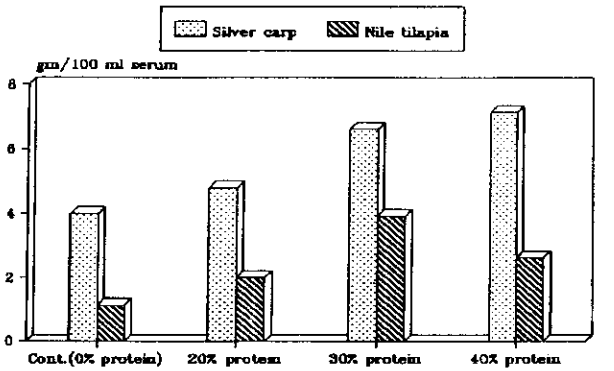


Haemoglobin contents

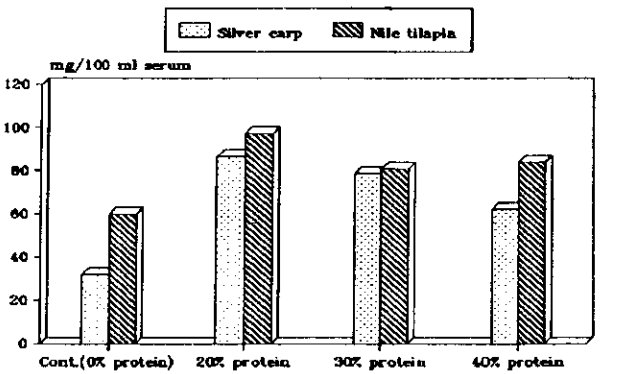
Fig.(54):Averages protein, lipid and glucose in serum of silver carp and Nile tilapia reared in earthen ponds at different dietary protein levels.



Serum protein



Serum Lipid



Serum glucose

Table (62) and Figure (55) showed also that, the average values of haematocrit slightly elevated with the increased initial size of rearing fish, its maximum values (46.00 ± 4.10% and 47.34 ± 2.30% for carp and tilapia respectively) were recorded at the largest initial size (17.56 cm, 61.05 gm for carp and 12.00 cm, 35.79 gm for tilapia). While the minimum values (22.00 ± 1.65 , 24.30 ± 0.85% for the two studied fish species respectively) were observed at the smallest initial size (6.20 cm, 7.40 gm for carp and 4.30 cm, 6.85 gm for tilapia).

At different food ration (Table 63 and Figure 57) the haematocrit values were highly significant ($P < 0.01$) increased to 25.20 ± 0.96%, 33.00 ± 2.06% and 40.50 ± 3.75% for carp and 27.00 ± 1.56% , 38.00 ± 2.25% and 42.60 ± 2.70% for tilapia at 1%, 3%, and 5% food rations respectively from those values of control fish. Also, the differences between the haematocrit values of carp and tilapia at the three different food rations and that of their control fish were highly significant ($P < 0.01$), table (64).

1-3- Haemoglobin content (Hg) :

The present data indicated that, the blood haemoglobin concentration of control carp and tilapia (one fish/m², without supplementary food and 2nd initial size) were 4.15 ± 1.64 and 5.10 ± 1.00 gm/100 ml blood respectively. These values highly significant ($P<0.01$) increased to 8.25 ± 3.93, 7.40 ± 1.05 and 6.15 ± 1.18 gm/100 ml blood for carp and 9.00 ± 4.33 , 8.15 ± 2.00 and 7.00 1.56 gm/100

ml blood for tilapia at the three different stocking densities (one fish/m², two fish/m² and three fish/m²) respectively (Table 60 and Figure 51). It is necessary to be noted that the highest haemoglobin content was recorded with the lowest stocking density for both species and vice versa.

At different dietary protein levels (Table 61 and Figure 53) the haemoglobin content of ***H. molitrix*** and ***O. niloticus*** showed a slight increase to 5.80 ± 0.96 and 6.00 ± 1.11 gm/100 ml blood (highly significant, $P < 0.01$ for carp and unsignificant $P > 0.05$ for tilapia) in fishes fed on diet contain 20% protein. The haemoglobin content increased to 7.40 ± 1.05 and 8.15 ± 2.00 gm/100 ml blood (highly significant, $P < 0.01$) for the two fish species, fed on a diet with 30% protein, respectively. These values also increased to 9.00 ± 3.75 and 6.61 ± 0.92 gm/100 ml blood (highly significant, $P < 0.01$) at diet contain 40% protein.

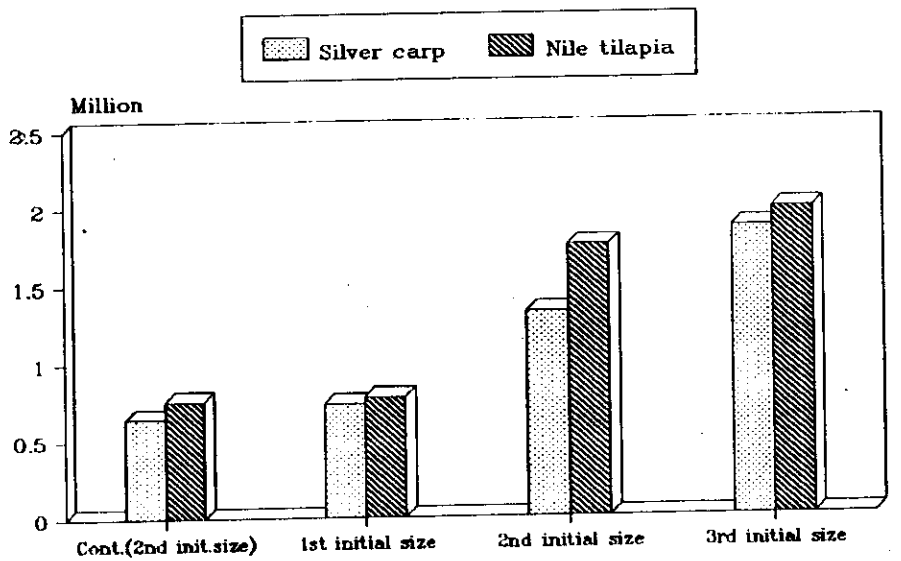
From tables (62) and Figure (55), it was noticed that the maximum values of haemoglobin content (8.64 ± 3.90 and 9.52 ± 1.85 gm/100 ml blood for silver carp and Nile tilapia respectively) were recorded in fishes with large initial size. While the minimum values (4.75 ± 1.45 and 6.15 ± 1.09 gm/100 ml blood for carp and tilapia respectively) were observed at small initial size (6.20 cm, 7.40 gm for carp and 4.30 cm, 6.85 gm for tilapia). The differences between the haemoglobin

Table (62) : Effect of initial size on blood parameters and serum analysis of silver carp ***(H.molitrix)*** and Nile tilapia ***(O.niloticus)*** reared in earthen freshwater ponds, at a period of 8 months.

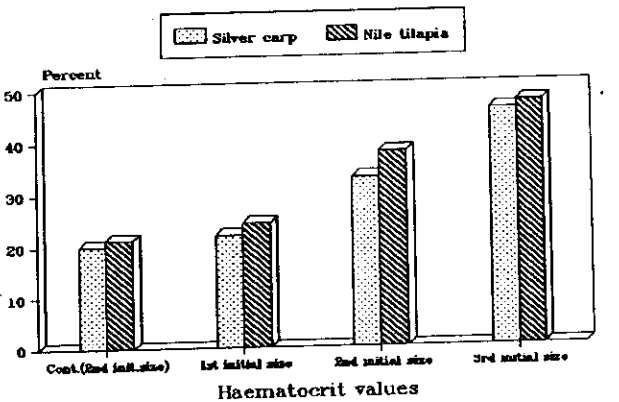
Initial size	Cont.(2 nd initial size)		1 st initial size		2 nd initial size		3 rd initial size	
Item	Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
Silver carp								
Blood parameters								
Erythrocyte	0.502-0.916	0.641±0.163	0.631-1.052	0.732±0.161	0.711-1.742	1.320±0.211	1.302-2.241	1.861±0.482
Haematocrit	19.10-23.50	20.00±1.75	21.00-25.31	22.00±1.65	27.00-37.12	33.00±2.06	40.00-54.21	46.00±4.10
Haemoglobin	3.30-7.42	4.15±1.64	3.71-7.65	4.75±1.45	5.00-8.50	7.40±1.05	6.85-10.43	8.64±3.90
Serum analysis								
Protein	1.15-1.93	1.32±0.31	1.81-3.42	2.60±0.41	1.35-5.20	3.28±0.96	3.54-9.21	5.75±1.73
Lipid	3.51-5.70	4.00±0.85	3.30-7.15	5.00±1.08	4.00-8.50	6.62±0.94	6.00-10.45	8.40±2.02
Glucose	22.62-38.50	32.00±3.25	80.00-97.12	91.00±2.75	71.11-88.20	78.51±4.85	49.00-63.21	57.06±2.08
Nile tilapia								
Blood parameters								
Erythrocyte	0.523-0.941	0.752±0.108	0.511-0.950	0.772±0.091	1.512-1961	1.751±0.211	1.571-2.350	1.981±0.190
Haematocrit	19.11-23.31	21.15±1.08	22.17-26.00	24.30±0.85	34.00-42.50	38.00±2.25	42.00-55.60	47.34±2.30
Haemoglobin	3.17-7.12	5.10±1.00	4.11-8.32	6.15±1.09	6.11-9.76	8.15±2.00	7.42-11.31	9.52±1.85
Serum analysis								
Protein	1.02-3.15	2.00±0.58	2.02-4.00	3.44±0.78	3.51-7.62	5.80±0.91	5.92-10.20	7.95±1.12
Lipid	0.62-1.75	1.14±0.30	1.73-2.94	2.25±0.35	2.02-6.17	3.92±1.13	3.71-7.25	5.64±0.30
Glucose	46.21-75.00	60.00±7.50	94.11-115.3	102.5±5.42	73.00-90.15	81.00±4.58	51.30-77.11	65.41±5.35

1 st initial size = 6.20 cm , 7.40 gm for carp and 4.30 cm , 6.85 gm for tilapia .
2 nd initial size = 12.16 cm , 21.75 gm for carp and 9.00 cm , 15.24 gm for tilapia.
3 rd initial size = 17.56 cm , 61.05 gm for carp and 12.00 cm , 35.79 gm for tilapia.

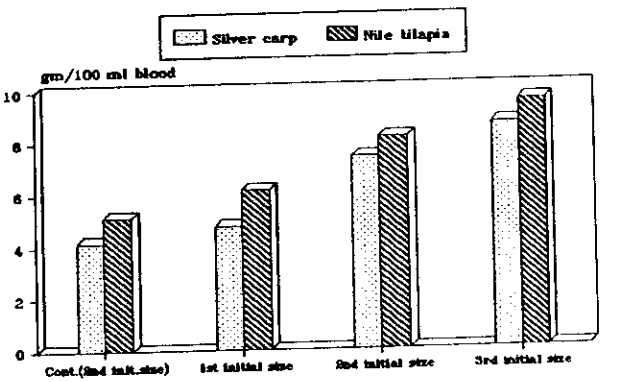
Fig(55): Averages erythrocyte, haematocrit and haemoglobin in blood of silver carp and Nile tilapia reared in earthen ponds at different initial sizes.



Erythrocyte counts

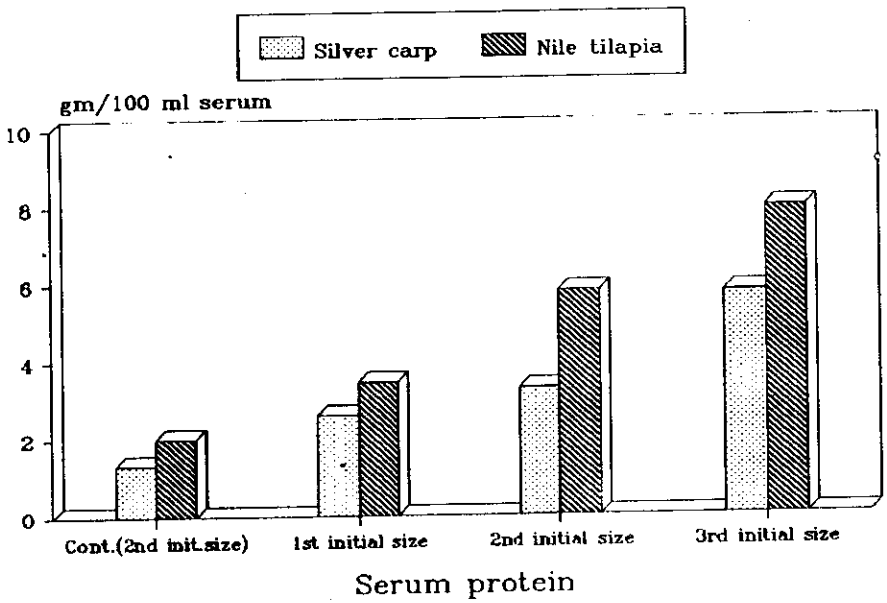


Haematocrit values

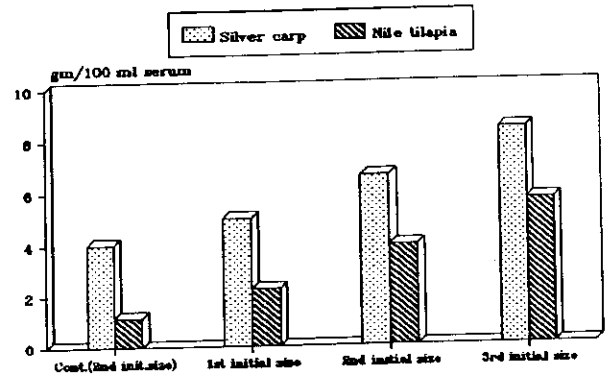


Haemoglobin contents

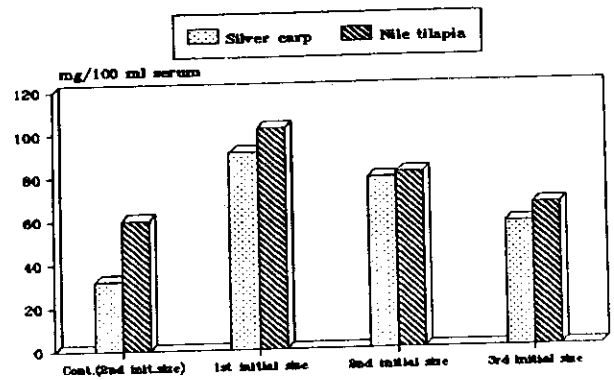
Fig.(56):Averages protein, lipid and glucose in serum of silver carp and Nile tilapia reared in earthen ponds at different initial sizes.



Serum protein



Serum lipid



Serum glucose

content of carp and tilapia reared with different initial sizes were and that of the control group highly significant ($P < 0.01$) , table (64).

At different food rations (Table 63 and Figure 57), the blood haemoglobin content of control silver and Nile tilapia showed progressive highly significant ($P < 0.01$) increase from that of the fore mentioned control fish to 6.00 ± 1.11, 7.40 ± 1.05 and 8.76 ± 1.43 gm/100 ml blood for carp and 7.15 ± 2.08, 8.15 ± 2.00 and 9.60 ± 2.60 gm/100 blod for tilapia at the three different food rations (1%, 3% and 5%) respectively.

2- Serum analysis :

2-1- Protein :

The present investigation (Table 60 and Figure 52) revealed that, the total serum protein of control silver carp and Nile tilapia (one fish/m², without supplementary food and 2nd initial size) were 1.32 ± 0.31 and 2.00 ± 0.58 gm/100 ml serum respectively. These values showed highly significant ($P < 0.01$) increase to 4.64 ± 1.56 , 6.98 ± 1.79 gm/100 ml serum in fishes stocked at one fish/m² ; 3.28 ± 0.96, 5.80 ± 0.91 gm/100 ml serum at stock of two fish/m² and 2.43 ± 0.60, 3.48 ± 1.09 gm/100 ml serum at stock of three fish/m² for the two fish species respectively.

At different dietary protein levels (Table 61 and Figure 54), the serum protein of ***H. molitrix*** and ***O. niloticus*** increase to 2.85 ± 0.33,

3.00 ± 1.00 at 20 % dietary protein level 3.28 ± 0.96, 5.80 ± 0.91 at 30% and 4.82 ± 1.70, 4.52 ± 0.92 gm/100 ml serum for the two fish species respectively. These increases from the that of control group were highly significant ($P < 0.01$).

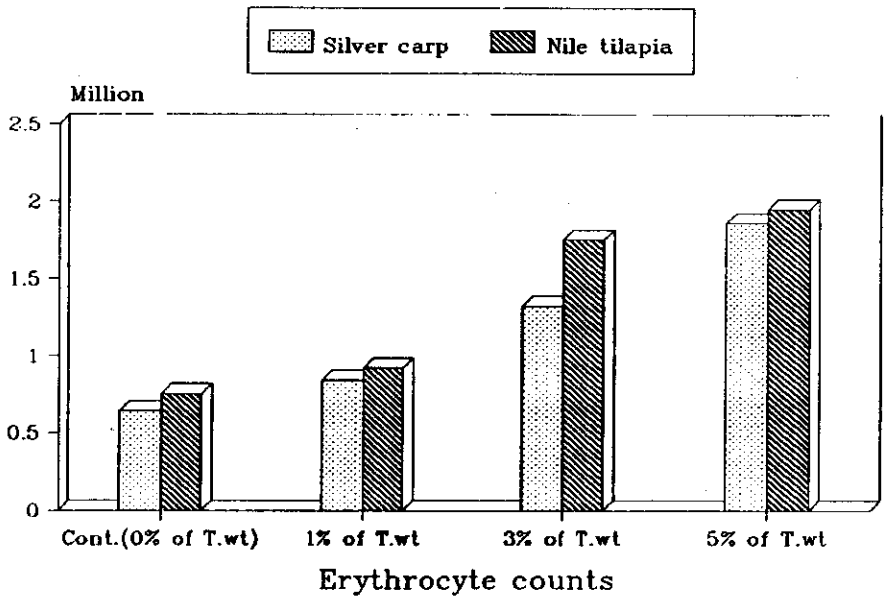
From the obtained results (Table 62 and Figure 56) it was noticed that, total serum protein in both fish species (carp and tilapia) were gradually elevated with the increased initial size of the rearing fish. Its maximum values (range of 3.54 - 9.21and 5.92 - 10.20 gm/100 ml serum with average of 5.75 ± 1.73 and 7.95 ± 1.12, gm/100 ml serum for carp and tilapia respectively) recorded at large initial size. While the minimum values of serum protein (ranged from 1.81 to 3.42 and from 2.02 to 4.00 gm/100 ml serum with average of 2.60 ± 0.41 and 3.44 ± 0.78 gm/100 ml serum for carp and tilapia respectively) at the smallest initial size. The differences between the serum protein of silver carp and Nile tilapia reared at different initial sizes and that of control fish were highly significant ($P < 0.01$), table (65).

At different food rations (Table 63 and Figure 58) the total serum protein of ***H. molitrix*** and ***O. niloticus*** showed a highly significant ($P<0.01$) successive increase to 2.40 ± 0.31, 3.28 ± 0.96 and 4.36 ± 1.38 gm/100 ml serum for carp and 3.29 ± 1.07 , 5.80 ± 0.91 and 6.73 ± 1.42 gm/100 ml serum for tilapia at food rations of 1% , 3% and 5% of total body weight respectively, from that of forementioned control fishes.

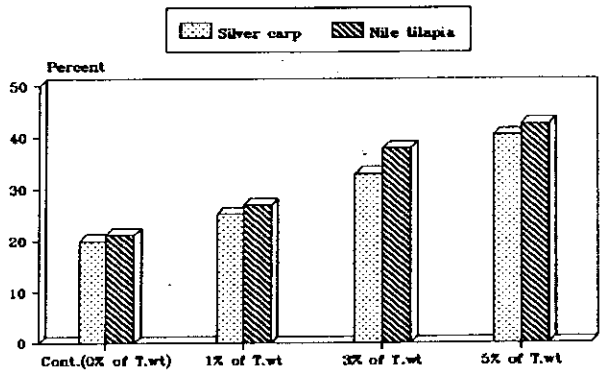
Table (63) : Effect of food ration on blood parameters and serum analysis of silver carp ***(H.molitrix)*** and Nile tilapia ***(O.niloticus)*** reared in earthen freshwater ponds, at a period of 8 months.

Food ration	Control (0 % of T.wt)		1 % of T.wt		3 % of T.wt		5 % of T.wt	
Item	Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
Silver carp								
Blood parameters								
Erythrocyte	0.502-0.916	0.641±0.163	0.631-1.060	0.841±0.112	0.711-1.742	1.320±0.211	1.761-2.051	1.860±0.451
Haematocrit	19.10-23.50	20.00±1.75	23.00-27.12	25.20±0.96	27.00-37.12	33.00±2.06	37.00-48.00	40.50±3.75
Haemoglobin	3.30-7.42	4.15±1.64	4.00-8.21	6.00±1.11	5.00-8.50	7.40±1.05	7.00-10.84	8.76±1.43
Serum analysis								
Protein	1.15-1.93	1.32±0.31	1.74-3.02	2.40±0.31	1.35-5.20	3.28±0.96	3.40-7.12	4.36±1.38
Lipid	3.51-5.70	4.00±0.85	3.30-7.15	5.12±1.02	4.00-8.50	6.62±0.94	5.60-10.00	7.75±1.63
Glucose	22.62-38.50	32.00±3.25	85.00-105.3	95.55±4.88	71.11-88.20	78.51±4.85	55.32-70.21	67.40±1.41
Nile tilapia								
Blood parameters								
Erythrocyte	0.523-0.941	0.752±0.108	0.541-1.321	0.921±0.201	1.512-1961	1.751±0.211	1.630-2.151	1.951±0.452
Haematocrit	19.11-23.31	21.15±1.08	24.10-30.17	27.00±1.56	34.00-42.50	38.00±2.25	38.15-48.00	42.60±2.70
Haemoglobin	3.17-7.12	5.10±1.00	3.52-11.30	7.15±2.08	6.11-9.76	8.15±2.00	7.32-11.80	9.60±2.60
Serum analysis								
Protein	1.02-3.15	2.00±0.58	1.51-5.42	3.29±1.07	3.51-7.62	5.80±0.91	4.25-9.07	6.73±1.42
Lipid	0.62-1.75	1.14±0.30	1.25-3.33	2.27±0.53	2.02-6.17	3.92±1.13	3.32-7.23	5.00±1.62
Glucose	46.21-75.00	60.00±7.50	92.13-116.7	104.8±5.84	73.00-90.15	81.00±4.58	57.32-80.00	70.44±4.78

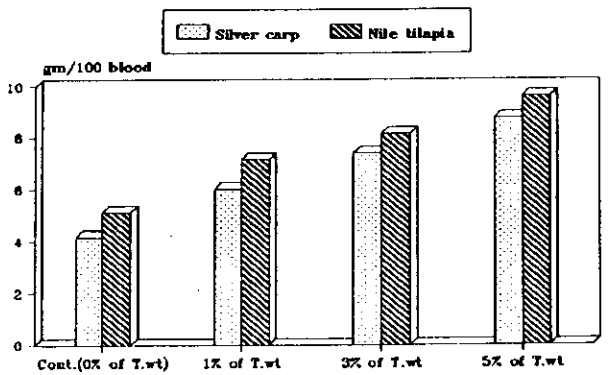
Fig(57): Averages erythrocyte, haematocrit and haemoglobin in blood of silver carp and Nile tilapia reared in earthen ponds at different food rations.



Erythrocyte counts

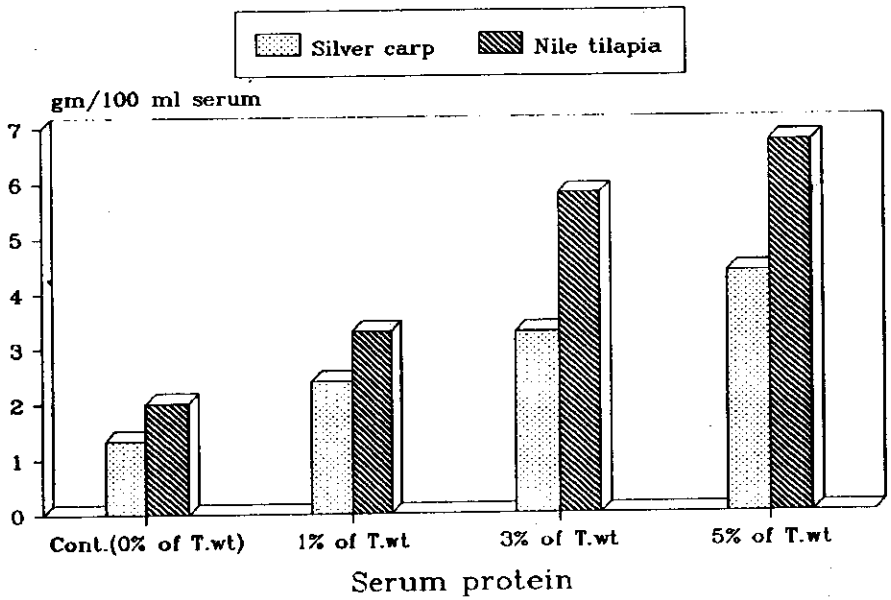


Haematocrit values

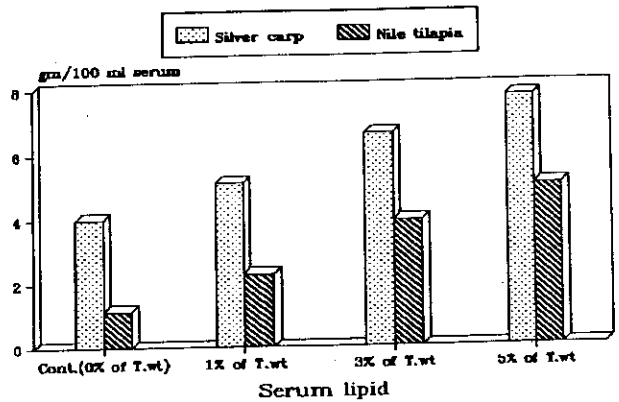


Haemoglobin contents

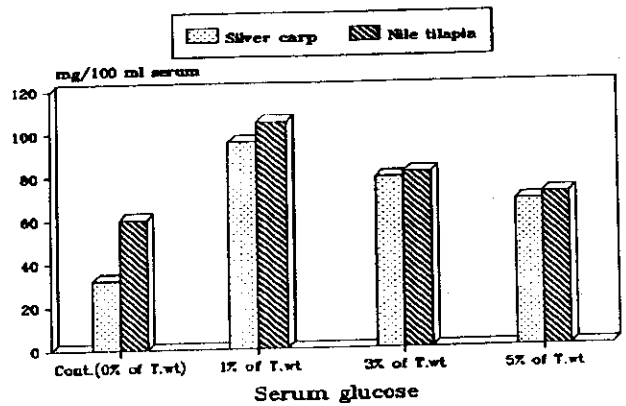
Fig.(58):Averages protein, lipid and glucose in serum of silver carp and Nile tilapia reared in earthen ponds at different food rations.



Serum protein



Serum lipid



Serum glucose

2-2- Lipid :

The present study indicated that, the total serum lipid of control silver carp and Nile tilapia (one fish/m^2 and maintained without supplementary food) were 4.00 ± 0.85 , 1.14 ± 0.30 gm/100 ml serum respectively.

These values showed highly significant($P < 0.01$) increase to 8.27 ± 1.97, 6.62 ± 0.94 and 5.53 ± 1.01 gm/100 ml serum for carp and 4.43 ± 1.59, 3.92 ± 1.13 and 2.33 ± 0.49 gm/100 ml serum for tilapia at the three different stocking densities (one fish/m^2, two fish/m^2 and three fish/m^2) respectively. It is worthily to mention that, the total serum lipid was lower at the highest stocking density of 3 fish/m^2 and 2fish/m^2 than that of the lowest one (one fish/m^2) for both fish specis (Table 60 and Figure 52).

Nevertheless, at different dietary protein levels (Table 61 and Figure 54) the total serum lipid gradually increased from 4.80 ± 0.57 to 6.62 ± 0.94 and 7.15 ± 1.68 gm/100 ml serum for ***H. molitrix*** and from 2.00 ± 0.50 to 3.92 ± 1.13 and 3.63 ± 0.86 gm/100 ml serum for ***O. niloticus*** at dietary protein levels of 20%, 30% and 40% respectively. These increases were highly significant ($P < 0.01$) as indicated in table (65).

From table (62) and figure (56), it was noticed that the total serum lipid in both fish species (carp and tilapia) were gradually

increased with the increased of initial size of rearing fish. Its maximum values (range of 6.00 - 10.45 and 3.71 - 7.25 gm/100 ml serum with average of 8.40 ± 2.02 and 5.64 ± 0.30 gm/100 ml serum for carp and tlapia respectively) were recorded at the largest initial size. While the minimum values of serum lipid (ranged from 3.30 to 7.15 and from 1.73 to 2.94 with average of 5.00 ± 1.08 and 2.25 ± 0.35 gm/100 ml serum for carp and tilapia respectively) were observed at the smallest initial size. The differences between the serum lipid of fish reared at different initial sizes and that of control group were highly significant ($P < 0.01$) for the both species (table 65).

At different food rations, the total serum lipid of ***H. molitrix*** and ***O. niloticus*** showed a highly significant ($P < 0.01$) progressive increase to 5.12 ± 1.02, 6.62± 0.94 and 7.75 ± 1.63 gm/100 ml serum for carp and 2.27 ± 0.53, 3.92 ± 1.13 and 5.00 ± 1.62 gm/100 ml serum for tilapia at food rations of 1%, 3% and 5% of total body weight respectively. (Table 63 and Figure 58).

2-3- Glucose :

From the present study, it was also noticed that, the control fishes (silver carp and Nile tilapia) showed a glucose concentration of 32.00 ± 3.25 and 60.00 ± 7.50 mg/100 ml serum respectively. These values were highly significant increased to 52.60 ± 4.30, 78.51 ± 4.85 and 92.59 ± 7.71, mg/100 ml serum for carp and 75.51 ± 4.85, 81.00 ± 4.58 and 103.60 ± 3.55 mg/100 ml serum for tilapia at the three

Table (64) : Comparison between the means of experimental cases and control of erythrocyte, haematocrit and haemoglobin in blood of silver carp ***(H.molitrix)*** and Nile tilapia ***(O. niloticus)*** reared in earthen pond by using t-test.

Item	Treatment	Control & 1 st case		Control & 2 nd case		Control & 3 rd case		1 st case & 2 nd case		1 st case & 3 rd case		2 nd case & 3 rd case	
		Carp	Tila.	Carp	Tila.	Carp	Tila.	Carp	Tila.	Carp	Tila.	Carp	Tila.
Erythrocyte count	Stocking density	8.60	9.09	8.19	21.28	3.24	4.72	3.57	1.03	6.82	7.09	5.18	10.00
	Protein level	2.29	2.20	8.19	21.28	15.28	15.00	6.50	13.62	15.23	11.28	9.73	3.33
	Initial size	1.13	3.00	8.19	21.28	15.40	20.48	6.55	16.80	14.80	20.15	10.18	2.55
	Food ration	3.33	2.83	8.19	21.28	8.71	9.99	6.85	12.87	7.36	9.50	1.33	2.14
Haematocrit value	Stocking density	12.51	23.71	15.26	22.62	10.55	14.94	2.92	2.73	8.92	18.16	9.56	16.36
	Protein level	6.35	8.22	15.26	22.62	25.68	15.50	12.86	17.43	25.53	9.85	12.93	6.25
	Initial size	2.63	7.32	15.26	22.62	19.85	34.92	13.25	19.85	18.60	32.91	9.42	9.25
	Food ration	8.66	9.91	15.26	22.62	16.66	25.53	11.64	12.94	14.57	16.42	5.77	4.18
Haemoglobin content	Stocking density	3.28	3.27	5.33	4.62	3.17	3.33	0.76	0.60	1.84	1.52	2.50	1.08
	Protein level	2.84	1.91	5.33	4.62	4.01	3.51	3.56	3.12	3.05	1.33	1.48	2.37
	Initial size	0.88	2.28	5.33	4.62	3.62	7.02	4.73	2.94	3.27	5.18	1.12	1.61
	Food ration	2.98	2.97	5.33	4.62	6.68	5.17	2.86	1.10	4.84	2.40	2.43	1.33

Degree of freedom (df) = n1 + n2 - 2 = 38 .
Tabulated value = 2.02 at 5 % and 2.71 at 1 % level .

different stocking densities (one fish/m^2, two fish/m^2 and three fish/m^2) respectively. It was found also that, the increase of stockeing density led to increase of serum glucose concentration for both fish species (Table 60 and Figure 52).

Otherwise, at different dietary protein levels (Table 61 and Figure 54), the serum glucose concentration which recorded high values than that of the control fishes at 20% protein level, declined gradually at the successive levels for both species. It gave values of 86.55 ± 7.29, 78.51 ± 4.85 and 62.23 ± 1.50 mg/100 ml serum for carp and 97.28 ± 2.44 , 81.00 ± 4.58 and 84.02 ± 5.62 mg/100 ml serum for tilapia at dietary protein levels of 20% , 30%, and 40% respectively.

The obtained results indicated also that, the serum glucose in both fish species (carp and tilapia) were gradually decreased with the increased initial size of rearing fish. Its maximum values (ranges of 80.00 - 97.12 and 94.11 - 115.3 mg/100 ml serum with average of 91.00 ± 2.75 and 102.5 ± 5.42 mg/100 ml serum for carp and tilapia respectively) were recorded at small experimental initial size. While the minimum values of serum protein (ranged from 49.00 to 63.21 and from 51.30 to 77.11 with average of 57.06 ± 2.08 and 65.41 ± 5.35 mg/100 ml serum for carp and tilapia respectively) were observed at large experimental initial size (Table 62 and Figure 56).

Table (65) : Comparison between the means of experimental cases and control of protein, lipid and glucose in serum of silver carp ***(H.molitrix)*** and Nile tilapia ***(O. niloticus)*** reared in earthen pond by using t-test.

Item	Treatment	Control & 1 st case		Control & 2 nd case		Control & 3 rd case		1 st case & 2 nd case		1 st case & 3 rd case		2 nd case & 3 rd case	
		Carp	Tila.	Carp	Tila.	Carp	Tila.	Carp	Tila.	Carp	Tila.	Carp	Tila.
Serum Protein	Stocking density	7.90	9.40	7.00	11.52	5.55	4.00	2.43	1.97	4.60	4.60	2.50	5.27
	Protein level	10.93	2.86	7.00	11.52	7.77	7.41	1.54	6.66	4.38	3.53	2.61	3.12
	initial size	8.00	4.80	7.00	11.52	9.63	15.68	2.27	6.38	8.64	10.76	4.11	4.80
	Food ration	7.71	3.46	7.00	11.52	8.00	9.40	3.14	5.72	5.15	5.26	2.08	0.83
Serum lipid	Stocking density	6.78	7.65	6.55	8.69	3.41	6.61	2.54	0.84	4.23	4.47	2.70	4.42
	Protein level	2.50	4.77	6.55	8.69	5.53	5.73	5.35	5.33	4.12	2.10	0.90	2.93
	Initial size	3.23	7.40	6.55	8.69	8.46	32.14	3.31	4.28	4.93	22.60	2.54	5.37
	Food ration	2.67	5.95	6.55	8.69	6.82	6.65	3.41	4.45	4.46	3.60	1.98	0.13
Serum glucose	Stocking density	12.19	5.60	25.55	7.81	24.73	17.64	12.64	2.60	14.92	5.47	5.01	14.94
	Protein level	23.21	16.72	25.55	7.81	28.52	8.17	2.98	10.36	12.47	7.33	11.55	1.32
	Initial size	43.70	14.70	25.55	7.81	4.51	1.88	12.64	9.63	31.14	15.38	13.84	7.02
	Food ration	34.92	14.99	25.55	7.81	33.71	32.56	3.80	10.23	19.96	14.45	7.88	5.05

Degree of freedom (df) = n1 + n2 - 2 = 38 .
Tabulated value = 2.02 at 5 % and 2.71 at 1 % level .

At different food ration (Table 63 and Figure 58) the serum glucose of carp and tilapia values showed highly signficiant ($P < 0.01$) increase to 95.55 ± 4.88 and 104.8 ± 5.84 for carp and tilapia respectively at 1% food ration, then the serum glucose decreased at the higher food ration. It attained 78.15 ± 4.85, 81.00 ± 4.50 and 67.40 ± 1.41, 70.44 ± 4.78 mg/100 ml serum for carp and tilapia at food rations of 3% and 5% of total body weight respectively.

3- Liver analysis :

3-1- Total protein :

The liver total protein of control silver carp and Nile tilapia (one fish/m^2, maintained without supplementary food) were 10.96 ± 0.91, 18.11± 1.67 gm/100 gm fresh tissue of liver respectively. These values highly significant ($P > 0.01$) increased to 20.33 ± 4.99 and 25.00 ± 3.05 gm/100 gm fresh tissue at stock of one fish/m^2 respectively then gradually decreased to 16.84 ± 2.88, 23.40 ± 2.71 gm/100 gm fresh tissue at stock of two fish/m^2 and further to 14.25 ± 1.62, 20.44 ± 3.19 gm/100 gm fresh tissue (highly significant, $P < 0.01$ for carp and significant, $P < 0.05$ for tilapia) at stock of three fish/m^2 for the two fish species respectively (Table 66 and Figures 59, 60).

From table (67) and figures (61,62) it was noticed that, the liver protein of ***H. molitrix*** and ***O. niloticus*** highly significant ($P < 0.01$) increased from that of the above mentioned control fishes to 14.82 ± 1.09, 16.84 ± 2.88 and 18.61 ± 1.24 gm/100 gm fresh tissue for carp

and 21.66 ± 1.72, 23.40 ± 2.71 and 25.75 ± 1.40 gm/100 gm fresh tissue for tilapia at the three protein levels (20%, 30% and 40% protein) respectively.

The liver total protein of silver carp and Nile tilapia were gradually also increased with the increased initial size of rearing fish. Its maximum mean values of 20.85 ± 1.21, 24.74 ± 0.62 gm/100 gm fresh tissue for carp and tilapia respectively, were recorded at the experimentes largest initial size. While the minimum mean values of 12.34 ± 1.15, 21.02 ± 0.86 gm/100 gm fresh tissue for carp and tilapia respectively were observed at small initial size (Table 68 and Figures 63,64).

The present data tabulated in table (69) and figures (65,66) showed that, the liver protein of carp and tilapia were highly signficant ($P < 0.01$) increased from that of control fishes to 14.30 ± 1.10, 16.84 ± 2.88 and 21.21 ± 1.05 gm/100 gm fresh tissue for carp and 21.40 ± 0.91, 23.40 ± 2.71 and 25.64 ± 0.81 gm/100 gm fresh tissue for tilapia at 1%, 3% and 5% food ration respectively (Table 70).

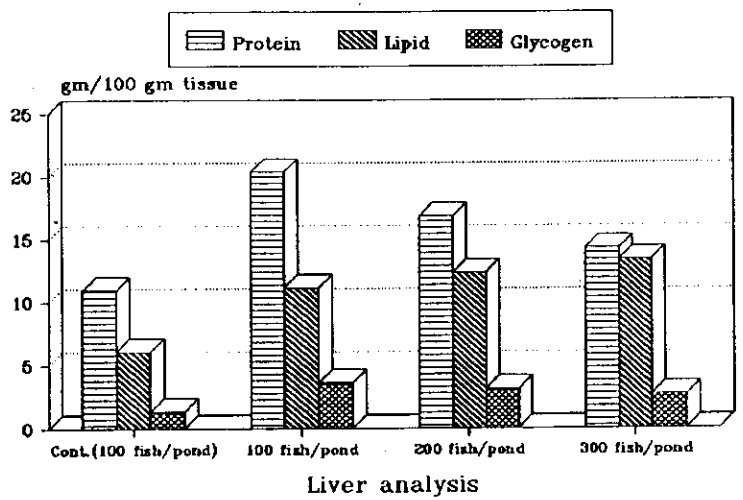
3-2- Total Lipid :

The present study indicated that the values of liver total lipid in control silver carp and Nile tilapia were 6.05 ± 1.40 and 5.52 ± 0.15 gm/100 gm fresh tissue respectively. Fishes reared at one fish/m^2, two fish/m^2 and three fish/m^2 resulted in successive highly significant

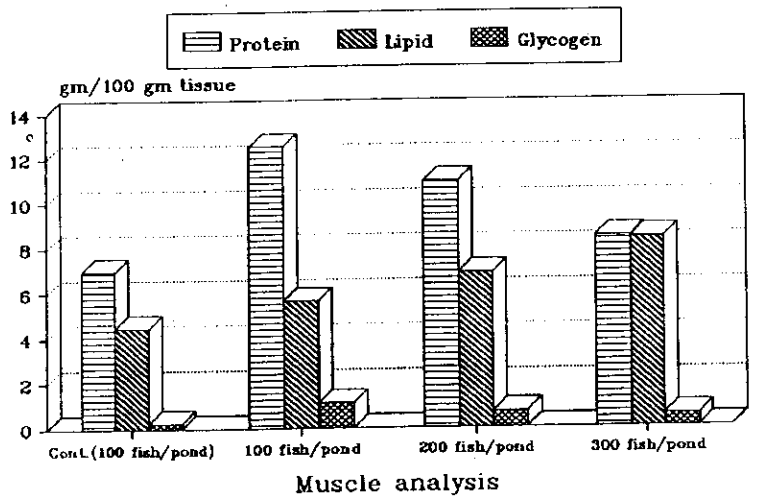
Table (66) : Effect of stocking density on biochemical analysis of liver and muscle of silver carp ***(H.molitrix)*** and Nile tilapia ***(O.niloticus)*** reared in earthen freshwater ponds, at a period of 8 months.

Stocking density	Control(100 fish / pond)		100 fish / pond		200 fish / pond		300 fish / pond	
No. of fish exam.	20		20		20		20	
Item	Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
Silver carp								
Liver analysis								
Protein	7.45-12.79	10.96±0.91	18.33-26.30	20.33±4.99	14.04-18.60	16.84±2.88	11.06-17.75	14.25±1.62
Lipid	4.75-8.85	6.05±1.40	9.40-14.11	11.15±1.48	10.50-15.25	9.35±1.45	11.61-16.21	13.37±1.42
Glycogen	1.13-2.00	1.33±0.34	2.30-7.00	3.61±0.70	2.33-4.15	3.09±0.28	1.75-3.38	2.65±0.37
Muscle analysis								
Protein	4.73-7.90	6.98±0.46	10.41-17.15	12.52±2.32	7.00-12.80	10.95±1.43	6.53-11.82	8.46±0.68
Lipid	2.78-7.42	4.47±1.48	3.10-8.82	5.65±1.74	3.90-8.70	6.86±0.92	6.12-11.72	8.40±1.36
Glycogen	0.23-0.50	0.25±1.13	0.93-1.45	1.12±0.16	0.46-0.83	0.72±0.06	0.35-0.68	0.54±0.08
Nile tilapia								
Liver analysis								
Protein	15.06-21.45	18.11±1.67	21.75-28.10	25.00±3.05	20.53-26.81	23.40±2.71	18.65-24.82	20.44±3.19
Lipid	4.76-5.821	5.52±0.15	5.15-9.82	7.50±0.66	6.00-9.120	8.00±0.56	8.00-10.80	9.35±0.75
Glycogen	1.07-2.60	2.10±0.25	2.12-7.43	4.25±1.59	2.52-6.00	3.90±1.05	1.85-3.15	2.86±0.17
Muscle analysis :								
Protein	9.55-13.75	11.05±0.85	15.36-21.55	18.47±1.54	13.25-18.40	16.70±1.35	9.32-14.41	14.87±1.57
Lipid	2.42-5.91	3.82±0.51	3.00-6.52	4.21±1.17	3.00-7.15	5.60±0.58	5.93-8.50	6.40±0.51
Glycogen	0.21-0.52	0.35±0.08	0.82-1.47	1.20±0.32	0.50-1.20	0.78±0.21	0.39-0.64	0.57±0.03

Fig(59) Averages total protein, lipid and glycogen in liver and muscle of silver carp *(H.molitrix)* reared in earthen ponds at different stocking densities,during a period of 244 days.

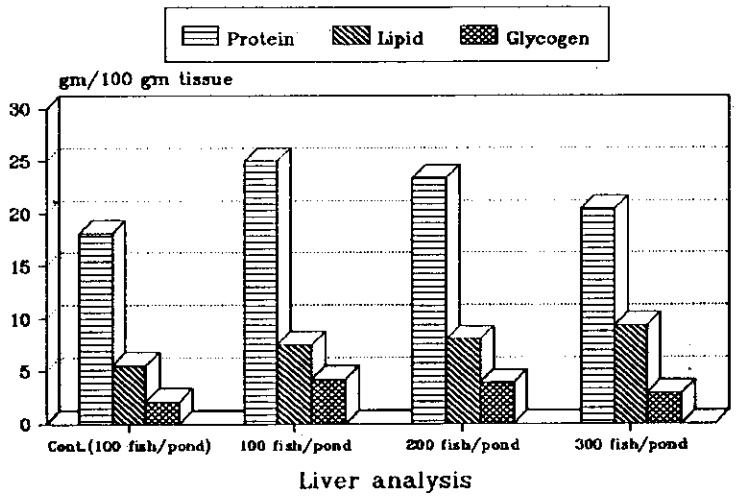


Liver analysis

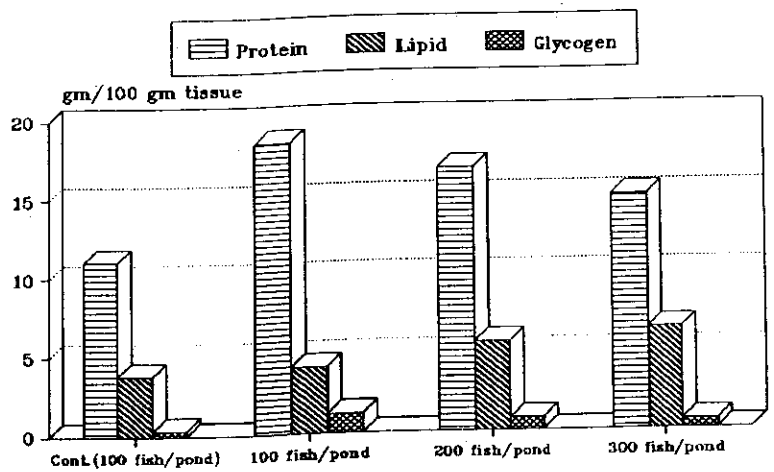


Muscle analysis

Fig(60) Averages total protein, lipid and glycogen in liver and muscle of Nile tilapia *(O.niloticus)* reared in earthen ponds at different stocking densities,during a period of 244 days.



Liver analysis



Muscle analysis

($P<0.01$) increases of liver lipid values to 11.15 ± 1.48, 12.35 ± 1.45 and 13.37 ± 1.42 gm/100 gm fresh tissue for carp and 7.50 ± 0.66, 8.00 ± 0.56 and 9.35 ± 0.75 gm/100 gm fresh tissue for tilapia respectively (Table 66 and Figures 59,60).

Otherwise, at the different dietary protein levels (Table 67 and Figures 61,62) the liver lipid of ***H. molitrix*** and ***O. niloticus*** highly significant ($P < 0.01$) increased from the for mentioned values of the control fishes to 10.60 ± 1.32, 9.35 ± 1.45, and 7.64 ± 1.06 gm/100 gm fresh tissue for carp and 9.54 ± 1.75 , 8.00 ± 0.56 and 6.68 ± 1.52 gm/100 gm fresh tissue for tilapia at diets contain 20%, 30% and 40% protein levels respectively.

From table (68) and figures (63,64) it was noticed that, the liver total lipid of silver carp and Nile tilapia were slightly decreased with the increased initial size of rearing fish. Its average maximum values (12.61 ± 0.81 and 10.42 ± 1.04 gm/100 gm fresh tissue for carp and tilapia respectively) were recorded at smallest initial size. While the lowest values of liver lipid (6.42 ± 0.86 and 5.84 ± 0.81 gm/100 gm fresh tissue for carp and tilapia respectively) were observed at largest initial size.

As different food rations (Table 69 and Figures 65,66) the liver lipid values of carp and tilapia highly signficant ($P < 0.01$) increased to 11.72 ± 0.85, 9.35 ± 1.45 and 7.75 ± 0.92 gm/100 gm fresh tissue for

carp and 9.81 ± 0.62, 8.00 ± 0.56 and 6.42 ± 0.92 gm/100 gm fresh tissue for tilapia at the food rations of 1%, 3% and 5% of total body weight respectively, from those values of control fishes (Table 70).

3-3- Glycogen :

The present study (Table 66 and Figures 59,60) indicated that, the control silver carp and Nile tilapia showed a liver glycogen of 1.33 ± 0.34, 2.10 ± 0.25 gm/100 gm fresh tissue respectively. Fishes reared at one fish/m^2 ,two fish/m^2 and three fish/m^2 resulted in a highly significant ($P < 0.01$) increase of liver glycogen to 3.61 ± 0.70, 3.09 ±0.28 and 2.65 ± 0.37 gm/100 gm fresh tissue for carp and 4.25 ± 1.59 , 3.90 ± 1.05 and 2.86 ± 0.17 gm /100 gm fresh tissue for tilapia respectively. It is worthily to mention that, the liver glycogen decreased progressively with the increase of stocking density.

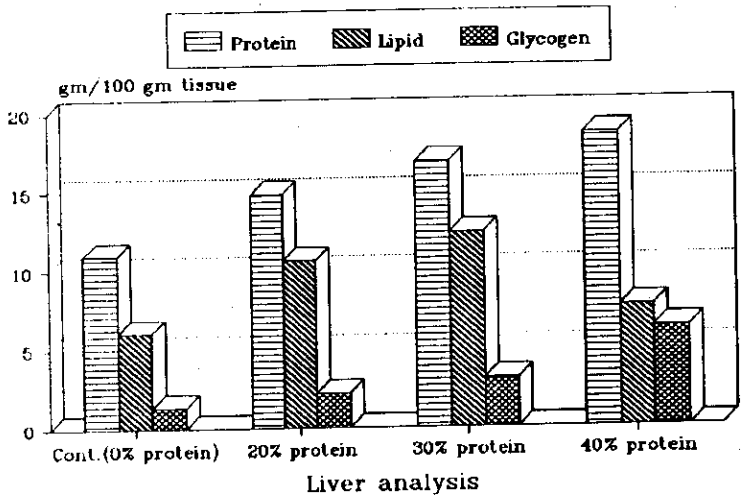
Nevertheless, at different dietary protein levels, the liver glycogen of ***H. molitrix*** and ***O. niloticus*** progressively highly signficiant ($P < 0.01$) increase to 2.16 ± 0.38, 3.09 ± 0.28 and 6.26 ± 0.10 gm/100 gm fresh tissue for carp and 2.48 ± 0.33, 3.90 ± 1.05 and 4.50 ± 0.82 gm/100 gm fresh tissue for tilapia at diets contain 20%, 30% and 40% protein levels respectively. (Table 67 and Figures 61, 62).

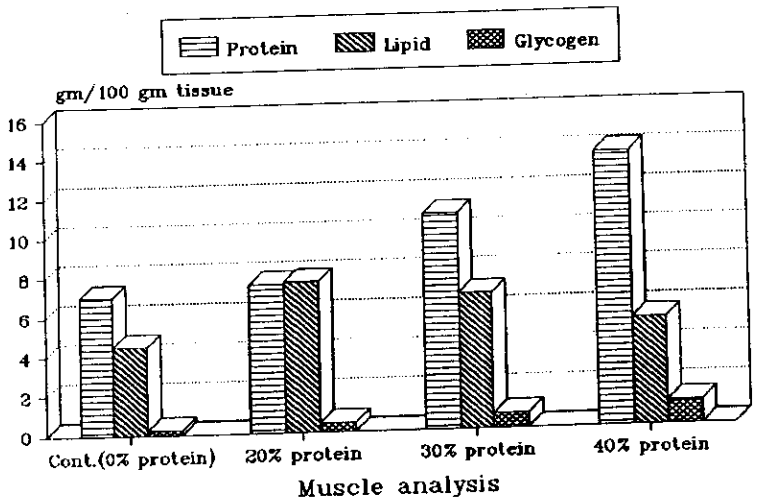
The results obtained from table (68) and figures (63,64) also cleared that the liver glycogen of silver carp and Nile tilapia were

Table (67) : Effect of dietary protein level on biochemical analysis of liver and muscle of silver ***carp (H.molitrix)*** and Nile tilapia ***(O.niloticus)*** reared in earthen freshwater ponds, at a period of 8 months.

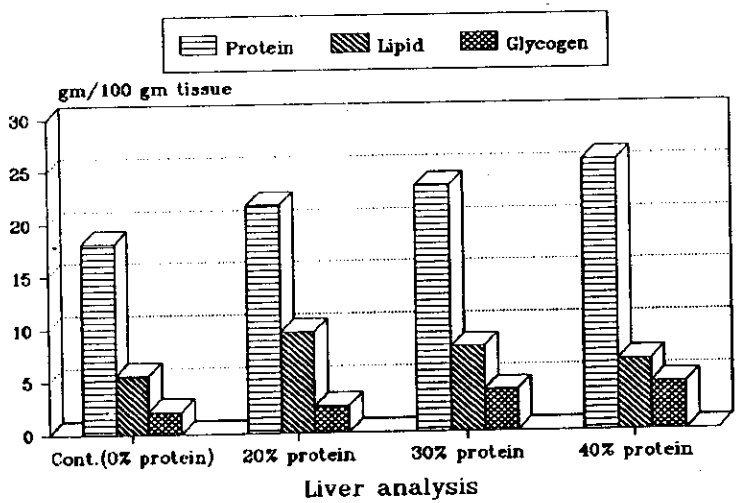
Protein level	Control (0 % protein)		20 % protein		30 % protein		40 % protein	
No. of fish exam.	20		20		20		20	
Item	Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
Silver carp								
Liver analysis								
Protein	7.45-12.79	10.96±0.91	11.64-17.00	14.82±1.09	14.04-18.60	16.84±2.88	16.42-20.22	18.61±1.24
Lipid	4.75-8.85	6.05±1.40	8.12-13.64	10.60±1.32	10.50-15.25	9.35±1.45	5.35-9.75	7.64±1.06
Glycogen	1.13-2.00	1.33±0.34	1.51-2.92	2.16±0.38	2.33-4.15	3.09±0.28	5.66-6.45	6.26±0.10
Muscle analysis								
Protein	4.73-7.90	6.98±0.46	9.22-11.75	7.54±1.61	7.00-12.80	10.95±1.43	14.75-21.64	13.92±0.83
Lipid	2.78-7.42	4.47±1.48	5.25-9.00	7.63±1.68	3.90-8.70	6.86±0.92	2.61-5.55	5.41±1.04
Glycogen	0.23-0.50	0.25±1.13	0.30-0.58	0.43±0.07	0.46-0.83	0.72±0.06	1.13-1.28	1.17±0.05
Nile tilapia								
Liver analysis								
Protein	15.06-21.45	18.11±1.67	20.25-26.11	21.66±1.72	20.53-26.81	23.40±2.71	21.62-28.55	25.75±1.40
Lipid	4.76-5.821	5.52±0.15	8.85-12.52	9.54±1.75	6.00-9.120	8.00±0.56	4.73-8.41	6.68±1.52
Glycogen	1.07-2.60	2.10±0.25	1.24-3.15	2.48±0.33	2.52-6.00	3.90±1.05	3.71-5.14	4.50±0.82
Muscle analysis								
Protein	9.55-13.75	11.05±0.85	10.26-17.24	14.00±1.62	13.25-18.40	16.70±1.35	13.72-17.15	15.65±1.25
Lipid	2.42-5.91	3.82±0.51	4.68-8.21	6.35±1.43	3.00-7.15	5.60±0.58	3.55-8.41	6.96±0.85
Glycogen	0.21-0.52	0.35±0.08	0.25-0.63	0.41±0.11	0.50-1.20	0.78±0.21	0.65-1.02	0.82±0.15

Fig(61) Averages total protein, lipid and glycogen in liver and muscle of silver carp *(H.molitrix)* reared in earthen ponds at different dietary protein levels,during a period of 244 days

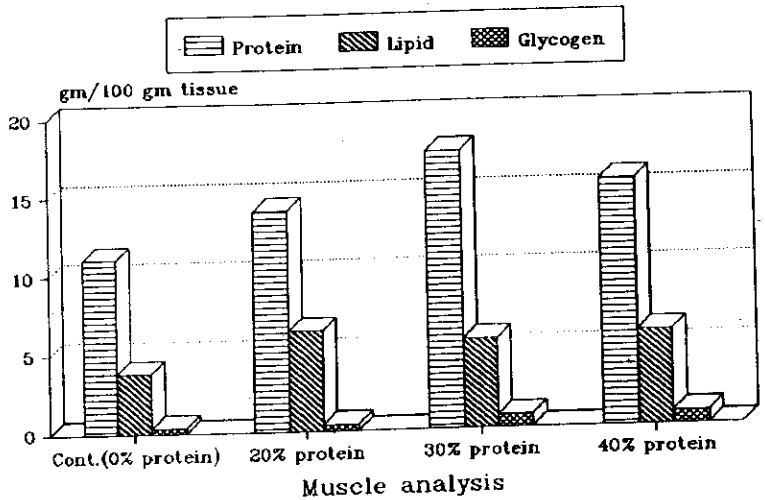




Fig(62) Averages total protein, lipid and glycogen in liver and muscle of Nile tilapia *(O.niloticus)* reared in earthen ponds at different dietary protein levels,during a period of 244 days



Liver analysis



Muscle analysis

suecessively increased with the increasing initial size of the rearing fish. Its average maximum values (4.63 ± 0.52, 4.82 ± 0.50 gm/100 gm fresh tissue for carp and tilapia respectively) were recorded at largest initial size. While the average minimum values of liver glycogen (2.18 ± 0.27, 2.65 ± 0.25 gm/100 gm fresh tissue for carp and tilapia respectively) were observed at smallest inital size.

At different food rations, liver glycogen highly significant ($P<0.01$) increased progressively to 2.70 ± 0.32, 3.09 ± 0.28 and 4.62 ± 0.52 gm/100 gm fresh tissue for carp and 2.30 ± 0.43, 3.90 ± 1.05 and 4.11 ± 1.50 gm/100 gm fresh tissue for tilapia with the increase of food rations (1%, 3% and 5% of total body weight)from the forementioned control values (Table 70).

4- Muscle analysis :

4-1- Total protein:

The muscle total protein of ***H. molitrix*** and ***O. niloticus*** showed a values of 6.98 ± 0.46, 11.05 ± 0.85 gm/100 gm fresh tissue in control fish (one fish/m^2, maintained without supplementary food and has 2nd initial size) respectively. These values were highly significant ($P < 0.01$) increased to 12.52 ± 2.32, 10.95 ± 1.43 and 8.46 ± 0.68 gm/100 gm fresh tissue for carp and 18.47 ± 1.54 , 16.70 ± 1.35 and 14.87 ± 1.57 gm/100 gm fresh tissue for tilapia at stocking densities of one fish/m^2, two fish/m^2 and three fish/m^2 respectively. It was noted that the

muscle total protein decreased with the increase of stocking density (Table 66 and Figures 59, 60).

While, at different dietary protein levels (Table 67 and Figures 61,62) the muscle protein of silver carp and Nile tilapia progressively increased to 7.54 ± 1.61, 14.00 ± 1.62 gm/100 gm fresh tissue (unsignificant, $P > 0.05$ for carp and highly significant,$P < 0.01$ for tilapia) at diet with 20% protein ; 10.95 ± 1.43, 16.70 ± 1.35 gm/100 gm fresh tissue (highly significant, $P < 0.01$) at diet contain 30% protein and 13.92 ± 0.83, 15.65 ± 1.25 gm/100 gm fresh tissue at diet with 40% protein.

Results obtained from table (68) and figures (63,64) showed that the muscle protein of carp and tilapia were also gradually increased with the initial size of rearing fish. Its minimum average values 8.16 ± 1.10 and 14.83 ± 0.42 gm/100 gm fresh tissue for carp and tilapia respectively) were recorded at the lowest initial size. While the maximum values (13.97 ± 1.75 and 17.64 ± 0.53 gm/100 gm fresh tissue respectively) were observed at the largest experimental initial size.

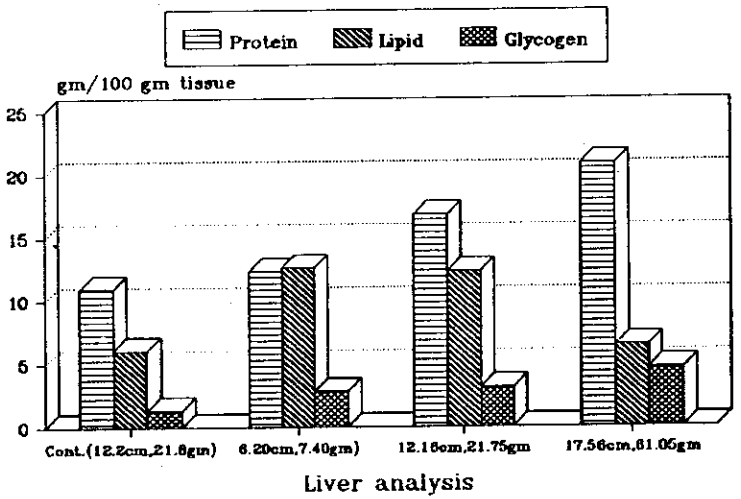
At different food rations (Table 69 and Figure 65,66) muscle total protein of ***H. molitrix*** and ***O. niloticus*** showed a progressive increase in fishes fed with 1%, 3% and 5% food rations than that of the control fishes. The total protein values of 8.14 ± 1.25, 10.95 ± 1.43 and

Table (68) : Effect of initial size on biochemical analysis of liver and muscle of silver carp ***(H.molitrix)*** and Nile tilapia ***(O.niloticus)*** reared in earthen freshwater ponds, at a period of 8 months.

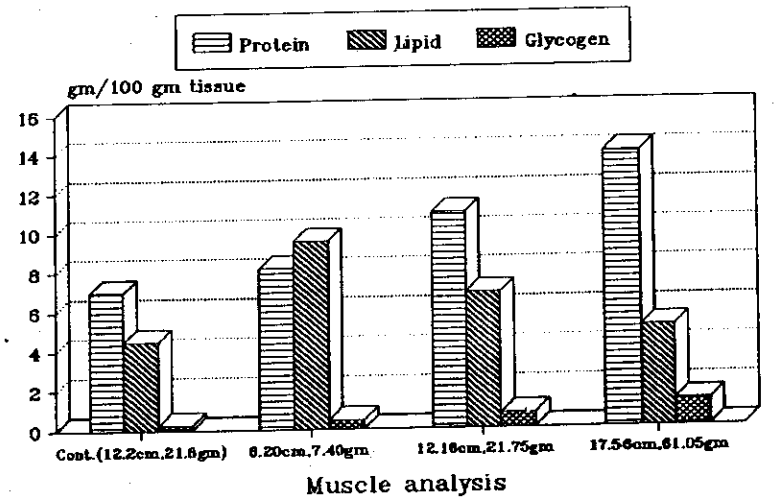
Initial size	Cont.(1 st initial size)		1 st initial size		2 nd initial size		3 rd initial size	
No. of fish exam.	20		20		20		20	
Item	Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
Silver carp								
Liver analysis								
Protein	7.45-12.79	10.96±0.91	10.25-15.61	12.34±1.15	14.04-18.60	16.84±2.88	17.41-23.23	20.85±1.21
Lipid	4.75-8.85	6.05±1.40	10.36-14.21	12.61±0.81	10.50-15.25	9.35±1.45	3.85-7.11	6.42±0.86
Glycogen	1.13-2.00	1.33±0.34	1.81-2.72	2.18±0.27	2.33-4.15	3.09±0.28	3.44-5.95	4.63±0.52
Muscle analysis								
Protein	4.73-7.90	6.98±0.46	5.80-11.36	8.16±1.10	7.00-13.80	10.95±1.43	10.97-16.64	13.97±1.75
Lipid	2.78-7.42	4.47±1.48	8.28-10.72	9.53±0.63	3.90-8.70	6.86±0.92	3.36-5.61	5.08±0.60
Glycogen	0.23-0.50	0.25±1.13	0.36-0.54	0.43±0.05	0.46-0.83	0.72±0.06	1.04-1.56	1.32±0.12
Nile tilapia								
Liver analysis								
Protein	15.06-21.45	18.11±1.67	19.52-24.12	21.02±0.86	20.53-26.81	23.40±2.71	20.62-27.11	24.74±0.62
Lipid	4.76-5.821	5.52±0.15	8.22-13.35	10.42±1.04	6.00-9.120	8.00±0.56	4.87-7.750	5.84±0.81
Glycogen	1.07-2.60	2.10±0.25	1.25-2.36	2.65±0.25	2.52-6.00	3.90±1.05	4.00-6.03	4.82±0.50
Muscle analysis								
Protein	9.55-13.75	11.05±0.85	12.58-16.25	14.83±0.42	13.25-18.40	16.70±1.35	13.12-16.95	17.64±0.53
Lipid	2.42-5.91	3.82±0.51	2.91-7.38	4.63±0.88	3.00-7.15	5.60±0.58	2.13-4.20	2.74±0.85
Glycogen	0.21-0.52	0.35±0.08	0.26-0.47	0.38±0.07	0.50-1.20	0.78±0.21	1.23-1.72	1.56±0.10

1 st initial size = 6.20 cm , 7.40 gm for carp and 4.30 cm, 6.85 gm for tilapia.
2 nd initial size = 12.16 cm ,21.75 gm for carp and 9.00 cm , 15.24 gm for tilapia .
3 rd initial size = 17.56 cm , 61.05 gm for carp and 12.00 cn, 35.79 gm for tilapia.

Fig(63) Averages total protein, lipid and glycogen in liver and muscle of silver carp *(H.molitrix)* reared in earthen ponds at different initial sizes,during a period of 244 days.

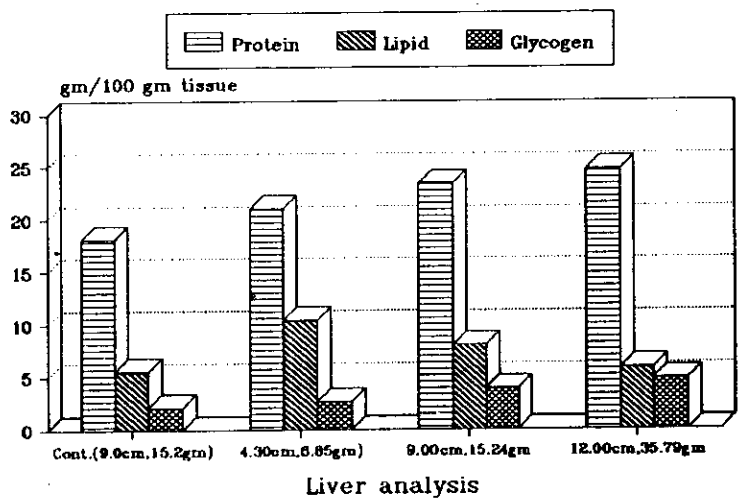


Liver analysis

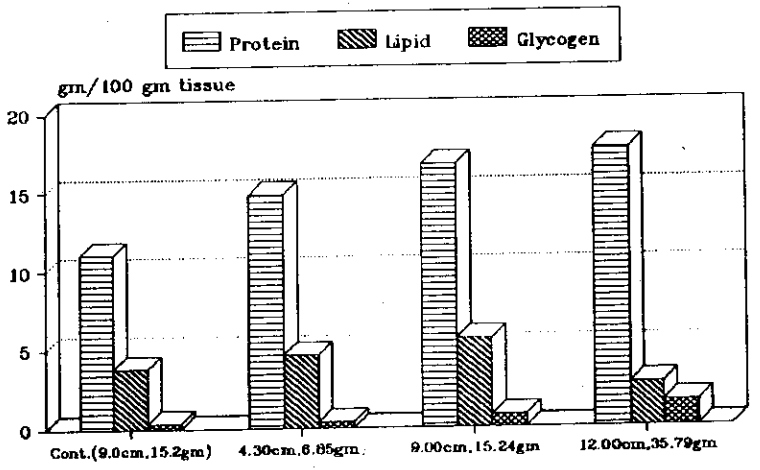


Muscle analysis

Fig(64) Averages total protein, lipid and glycogen in liver and muscle of Nile tilapia *(O.niloticus)* reared in earthen ponds at different initial sizes,during a period of 244 days.



Liver analysis



Muscle analysis

15.66 ± 1.02 for carp and 14.31 ± 0.65, 16.70 ± 1.35 and 17.85 ± 1.62 gm/100 gm fresh tissue for tilapia respectively with 1%, 3% and 5% food ration were recorded. These increases were highly significant ($P < 0.01$), as cleared in table (71).

4-2- Total lipid :

The present investigation (Table 66 and Figures 59,60) showed that the muscle total lipid of control silver carp and Nile tilapia were 4.47 ± 1.48 and 3.82 ± 0.51 gm/100 gm fresh tissue respectively. These values unsignificant ($P > 0.05$) increase to 5.65 ± 1.74 and 4.21 ± 1.17 gm/100 gm fresh tissue for carp and tilapia at stocking density of one fish/m^2. While, at stock of two fish/m^2 and three fish/m^2 the muscle lipid highly significant ($P < 0.01$) increase to 6.86 ± 0.92, 5.60 ± 0.58 and 8.40 ± 1.36, 6.40 ± 0.51 gm/100 gm fresh tissue for carp and tilapia respectively.

On the other hand, the total muscle lipid of the reared fish was highly significant ($P < 0.01$) increase to 7.63 ± 1.68, 6.86 ± 0.92 and 5.41 ± 1.04 gm/100gm fresh tissue for ***H. molitrix*** and 6.35 ± 1.43, 5.60 ± 0.58 and 6.96 ± 0.85 gm/100 gm fresh tissue for ***O. niloticus*** at diets contain 20% 30% and 40% dietary protein levels repectively (Table 67 and Figures 61,62).

Resultes obtained from table (68) and figures (63,64) also showed that, the muscle total lipid of silver carp and Nile tilapia were

slightly decreased with the increased initial size of rearing fish. Its highest values (range of 8.28 - 10.72 and 2.91 - 7.38 gm/100 gm fresh tissue with average of 9.53 ± 0.63 and 4.63 ± 0.88 gm/100 gm fresh tissue for carp and tilapia respectively) were recorded at smallest experimental initial size of both fish species. While the lowest values (average of 5.80 ± 0.60 , 2.74 ± 0.85 gm/100 gm fresh tissue for carp and tilapia respectively) were observed at largest initial size.

At different food ration (Table 69 and Figures 65,66) the muscle total lipid highly significant ($P < 0.01$) increased to 9.45 ± 1.02, 6.75 ± 0.84 and 6.86 ± 0.92, 5.60 ± 0.58 gm/100 gm fresh tissue for carp and tilapia at 1% and 3% food rations respectively. While at food ration 5% the muscle total lipid of the two fish species were increased to 4.83 ± 0.21 and 4.52 ± 0.58 gm/100 gm fresh tissue (unsignificant, $P > 0.05$ for carp and highly significant, $P < 0.01$ for tilapia) as indicated in table (71).

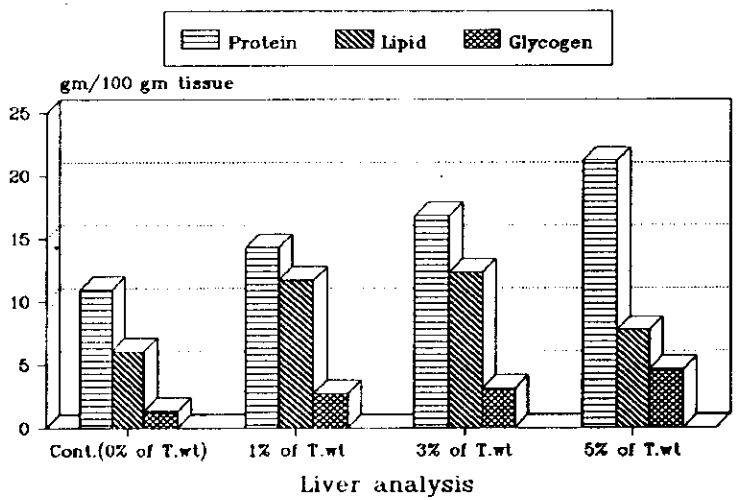
4-3- Glycogen :

The muscle glycogen of control silver carp and Nile tilapia were 0.25 ± 0.13 and 0.35 ± 0.08 gm/100 gm fresh tissue respectively. These values highly significant ($P < 0.01$) increased to 1.12 ± 0.16, 0.72 ± 0.06 and 0.54 ± 0.08 gm/100 gm fresh tissue for carp and 1.20 ± 0.32, 0.78 ± 0.21 and 0.57 0.03 gm/100 gm fresh tissue for tilapia at stocking densities of one fish/m^2, two fish/m^2 and three fish/m^2 respectively. It is worthily of mentioning that, the muscle glycogen

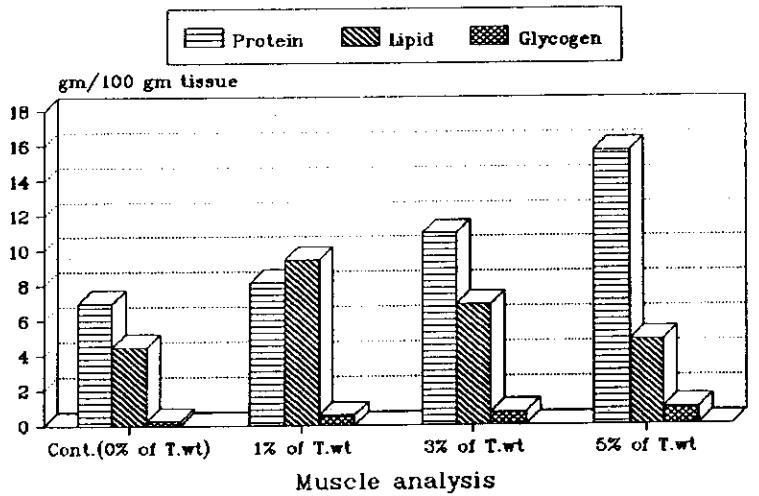
Table (69) : Effect of food ration on biochemical analysis of liver and muscle of silver carp ***(H.molitrix)*** and Nile tilapia ***(O.niloticus)*** reared in earthen freshwater ponds, at a period of 8 months.

Food ration	Control (0% of T.wt)		1 % of T.wt		3 % of T.wt		5 % of T.wt	
No. of fish exam.	20		20		20		20	
Item	Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
Silver carp								
Liver analysis								
Protein	7.45-12.79	10.96±0.91	10.66-17.51	14.30±1.10	14.04-18.60	16.84±2.88	18.45-23.13	21.21±1.05
Lipid	4.75-8.85	6.05±1.40	9.54-13.41	11.72±0.85	10.50-15.25	9.35±1.45	4.73-9.08	7.75±0.61
Glycogen	1.13-2.00	1.33±0.34	2.10-3.33	2.70±0.32	2.33-4.15	3.09±0.28	3.21-5.66	4.62±0.52
Muscle analysis								
Protein	4.73-7.90	6.98±0.46	7.80-11.63	8.14±1.25	7.00-12.80	10.95±1.43	12.15-18.68	15.66±1.02
Lipid	2.78-7.42	4.47±1.48	8.35-11.41	9.45±1.02	3.90-8.70	6.86±0.92	3.21-5.00	4.83±0.21
Glycogen	0.23-0.50	0.25±1.13	0.42-0.66	0.57±0.05	0.46-0.83	0.72±0.06	0.84-1.13	0.97±0.08
Nile tilapia								
Liver analysis								
Protein	15.06-21.45	18.11±1.67	18.31-25.18	21.40±0.91	20.53-26.81	23.40±2.71	22.11-27.33	25.64±0.81
Lipid	4.76-5.821	5.52±0.15	7.21-11.00	9.81±0.62	6.00-9.120	8.00±0.56	4.33-8.21	6.42±0.92
Glycogen	1.07-2.60	2.10±0.25	1.88-3.00	2.30±0.43	2.52-6.00	3.90±1.05	2.46-7.12	4.11±1.50
Muscle analysis								
Protein	9.55-13.75	11.05±0.85	11.22-18.64	14.31±0.65	13.25-18.40	16.70±1.35	13.61-20.65	17.85±1.62
Lipid	2.42-5.91	3.82±0.51	5.11-8.23	6.75±0.84	3.00-7.15	5.60±0.58	3.21-5.64	4.52±0.58
Glycogen	0.21-0.52	0.35±0.08	0.37-0.60	0.46±0.07	0.50-1.20	0.78±0.21	0.48-1.42	0.82±0.30

Fig(65) Averages total protein, lipid and glycogen in liver and muscle of silver carp *(H.molitrix)* reared in earthen ponds at different food rations,during a period of 244 days.

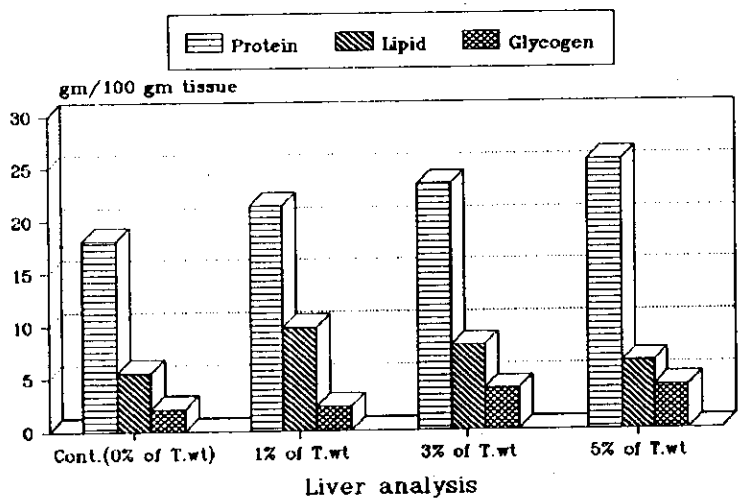


Liver analysis

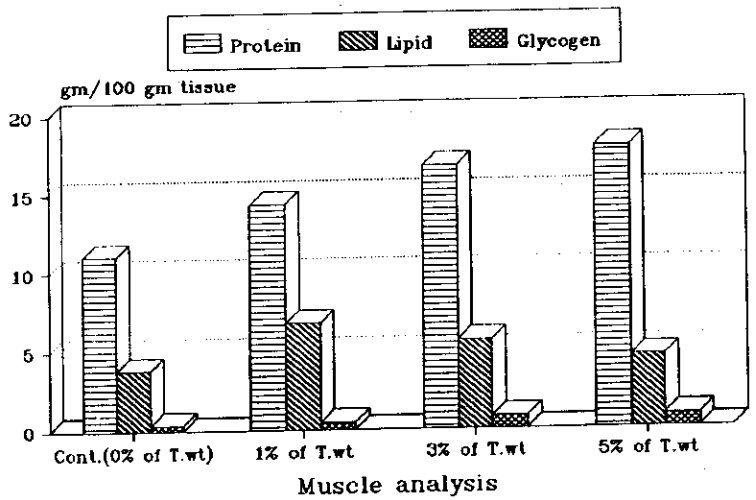


Muscle analysis

Fig(66) Averages total protein, lipid and glycogen in liver and muscle of Nile tilapia *(O.niloticus)* reared in earthen ponds at different food rations, during a period of 244 days.



Liver analysis



Muscle analysis

content decreased with the increased stocking density (Table 66 and Figures 59,60).

Nevertheless, at different dietary protein levels (Table 67 and Figures 61,62) the muscle glycogen of ***H. molitrix*** and ***O. niloticus*** slightly increased to 0.43 ± 0.07 and 0.41 ± 0.11 gm/100 gm fresh tissue (highly significant, $P < 0.01$ for carp and unsignificant, $P > 0.05$ for tilapia) at diet with 20% protein. At diets contain 30%, 40% protein the muscle glycogen of both fish species highly significant, $P < 0.01$ increased to 0.72 ± 0.06 , 1.17 ± 0.05 gm/100 gm fresh tissue for carp and 0.78 ± 0.21, 0.82 ± 0.15 gm/100 gm fresh tissue for tilapia.

From the obtained results, it was noticed also that, the muscle glycogen of silver carp and Nile tilapia were gradually increased with the increased initial size of rearing fish. Its mean maximum values (1.32 ± 0.12 and 1.56 ± 0.10 gm/100 gm fresh tissue for carp and tilapia respectively) were recorded at the largest initial size for both fish. While the minimum values of glycogen content averaged of 0.43 ± 0.05 , 0.38 ± 0.07 gm/100 gm fresh tissue for carp and tilapia respectively were observed at smallest experimental initial size (Table 68 and Figures 63,64).

At different food rations (Table 69 and Figure 65,66) the muscle glycogen content highly significant ($P < 0.01$) increased progressively to 0.57 ± 0.05, 0.72 ± 0.06 and 0.97 ± 0.08 gm/100 gm fresh tissue for

Table (70) : Comparison between the means of experimental cases and control of protein, lipid and glycogen in liver of silver carp ***(H.molitrix)*** and Nile tilapia ***(O.niloticus)*** reared in earthen pond by using t-test.

Item	Treatment	Control & 1 st case		Control & 2 nd case		Control & 3 rd case		1 st case & 2 nd case		1 st case & 3 rd case		2 nd case & 3 rd case	
		Carp	Tila.	Carp	Tila.	Carp	Tila.	Carp	Tila	Carp	Tila.	Carp	Tila.
Liver protein	Stocking density	7.10	6.56	7.00	5.40	3.96	2.16	1.98	1.24	3.47	3.28	2.04	2.24
	Protein level	8.77	4.73	7.00	5.40	17.79	11.23	2.92	1.76	8.06	5.92	2.03	2.55
	Initial size	3.00	5.20	7.00	5.40	21.04	13.00	5.00	2.98	16.06	11.27	4.41	1.79
	Food ration	7.42	5.27	7.00	5.40	23.84	13.69	2.85	2.47	14.39	11.16	5.02	2.83
Liver lipid	Stocking density	7.97	11.00	9.69	15.50	11.62	11.73	1.85	1.79	3.42	5.92	1.59	3.33
	Protein level	7.46	9.57	9.69	15.50	2.89	3.14	2.02	2.96	5.48	3.92	3.05	7.74
	Initial size	13.39	18.85	9.69	15.50	0.74	9.68	6.52	6.72	16.73	11.12	5.75	6.90
	Food ration	11.34	25.23	9.69	15.50	3.78	3.75	3.14	6.70	12.02	9.68	3.55	4.65
Liver glycogen	Stocking density	9.50	5.12	16.14	6.21	8.25	8.44	0.09	0.59	4.00	3.56	6.71	4.00
	Protein level	5.18	2.92	16.14	6.21	54.77	10.30	9.53	4.73	37.27	8.08	33.37	1.46
	Initial size	6.07	2.08	16.14	6.21	16.50	16.00	11.75	3.62	13.61	12.76	5.78	2.71
	Food ration	9.13	2.86	16.14	6.21	16.45	5.03	6.84	4.85	10.10	4.11	5.72	0.37

Degree of freedom (df) = n1 + n2 - 2 = 38 .
Tabulated value = 2.02 at 5 % and 2.71 at 1 % level.

Table (71) : Comparison between the means of experimental cases and control of protein, lipid and glycogen in muscle of silver carp ***(H.molitrix)*** and Nile tilapia ***(O.niloticus)*** reared in earthen pond by using t-test.

Item	Treatment	Control & 1 st case		Control & 2 nd case		Control & 3 rd case		1 st case & 2 nd case		1 st case & 3 rd case		2 nd case & 3 rd case	
		Carp	Tila.	Carp	Tila.	Carp	Tila.	Carp	Tila.	Carp	Tila.	Carp	Tila.
Muscle protein	Stocking density	8.94	14.00	9.45	11.53	5.92	7.07	1.87	2.76	6.06	5.30	5.30	2.82
	Protein level	1.22	5.36	9.45	11.53	24.78	9.79	5.01	4.09	11.81	2.94	5.94	1.81
	Initial size	3.37	13.50	9.45	11.53	14.26	21.26	4.89	4.79	9.08	13.38	4.25	2.42
	Food ration	3.05	9.59	9.45	11.53	26.30	12.30	4.68	5.31	14.75	6.94	8.56	1.74
Muscle lipid	Stocking density	1.64	1.05	4.42	7.42	6.24	16.27	2.02	3.56	3.98	8.62	3.02	7.83
	Protein level	4.45	5.88	4.42	7.42	1.68	10.47	1.31	1.67	3.64	1.20	3.37	4.25
	Initial size	10.76	2.16	4.42	7.42	1.33	3.60	9.88	2.06	16.48	4.85	5.23	3.78
	Food ration	8.89	9.77	4.42	7.42	0.95	2.92	5.89	3.79	16.50	6.97	7.81	4.15
Muscle glycogen	Stocking density	12.42	9.44	11.75	6.14	5.60	7.33	8.00	3.50	9.83	7.88	6.33	3.50
	Protein level	3.60	1.50	11.75	6.14	23.00	9.40	9.66	5.28	24.66	8.20	22.50	0.50
	Initial size	4.50	4.00	11.75	6.14	17.83	30.25	14.50	1.50	22.25	39.33	15.00	11.14
	Food ration	8.00	2.75	11.75	6.14	14.40	5.22	7.50	4.57	13.33	4.00	8.33	0.33

Degree of freedom (df) = n1 + n2 - 2 = 38 .
Tabulated value = 2.02 at 5 % and 2.71 at 1 % level.

carp and 0.46 ± 0.07, 0.78 ± 0.21 and 0.82 ± 0.30 gm/100 gm fresh tissue for tilapia at food rations of 1% , 3% and 5% of total body weight respectively.

5- Carcass composition of fish flesh :

5-1- At the beginning of experimental period (April, 1991).

The carcass composition (crude protein, crude fat, ash and water content) and energy content (gross energy, metabolizable energy and energy protein ratio) of three initial size groups for silver carp ***(H. molitrix)*** and Nile tilapia ***(O. niloticus)*** at the beginning of experimental period were done in table (72).

The average values of crude protein, crude fat, ash, water content, gross energy, metabolizable energy and energy protein ratio for the two rearing fish (carp and tilapia) were 53.75 ± 0.69% and 57.03 ± 1.51% ; 19.12 ± 2.00% and 17.84 ± 1.45% ; 10.25 ± 1.92% and 11.65 ± 2.04% ; 74.22 ± 1.92% and 69.00 ± 2.15% ; 4852 ± 228 and 4908 ± 218 kcal/kg ; 3626 ± 186 and 3651 ± 172 kcal/kg ; 67.46 ± 2.51 and 64.02 ± 1.21 respectively at 1 st initial size group (6.20 cm, 7.40 gm for carp and 4.30 cm, 6.85 gm for tilapia). While at 2nd initial size group (12.16 cm, 21.75 gm for carp and 9.00 cm, 15.24 gm for tilapia), the average values of the above mentions parameters were 56.83 ± 1.65% and 58.45 ± 1.62 % ; 17.83 ± 1.96% and 16.50 ± 1.75% ; 11.21 ± 1.31% and 13.00 ± 1.50% ; 75.40 ± 1.53% and 70.15

± 1.52% ; 4896 ± 200 and 5145 ± 256 kcal/kg; 3643 ± 165 and 3840 ± 203 kcal/kg ; 67.22 ± 2.03% and 64.10 ± 1.60% for carp and tilapia respectively. The 3rd initial size group (17.56 cm, 61.05 gm for carp and 12.00 cm, 35.79 gm for tilapia) showed an average values of 58.41 ± 2.03% and 60.82 ± 2.05% ; 16.34 ± 1.50% and 15.77 ± 1.41% ; 13.28 ± 1.64% and 15.05 ± 1.55% ; 77.51 ± 1.52% and 72.11 ± 1.50% ; 4844 ± 232 and 5021 ± 244 kcal/kg ; 3585 ± 181 and 3714 ± 188 kcal/kg ; 69.58 ± 0.91% and 61.37 ± 1.04 for carp and tilapia respectively.

5-2- At the end of experimental period (November, 1991) :

5-2-1- Grude protein:

Table (73) and figure (67) indicated that, the crude protein which was determined as percentage of the dry matter of fish flesh, was gradually decreased with the increased stocking density. Its average values were 55.08 ± 2.00% and 62.17 ± 1.30% in control silver carp and Nile tilapia respectively (one fish/m^2, maintained without supplementary food and has 2nd initial size). These values highly significant ($P < 0.01$) increased to 60.32 ± 1.45%, 58.10 ± 2.05% and 57.13 ± 1.64%for carp and 67.13 ± 1.11%, 65.12 ± 1.05% and 64.50 ± 1.51% for tilapia at the three different stocking densities (one fish/m^2, two fish/m^2 and three fish/m^2) respectively.

As shown in table (74) and figure (68) the crude protein of flesh of ***H. molitrix*** and ***O. niloticus*** slightly increased with the increase of

Table (72) : Initial carcass composition (percent) and energy content (kcal / kg) of silver carp ***(H.molitrix)*** and Nile tilapia ***(O.niloticus)*** at the beginning of the experimental period .

Initial size	Cont. (1st initial size)		1 st initial size		2 nd initial size		3 rd initial size	
No. of fish exam.	20		20		20		20	
Item	Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
Silver carp								
Carcass comp.								
Crude protein	50.00-55.13	53.75±0.69	50.00-55.13	53.75±0.69	53.25-60.32	56.83±1.65	55.00-62.00	58.41±2.03
Crude fat	18.02-23.11	19.12±2.00	18.02-23.11	19.12±2.00	15.75-21.35	17.83±1.96	13.32-19.45	16.34±1.50
Ash content	8.26-13.15	10.25±1.92	71.32-78.06	10.25±1.50	9.15-13.85	11.21±1.31	10.45-16.21	13.28±1.64
water content	71.32-78.06	74.22±1.92	71.32-78.06	74.22±1.92	73.10-78.32	75.40±1.53	73.36-80.50	77.51±1.52
Energy content :								
Gross energy	4527-5298	4852±228	5427-5298	8.16±1.10	4612-52090	4896±200	4631-5377	4844±232
Metabo. energy	3392-3999	3626±186	3392-3999	9.53±0.63	3453-4100	3643±165	3391-4027	3585±181
E / P ratio	61.84-72.54	67.46±2.51	61.84-72.54	0.43±0.05	63.81-71.28	67.22±2.03	67.22-71.40	69.58±0.91
Nile tilapia								
Carcass comp.								
Crude protein	55.14-60.13	57.03±1.51	55.14-60.13	57.03±1.51	57.54-61.63	58.45±1.62	56.85-64.90	60.82±2.05
Crude fat	15.62-20.62	17.84±1.45	15.62-20.62	17.84±1.45	17.30-23.03	16.50±1.75	13.67-19.50	15.77±1.41
Ash content	10.66-15.32	11.65±2.04	10.66-15.32	11.65±2.04	10.15-16.03	13.00±1.50	12.02-18.50	15.05±1.55
water content	66.00-73.20	69.00±2.15	66.00-73.20	69.00±2.15	66.13-73.00	70.15±1.52	68.15-75.00	72.11±1.50
Energy content :								
Gross energy	4591-5346	4908±218	4591-5346	4908±2180	4885-5658	5145±256	4504-5510	5021±244
Metabo. energy	3400-3995	3651±172	3400-39952	3651±172	3628-4246	3840±203	3310-4091	3714±188
E / P ratio	61.66-66.34	64.02±1.21	61.66-66.34	64.02±1.21	63.05-68.90	64.10±1.60	58.22-63.03	61.37±1.04

1 st initial size = 6.20 cm , 7.40 gm for carp and 4.30 cm, 6.85 gm for tilapia
2 nd initial size = 12.16 cm ,21.75 gm for carp and 9.00 cm , 15.24 gm for tilapia .
3 rd initial size = 17.56 cm , 61.05 gm for carp and 12.00 cn, 35.79 gm for tilapia.

protein level in the diet. Its average values increased to 56.17 ± 1.51%, 63.35 ± 1.93% (unsignificant, P > 0.05), 58.10 ± 2.05% , 65.12 ± 1.05 (highly significant, P < 0.01) and 61.43 ± 2.12% , 64.08 ± 2.00% (highly significant, P < 0.01 for carp and significant, P < 0.05 for tilapia) for carp and tilapia at 20%, 30% and 40% dietary protein levels respectively.

From table (75) and figure (69) it was noticed that, the crude protein of flesh of silver carp and Nile tilapia also increased with the increased initial size of rearing fish. Its values slight increase to 57.21 ± 2.46 , 63.22 ± 1.54% (unsignificant, P > 0.05) ; 58.10 ± 2.05% , 65.12 ± 1.05% (highly significant, P < 0.01) and 61.31 ± 2.83% , 66.15 ± 2.03% (highly significant, P < 0.01) for carp and tilapia at the three different initial sizes respectively (Table 77).

The crude protein of silver carp and Nile tilapia were also gradually increased with the increased food ration. Its average values significantly (P < 0.05) increase to 57.15 ± 2.03%, 64.13 ± 2.54% ; 58.10 ± 2.05%, 65.12 ± 1.05% and 60.38 ± 1. 51%, 67.50 ± 1.77% for carp and tilapia at food rations of 1%, 3% and 5% of total body weight respectively (Table 76 and Figure 70).

5-2-2- Crude fat :

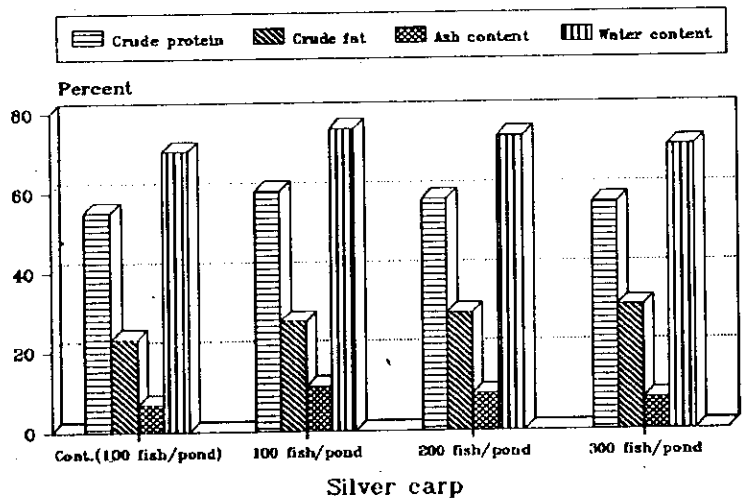
The crude fat which was expressed also as precentage in the dry matter of fish flesh were slightly increased with the increased stocking densiy (Table 73 and Figure 67). The control ***H. molitrix*** and ***O. niloticus*** (one fish/m², without supplementary food and 2nd initial size) showed a crude fat values of 23.21 ± 1.67% and 17.63 ± 1.19 respectively. These values highly significant ($P < 0.01$) increase progressively to 27.55 ± 2.43%, 29.42 ± 0.53% and 31.16 ± 1.42% in dry matter for carp and 20.12 ± 1.55%, 22.38 ± 0.92% and 26.85 ± 1.68% for tilapia at stocking densities of one fish/m², two fish/m² and three fish/m² respectively.

The present data (Table 74 and Figure 68) indicated that, the crude fat of flesh of silver carp and Nile tilapia significantly increased with the supplementary food containing 20% protein level then decrease with the increase of dietary protein level. Its average values were 32.83± 2.00%, 27.82 ± 1.70% (unsignificant, $P > 0.05$), inspit of the values of control fish (without supplementary food) 23.21 ± 1.67% and 17.63 ± 1.19% for both carp and tilapia respectively. The crude fat content then slightly declined with 30% and 40% dietary protein level to 29.42 ± 0.53%, 22.38 ± 0.92% (highly significant, $P < 0.01$) and 26.70 ± 1.65% , 24.30 ± 1.46% (highly significant, $P < 0.01$) for the two reared fish species respectively (Table 77).

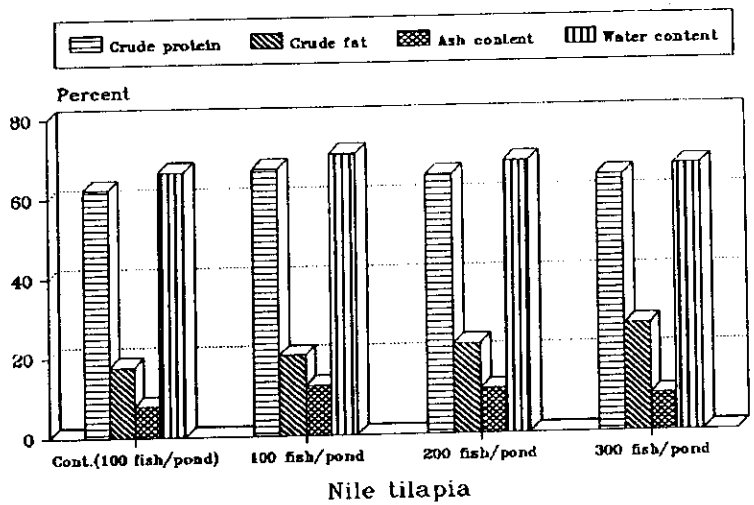
Table (73) : Effect of stocking denisty on carcass compostion (percent) and energy content (kcal / kg) of the flesh of silver carp ***(H.molitrix)*** and Nile tilapia ***(O.niloticus)*** at the end of rearing period (244 days).

Stocking density	Control (100 fish/pond)		100 fish / pond		200 fish / pond		300 fish / pond	
No. of fish exam	20		20		20		20	
Item	Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
Silver carp								
Carcass comp.								
Crude protein	54.21-57.10	55.08±2.00	59.11-62.21	60.32±1.45	55.11-62.21	58.10±2.05	55.45-59.41	57.13±1.64
Crude fat	20.00-26.55	23.21±1.67	22.45-30.42	27.55±2.43	27.42-30.41	29.42±0.53	26.23-35.00	31.16±1.42
Ash content	3.76-10.78	6.70±2.00	9.26-14.33	11.24±1.55	6.26-11.00	9.15±1.50	5.91-10.36	7.83±1.27
water content	64.00-75.20	70.41±2.32	73.33-78.51	75.88±1.82	71.33-75.22	73.87±1.68	68.32-73.21	71.45±1.88
Energy content :								
Gross energy	5098-5597	5305±92	5461-6390	6012±386	5705-6389	6063±163	5599-6664	6172±245
Metabo. energy	3814-4211	4005±74	4201-4660	4556±62	4343-4859	4620±120	4461-5117	4721±198
E / P ratio	77.64-78.84	72.71±2.25	75.42-81.63	78.53±2.94	76.23-82.79	79.52±2.09	79.25-86.83	82.64±2.05
Nile tilapia								
Carcass comp.								
Crude protein	58.71-64.80	62.17±1.30	65.31-69.15	67.13±1.11	64.14-67.21	65.12±1.05	62.14-67.21	64.50±1.51
Crude fat	15.12-19.02	17.63±1.19	17.20-22.25	20.12±1.55	20.33-23.22	22.38±0.92	23.32-28.21	26.85±1.68
Ash content	6.21-10.50	7.72±1.38	9.50-15.51	12.48±1.61	8.92-15.00	11.15±2.08	6.41-13.50	9.13±2.19
water content	62.67-72.75	66.51±1.62	68.55-72.66	70.72±2.03	66.17-71.25	68.26±1.50	65.12-70.75	67.00±3.11
Energy content :								
Gross energy	4691-5403	5178±140	5315-6081	5705±188	5545-5992	5794±99	5715-6464	6182±141
Metabo. energy	3599-4018	3825±62	3853-4483	4235±124	4128-4479	4330±74	4289-4879	4664±108
E / P ratio	58.22-64.35	61.68±1.43	58.13-65.15	62.91±1.48	62.98-69.00	66.49±1.51	67.10-75.92	72.31±1.74

Fig(67):Carcass composition of the flesh of silver carp *(H.molitrix)* and Nile tilapia *(0.niloticus)* reared in earthen ponds at different stocking densities during a period of 244 days.



Silver carp

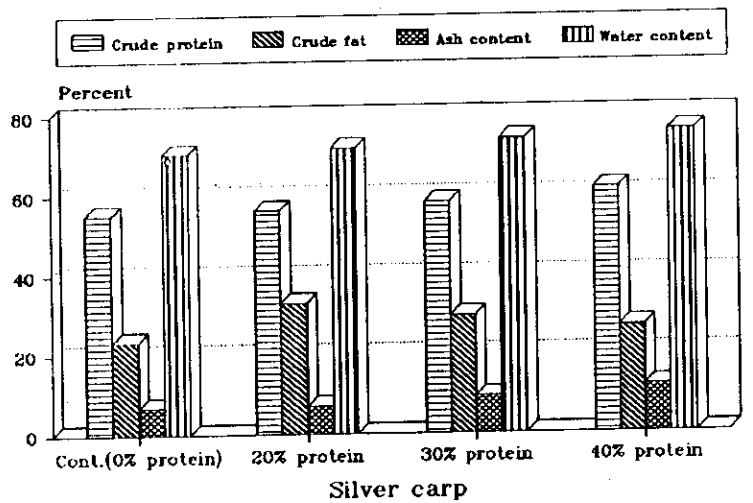


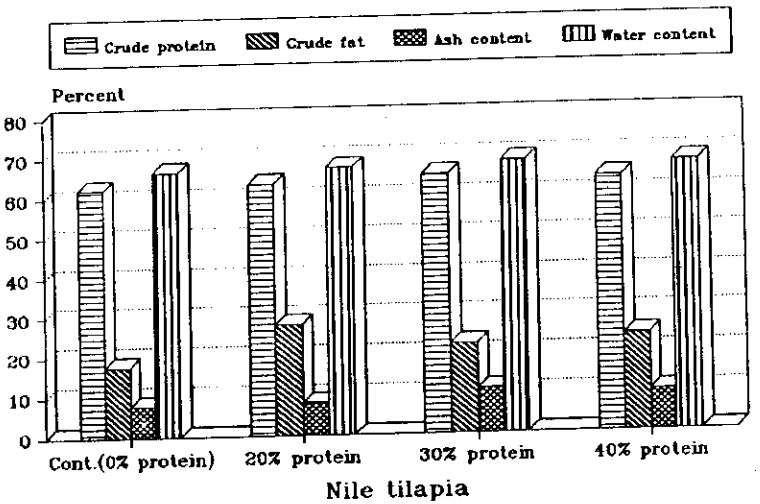
Nile tilapia

Table (74) : Effect of dietary protein level on carcass composition (percent) and energy content (kcal / kg) of the flesh of silver carp ***(H.molitrix)*** and Nile tilapia ***(O.niloticus)*** at the end of rearing period (244 days).

Protein elvel	Control (0% protein)		20 % protein		30 % protein		40 % protein	
No. of fish exam	20		20		20		20	
Item	Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
Silver carp								
Carcass comp.								
Crude protein	54.21-57.10	55.08±2.00	54.33-57.20	56.17±1.51	55.11-62.21	58.10±2.05	59.11-67.21	61.43±2.12
Crude fat	20.00-26.55	23.21±1.67	30.65-37.15	32.83±2.00	27.42-30.41	29.42±0.53	22.55-30.00	26.70±1.65
Ash content	3.76-10.78	6.70±2.00	3.26-10.28	7.05±1.62	6.26-11.00	9.15±1.50	9.75-14.50	11.75±1.38
water content	64.00-75.20	70.41±2.32	69.31-73.70	71.76±1.47	71.33-75.22	73.87±1.68	73.23-78.14	75.80±1.71
Energy content :								
Gross energy	5098-5597	5305±92	5966-6742	6217±262	5705-6389	6063±163	5863-6321	5994±163
Metabo. energy	3814-4211	4005±74	4571-5203	4767±217	4343-4859	4620±120	4441-5021	4532±244
E / P ratio	77.64-78.84	72.71±2.25	81.62-90.96	84.87±3.05	76.23-82.79	79.52±2.09	69.72-78.43	73.78±2.32
Nile tilapia								
Carcass comp.								
Crude protein	58.71-64.80	62.17±1.30	61.15-64.21	63.35±1.93	64.14-67.21	65.12±1.05	63.71-66.22	64.08±2.00
Crude fat	15.12-19.02	17.63±1.19	25.33-29.22	27.82±1.70	20.33-23.22	22.38±0.92	21.41-26.22	24.30±1.46
Ash content	6.21-10.50	7.72±1.38	5.41-11.50	8.16±2.17	8.92-15.00	11.15±2.08	8.42-13.64	10.02±2.31
water content	62.67-72.75	66.51±1.62	65.17-69.25	67.23±4.02	66.17-71.25	68.26±1.50	68.27-72.30	67.74±1.45
Energy content :								
Gross energy	4691-5403	5178±140	5848-6381	6209±86	5545-5992	5794±99	5967-6328	6143±157
Metabo. energy	3599-4018	3825±62	4478-4842	4692±72	4128-4479	4330±74	4258-4678	4635±115
E / P ratio	58.22-64.35	61.68±1.43	73.23-75.41	74.13±0.65	62.98-69.00	66.49±1.51	64.73-72.57	69.92±1.23

Fig(68):Carcass composition of the flesh of silver carp *(H.molitrix)* and Nile tilapia *(O.niloticus)* reared in earthen ponds at different dietary protein levels,during a period of 244 days





increased with the increased food ration. Its average values increased from that of control group to 7.14 ± 0.95% , 10.15 ± 1.73% (unsignificant, $P > 0.05$ for carp and highly significant, $P < 0.01$ for tilapia) ; 9.15 ± 1.50%, 11.15 ± 2.08% (highly significant, $P < 0.01$) and 10.51 ± 2.05%, 13.00 ± 1.75% (highly significant $P < 0.01$) for carp and tilapia at 1%, 3% and 5% food rations respectively.

5-2-4- Water content :-

The water content was expressed also as percentage in fish flesh (wet matter). The average values of water content were slightly decreased with the increased stocking density (Table 73 and Figure 67). The control ***H. molitrix*** and ***O. niloticus*** (one fish/m^2, without supplementary food and has 2nd initial size) showed a water content of 70.41 ± 2.32% and 66.51 ± 1.62% respectively. These values increased to 75.88 ± 1.82% , 70.72 ± 2.03% (highly significant, $P < 0.01$) at stock of one fish/m^2 ; 73.87 ± 1.68% , 68.26 ± 1.50%, (highly significant, $P < 0.01$ for carp and significant, $P < 0.05$ for tilapia) at stock of two fish/m^2 and 71.45 ± 1.88%, 67.00 ± 3.11% (unsignificant, $P > 0.05$) at stock of three fish/m^2 for carp and tilapia respectively.

The present data (Table 74 and Figure 68) indicated that, water content of carp and tilapia flesh was slightly increased with the increased protein level in their diet. Its average value increased from that of control group to 71.76 ± 1.47% , 67.23 ± 4.02% (unisgnificant, $P > 0.05$) at 20% protein level ; 73.87 ± 1.68% , 68.26 ± 1.50%

(significant, $P < 0.05$) at 30% and 75.80 ± 1.71% , 67.74 ± 1.45% (highly significant, $P < 0.01$ for carp and unsignificant, $P > 0.05$ for tilapia) at 40% protein level for carp and tilapia respectively.

The obtained results cleared also that, water content of both fish species (carp and tilapia) was gradually increased with the increased initial size of rearing fish. The average values increased from 70.41 ± 2.32%, 66.51 ± 1.62% in control ***H. molitrix*** and ***O. niloticus*** to 71.78 ± 5.51% , 67.12 ± 2.09% (unsignificant $P > 0.05$) ; 73.87 ± 1.68% , 68.26 ± 1.50% (significant, $P < 0.05$) and 74.32 ± 2.24% , 71.33 ± 2.65% (highly significant, $P < 0.01$) at the three different experimental sizes respectively (Table 75 and Figure 69).

The present study (Table 76 and Figure 70) also showed that,water content of fish flesh for both species was slightly increased with the increased food ration. Its values increased from that of the above mentioned control group to 70.74 ± 1.63% , 67.00 ± 2.13% (unsignificant, $P > 0.05$) at 1% food ration ; 73.87 ± 1.68% , 68.26 ± 1.50% (significant $P < 0.05$) at 3% food ration and 75.51 ± 2.36%, 70.13 ± 1.27% (highly significant, $P < 0.01$) at 5% food ration for carp and tilapia respectively.

5-2-5- Energy content :

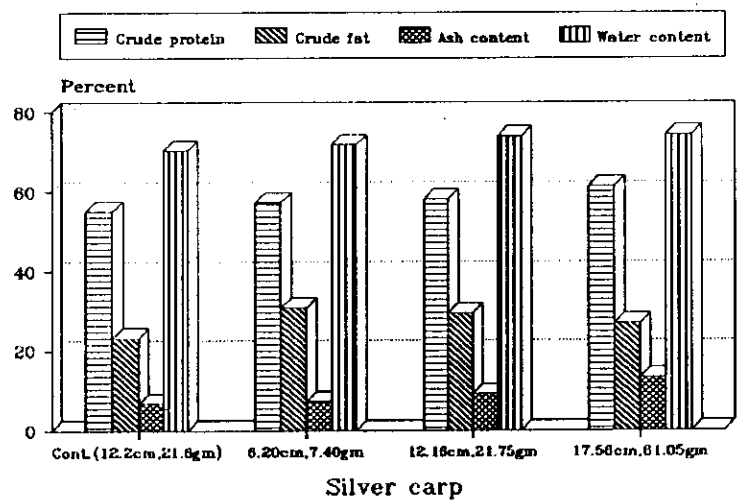
The gross (total) and metabolizable energies as well as energy protein ratio of flesh of silver carp and Nile tilapia were slightly

Table (75) : Effect of initial size on carcass compostion (percent) and energy content (kcal / kg) of the flesh of silver carp ***(H.molitrix)*** and Nile tilapia ***(O.niloticus)*** at the end of rearing period (244 days).

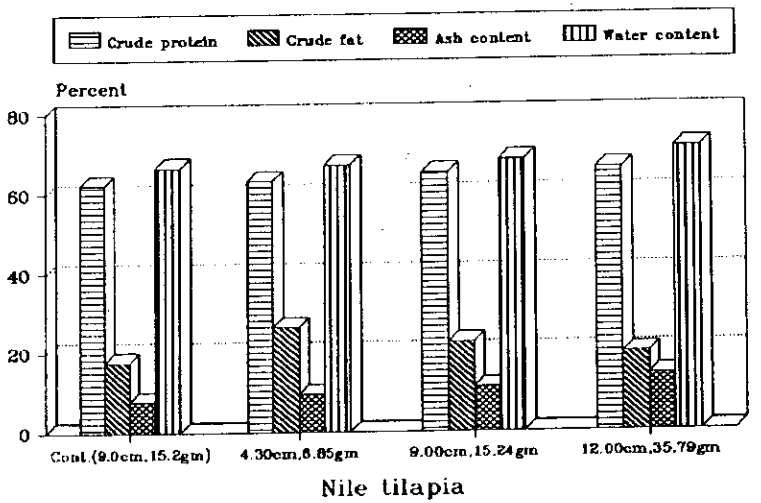
Initial size	Cont.(1 st initial size)		1 st initial size		2 nd initial size		3 rd initial size	
No. of fish exam	20		20		20		20	
Item	Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
Silver carp								
Carcass comp.								
Crude protein	54.21-57.10	55.08±2.00	55.32-59.20	57.21±2.46	55.11-62.21	58.10±2.05	59.11-62.21	61.31±2.83
Crude fat	20.00-26.55	23.21±1.67	25.65-33.15	30.76±1.20	27.42-30.41	29.42±0.53	20.05-29.50	26.81±1.85
Ash content	3.76-10.78	6.70±2.00	4.56-11.68	7.35±2.12	6.26-11.00	9.15±1.50	10.25-17.00	13.21±1.96
water content	64.00-75.20	70.41±2.32	68.81-73.20	71.78±5.51	71.33-75.22	73.87±1.68	72.00-76.80	74.32±2.24
Energy content :								
Gross energy	5098-5597	5305±92	5556-6477	6139±169	5705-6389	6063±163	5281-6302	5997±152
Metabo. energy	3814-4211	4005±74	4210-4961	4692±134	4343-4859	4620±120	3909-4786	4536±125
E / P ratio	77.64-78.84	72.71±2.25	76.08-83.80	82.01±0.92	76.23-82.79	79.52±2.09	66.13-76.93	73.98±1.53
Nile tilapia								
Carcass comp.								
Crude protein	58.71-64.80	62.17±1.30	60.15-66.31	63.22±1.54	64.14-67.21	65.12±1.05	64.43-68.21	66.15±2.03
Crude fat	15.12-19.02	17.63±1.19	24.42-28.36	26.32±2.45	20.33-23.22	22.38±0.92	21.41-23.03	19.56±1.84
Ash content	6.21-10.50	7.72±1.38	6.92-13.14	9.50±1.82	8.92-15.00	11.15±2.08	11.41-15.50	14.02±1.75
water content	62.67-72.75	66.51±1.62	65.24-70.50	67.12±2.09	66.17-71.25	68.26±1.50	69.17-72.25	71.33±2.65
Energy content :								
Gross energy	4691-5403	5178±140	7506-6413	6059±177	5545-5992	5794±99	5358-5831	5586±145
Metabo. energy	3599-4018	3825±62	4299-4844	4571±136	4128-4479	4330±74	4050-4458	4145±106
E / P ratio	58.22-64.35	61.68±1.43	71.48-73.05	72.30±0.37	62.98-69.00	66.49±1.51	59.51-65.75	62.66±0.94

1 st initial size = 6.20 cm, 7.40 gm for carp and 4.30 cm , 6.85 gm for tilapia.
2 nd initial size = 12.16 cm, 21.75 gm for carp and 9.00 cm , 15.24 gm for tilapia.
3 rd initial size = 17.56 cm, 61.05 gm for carp and 12.00 cm , 35.79 gm for tilapia.

Fig(69):Carcass composition of the flesh of silver carp *(H.molitrix)* and Nile tilapia *(O.niloticus)* reared in earthen ponds at different initial sizes,during a period of 244 days.



Silver carp



Nile tilapia

increased with the increased stocking density. Their maximum values (6172 ± 245, 6182 ± 141 kcal/kg ; 4721 ± 198, 4664 ± 108 kcal/kg and 82.64 ± 2.05 , 72.31 ± 1.74) were recorded at stock of three fish/m² for carp and tilapia respectively. While the minimum values of these parameters (6012 ± 386, 5705 ± 188 kcal/kg ; 4556 ± 62, 4235 ± 124 kcal/kg and 78.53 ± 2.94, 62.91 ± 1.48 for carp and tilapia respectively) were observed at stock of one fish/m² (Table 73 and Figure 67).

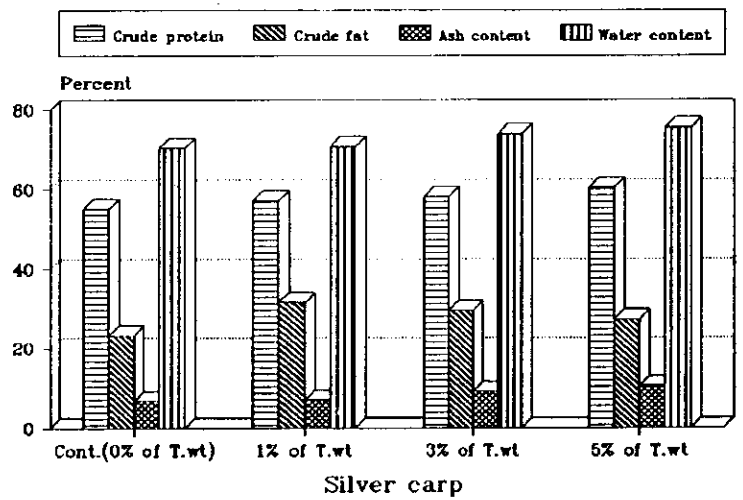
As shown in table (74) and figure (68) the energy content (gross energy, metabolizable energy and enertgy- protein ratio) of flesh of ***H. molitrix*** and ***O. niloticus*** decreased with the increased protein level in the diet. Its highest values (6217 ± 262, 6209 ± 86 kcal/kg ; 4767 ± 217, 4692 ± 72 kcal/kg and 84.87 ± 3.05, 74.13 ± 0.65 for carp and tilapia respectively) were recorded at the low dietary protein level (20%). While the lowest values (5994 ± 163, 5794 ± 99 kcal/kg ; 4532 ± 244, 4330 ± 74 Kcal/kg and 73.78 ± 2.32, 66.49 ± 1.51 for carp and tilapia respectively) were observed at the high dietary protein levels (40% for carp and 30% for tilapia).

The average values of gross energy, metabolizable energy and energy- protein ratio in fish flesh also slightly decrease with the increased initial size of rearing fish (Table 75 and Figure 66). The small experimental initial size showed values of 6139 ± 169, 6059 ± 177 kcal/kg ; 4692 ± 134, 4571 ± 136 kcal/kg and 82.01 ± 0.92 , 72.30 ±

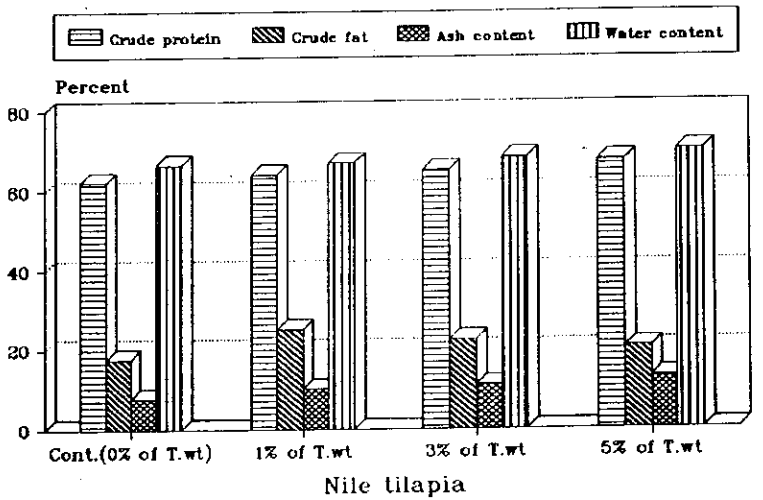
Table (76) : Effect of food ration carcass compostion (percent) and energy content (kcal / kg) of the flesh of silver carp ***(H.molitrix)*** and Nile tilapia ***(O.niloticus)*** at the end of rearing period (244 days).

Food ration	Control (0 % of T.wt)		1 % of T.wt		3 % of T.wt		5 % of T.wt	
No. of fish exam.	20		20		20		20	
Item	Range	M ± SD	Range	M ± SD	Range	M ± SD	Range	M ± SD
Silver carp								
Carcass comp.								
Crude protein	54.21-57.10	55.08±2.00	55.11-59.21	57.15±2.03	55.11-62.21	58.10±2.05	58.43-62.30	60.38±1.51
Crude fat	20.00-26.55	23.21±1.67	29.42-33.41	31.56±1.93	27.42-30.41	29.42±0.53	25.15-30.65	27.22±1.71
Ash content	3.76-10.78	6.70±2.00	2.28-10.00	7.14±0.95	6.26-11.00	9.15±1.50	8.76-11.38	10.51±2.05
water content	64.00-75.20	70.41±2.32	68.33-74.21	70.74±1.63	71.33-75.22	73.87±1.68	73.00-78.70	75.51±2.36
Energy content :								
Gross energy	5098-5597	5305±92	5893-6502	6211±145	5705-6389	6063±163	5678-6416	5983±216
Metabo. energy	3814-4211	4005±74	4503-4982	4753±114	4343-4859	4620±120	4291-4882	4532±175
E / P ratio	77.64-78.84	72.71±2.25	81.72-84.14	83.16±0.49	76.23-82.79	79.52±2.09	73.43-78.35	75.06±1.65
Nile tilapia								
Carcass comp.								
Crude protein	58.71-64.80	62.17±1.30	61.14-66.41	64.13±2.54	64.14-67.21	65.12±1.05	65.31-68.03	67.50±1.77
Crude fat	15.12-19.02	17.63±1.19	23.33-27.21	25.00±1.11	20.33-23.22	22.38±0.92	18.20-22.25	20.53±1.34
Ash content	6.21-10.50	7.72±1.38	7.91-14.00	10.15±1.73	8.92-15.00	11.15±2.08	10.50-16.41	13.00±1.75
water content	62.67-72.75	66.51±1.62	64.28-70.25	67.00±2.13	66.17-71.25	68.26±1.50	68.55-73.63	70.13±1.27
Energy content :								
Gross energy	4691-5403	5178±140	5715-6313	6195±58	5545-5992	5794±99	5410-5946	5755±95
Metabo. energy	3599-4018	3825±62	4290-4760	4501±130	4128-4479	4330±74	4003-4297	4276±53
E / P ratio	58.22-64.35	61.68±1.43	69.04-71.89	70.18±0.85	62.98-69.00	66.49±1.51	61.29-64.16	63.35±0.40

Fig(70):Carcass composition of the flesh of silver carp *(H.molitrix)* and Nile tilapia *(O.niloticus)* reared in earthen ponds at different food rations,during a period of 244 days.



Silver carp



Nile tilapia