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RESEARCH PAPER

Effects of Dietary Supplementation of Lysine and Methionine on Growth Performance, Blood Parameters and Body Composition of Common Carp (Cyprinus Carpio) Fingerling

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A B S T R A C T:

The current study was carried out to investigate the effects of dietary supplementation of lysine and methionine on growth performance, approximate carcass compositions and haematological and biochemical parameters in common carp, *Cyprinus carpio* fingerlings (average weight 22 ± 0.9 g) for 10 weeks. Four experimental diets were prepared with supplemented with lysine and methionine at levels of (0 (control diet), T1 (1Lys and 0.4Met g/kg), T2 (2Lys and 0.8Met g/kg), T3 (3Lys and 1.2Met g/kg). No mortalities were recorded during the experimental study. Final weight (FW), weight gain (WG), specific growth rate (SGR), feed conversion efficiency (FCE) were significantly improved ($P<0.05$) in fish fed T1 compare to fish fed control diet. However Lys and Met levels in T3 diet compromised the growth performance and feed utilization. There was significantly ($p<0.05$) effect protein and ash on whole-body composition by dietary lysine and methionine supplementation but has not significantly affect whole body lipid content.

The result of this study has significantly effect on some biochemical blood parameters include erythrocytic count, leucocytic count and haematocrit and this study showed that plasma cholesterol and triglyceride of the fish was significantly affected. Addition of lysine and methionine resulted in significant differences in amino acid profile in fish meat. The result indicated that supplementing lysine and methionine of the diet T1 improve growth performance and feed utilization and up to T2 diet with slight increase in performance and health status of common carp (*C. carpio*) fingerlings.

KEY WORDS: Cyprinus carpio, body compositions; growth performance; haemato-biochemical profiles; lysine; methionine; nutrient utilization.
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1.INTRODUCTION :

In order to provide a stability source of nutritionally balanced feeds at a reasonable price, approximately 50-60% of the total production cost is allocated for fish feed (FAO, 2020). To meet the growing demands of enhanced aquaculture output, fish meals and oil are increasingly used in fish feed (Gatlin et al., 2007). However, fish meal prices have increased and availability has been restricted, it has become essential to find alternative plant protein sources. These alternative sources must have a balanced diet with a capacity to sustain rapid growth (Tacon and Metian, 2008).

The full ten quantitative essential amino acids required by cultivated fish have been determined (Abidi and Khan, 2010). In aquafeeds, lysine and methionine are often the first most limited amino acids (NRC, 2011). Lysine is an essential amino acid that is frequently deficient in fish diets (Small and Soares, 2000). Common carp gained more weight when lysine was added at a level of 1.89% lysine-deficient diets (Signor et al., 2017) rearing in aquariums. Fish with an ideal lysine level have better development, feed consumption and health (Zhang et al., 2008). Conversely, inadequate lysine supplementation results in negative outcomes, such as increased mortality, decreased

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feed intake and utilization, and decreased protein efficiency ratio and growth (Wang et al., 2005).

All species including fish and crustaceans need methionine as an essential amino acid for the creation of proteins (Alam et al., 2005). The growth performance in common carp larvae was improved by the addition of methionine in *Artemia nauplii* (Chen et al., 2018). Sardar et al. (2009) found that supplementation 4g/kg lysine and 7g/kg methionine in the diet for *Catla catla* and *Labeo rohita,* fingerlings had better growth performances feed utilization carcass composition and haemato-biochemical. Pandey et al. (2012) they found that addition of lysine and methionine 1% in the diet has improved the growth of *C. catla* and *L. rohita*, fingerlings. Gan et al. (2012) they found supplementation lysine and methionine to the plant protein sources-based practical diets had improved growth performance and feed utilization for grass carp.

The best growth and specific growth rate of Sea Bass (*Dentrarshus laborax*) larvae they were added at level 1.8g lysine 2.016% in the diet and 5.76% crude protein with 0.4 methionine + cyctine level 1.48% in the diet and 4.23 % crude protein in the diet Salama et al., (2013). Lysine rich diets increase the growth capacity for *Heteropneustes fossilis* fry (Khan and Abidi, 2011). The lysine requirement of gibel carp was determined to be 24.4 and 24.2 g/kg (65.9 and 65.4 g/kg of dietary protein) in the zero fish meal diet, has effect on growth parameters and plasma biochemical parameters (Ji et al., 2021).The effect of dietary methionine levels 1.4-1.5 g 100 g-1 diet which brought an increase in weight for Nile Tilapia *(Oreochromis niloticus)* fingerlings (Mohammed et al., 2020).

The current study will examine the effects of lysine and methionine supplementation on growth performance and feed utilization in common carp fingerlings, the effect of different levels lysine and methionine levels on body composition with respect to water quality parameters and the impact of lysine and methionine levels on blood parameters.

2.Material and methods

2.1Fish Experimental

The experiment was conducted for 10 week and for this purpose 180 fingerlings common carp *C. carpio*. (Weights average 22 ± 0.9 g) Fish were obtained from Ainkawa Fish Hatchery Project, Ministry of Agriculture and Water Resources – Erbil- Kurdistan region, Iraq). The fish were sorted depending on size then weighed and put in experimental fiberglass tank. The fish were acclimated to laboratory conditions and fed with control pellets (30% Crude protein) prior to the feeding trials for 3 weeks.

2.2Tanks and Experimental System

Twelve fiberglass tanks (200 L) were used in this trial. Each tank was provided with a proper continuous aeration. Each tank was stocked with fifteen fishes. Fishes were distributed into four experimental treatments as three replicates per each treatment. Each tanks was supply with Flow-through aeration was provided for each container by electrical aerator (ROYAL, Submersible water pump, QDX1.5-32-0.75F, China). In addition, all tanks were cleaned 2-3 times a week and siphoning method was applied to remove remaining particles from the system. The physical and chemical parameters of the water, hydrogen ion concentration (pH) and Water temperature(°C) were measured directly by an electrometric method using portable pH-meter in the field using portable device model (HANNA instruments, HI98129, CE, Mauritius). Dissolved Oxygen (DO1) was measured directly from water tanks by an electrometric method using portable DO-meter model (AZ 8403), method 4500-O.G. Conductivity was measured directly using a portable EC-meter were Monitored at the time of feeding. Water samples were collected using 1.5 litter acid washed polypropylene containers and taken to the laboratory for analysis ammonia was measured by a portable device (Milwaukee, ammonia medium range meter-MI405, made in Romania) as described in APHA (1998).

2.3Feed formulation and experimental diet preparation

Experimental diets were prepared in 4 kg batches. Diets were formulated to contain (30% crude protein, crude lipid %8) using basal ingredients Table (1).the basal diet used as a control diet (0 g of Lys and Met /kg) and the experimental diets were prepared using the same basal diets supplemented with different level of lysine and methionine as follows; T1 (1 g Lys , 0.4 g Met /kg), T2 (2 g Lys , 0.8 g Met /kg) and T3 (3 g Lys

, 0.1.2 Met /kg). After grinding, each solution (treatment) and water (3L) was added to form alight dough of each diet for the experimental diets. The pastes were passed through a meat grinder machine (Silver Crest BLENDER 4500W SC-5003) and an appropriate fine aperture disc (2-mm) was used to achieve the desired pellet size (2-mm pellets). We had dried the pellet naturally for 24 to 48 hours under the sun (Omar, 2017). Diets were crushed very well and put in a plastic vessel then labelled and kept stored in a dry, dark place until used. Dietary formulation and proximate analysis of the experimental diets are presented in Table (2).

2.4Growth Parameters and Feed Utilization

The growth performance and feed efficacy of the experimental fish during the study (10 week) were investigated by final weight (FW), weight gain (WG), total feed intake (TFI), specific growth rate (SGR), feed conversion ratio (FCR), feed efficiency rate (FCE) and protein efficiency ratio (PER), (Abdalqadir, 2014). Calculations were conducted using following equations;

WG (g/fish) = FBW-IBW

SGR (% day) = 100 * (lnFBW – lnIBW)/T

FCR = FI/WG

FCE (%) = WG/FI × 100

PER = WG/PI

PI = protein intake (g)/number of fish

Where FBW = final body weight (g), IBW = initial body weight (g), lnFBW = Logarithm of final body weight, lnIBW = Logarithm of initial body weight, T = duration of the study (days), FI = feed intake (g) and PI = protein intake (g).

2.5Amino acid

The amino acid compositions of experimental diets and fish were determined using an automated amino acid analyzer after hydrolyzing the samples with 6 M HCl at 110 °C for 24 h (Hassaan et al., 2018). Sulphur-containing amino acids were oxidized using performic acid before the acid hydrolysis. Four Diets and fish samples per treatment were analyzed using and sending to Department of Animal Production, Fish Nutrition Research Laboratory, Faculty of Agriculture at Moshtohor, Benha, University, 13736, Egypt.

2.6 Hematological Analyses

Blood samples were taken from *C. carpio* from each tank (replicate). At the end of the experiment, two fish per tank (6 per treatment) were collected. Fish were not fed for 24 hours before sampling. The blood was obtained from the caudal vein of the ventral body wall (Campbell, 2015). The blood samples were taken in Heparinized vials as an anticoagulant agent (Blaxhall and Daisley, 1973), and other tubes with gel for biochemical testing blood samples then centrifuged at 3000 rpm (Round per minute) for 5 min and plasma was separated for determination of biochemical parameters. For hematological analyses red blood cells (RBCs), white blood cells (WBCs), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), hemoglobin (Hb), haematocrit (HCT) and platelets (PLA), Were measured in center research laboratory in Agricultural Engineering Sciences college moreover serum biochemical tests (Total Cholesterol, Total Triglycerides, Alanine Aminotransferase (GPT), Aspartate Aminotransferase (GOT), High Density Lipids (HDL), Low Density Lipids (LDL), alkalin phosphatese (ALP)) were measured by in Alpha Laboratory for Disease Diagnosis at 100m street in front of East Emergency Hospital.

2.7Statistical Analysis

The data obtained in the experiments were statistically analyzed using one-way ANOVA test, SPSS program (Statistical Package for Social Science) (SPSS 26, 2019). Therefore, means and stander error were calculated. Duncan test utilized and aided to calculate significant differences at 0.05 levels among the various parameters (Duncan, 1995).

3. Results

3.1. Water quality

In the experiment, the temperatures were (24.21 ± 0.88C°) through the entire period and the pH was (7.86 ± 0.12) and the dissolved oxygen (DO) was (7.56± 0.29 ppm). The total dissolved solid was (256 ± 12.09 ppm) the electrical conductivity (EC) was (0.27 ± 0.05 mS.cm-1) and ammonia (0.53 ppm) in Table (1).

3.2.Growth performances

Growth performances of common carp fingerlings fed the four experimental diets are presented in Table (3). During the study, no mortalities were recorded during the experimental period. There were significant differences between the final weights of fish fed T1 supplemented diet compared with fish fed control diet, but fish fed T2 supplemented diet improved slightly although was not appeared to be significant differences compared with the control fish group. Fish fed lysine and methionine supplemented diet received significantly lower WG compared with control fish fed. Furthermore, the weight gain of fish fed T1 supplemented was significantly ($p \leq .05$) higher than fish fed the control diet, while fish fed T2 supplemented diet slightly decreased was not observed to be significant differences compared with the fish control group. Fish fed with lysine and methionine supplemented diet revealed significantly lower weight gain compared to control diet. The highest specific growth rate was obtained in the groups of T1 (0.96) and T2 (0.95) which had significantly higher value than control (0.90) group, followed by group T3 (0.85) which was observed significantly lower than control group.

3.3.Feed utilization

The feed utilization of common carp fingerlings fed diets supplemented with different levels of lysine and methionine are given in Table (3). The best feed conversion ratio was obtained in the group T1 (3.92 ± 0.06) which was significantly higher than all other groups ($p \leq .05$). Although trends towards better FCR were observed in fish fed supplemented diets up to and including T2, no significant trends were observed with fish fed T2. Whilst fish fed T3 FCR was significantly ($p \leq .05$) worst among the treatments Table (3). Compared to the control group, the FCE was improved up to T1 and T2 levels; which were only obtained significantly higher at T1 level and statistically FCE remained unaffected in T2 supplemented diet. However, T3 supplemented obtained worst FCE within the experimental group ($p \leq .05$). PER for T1 fed fingerlings was improved significantly from those carp fed control ($p < .05$). Furthermore, protein efficiency ratio (PER) of fish fed diet T2, did not differ significantly from control fed fish ($p \leq .05$). On the other hand, T3 dietary supplemented resulted in significantly lower compare with the control group.

3.4.Whole body composition

The whole body composition of fish is presented Table (4). No significant differences were found in whole-body lipid contents of fish fed the different experimental diets. However, wholebody moisture of fish was significantly higher in fish fed T2 supplemented diet than fish fed the control diet. However, whole body protein and ash of fish fed experimental diets increased significantly with the increasing levels of lysine and methionine supplementation compare with fish fed control diets.

3.5.Blood parameters

Haematological parameters of common carp fingerlings fed experimental diets are presented in Table (5). No significant differences were observed in the Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin Concentration (MCHC), RWD, RWD-SD and (Platelets) PLT from fish fed different experimental diets. The levels of, MON, Lym, RBC, HCT and MCH of fish fed experimental diets were significantly ($P \leq 0.05$) elevated by increasing the supplemented levels of lysine and methionine compared with control fish fed. The total numbers of leucocytes (WBC) were significantly higher in fish fed the T1 and T2 diets than in the fish fed the control diet. The Hb of fish fed T1 and T2 diets revealed significantly higher compared to fish fed control diet. The granulocyte counts of fish fed T1 diets significantly higher than those fish fed all other experimental diets. The biochemical responses in common carp fingerling fed with supplemented diets are shown in Table (6). Maximum (Cholesterol) CHO, Plasma High-Density Lipoprotein (HDLD) and low-Density Lipoprotein (LDLD) were observed in fish fed the T3 diet, and the highest triglycerides (TG), alkaline phosphatese (ALP) and Very Low Density Lipoprotein (VLDL) were obtained in the fish fed T2 diet. However, the glutamyl oxaloacetic transaminase (GOT) activity was improved significantly in fish fed with supplemented diets. However, the glutamic-pyruvate transaminase (GPT) of fish fed supplemented diets has not significant effect compare to the control diet.

Table 1: Water quality assessment for studied water samples

Parameters	close system
PH	7.86 ± 0.12
EC(mS.cm-1)	0.27 ± 0.05
TDS(ppm)	256 ± 12.09
RES	2.63 ± 0.11
Conductivity mS.cm-1	376 ± 32.62
SAL	0.18 ± 0.01
Do (ppm)	7.56.± 0.29
water Temperature (C˚)	24.21 ± 0.88
Ammonia (ppm)	0.53 ± 0.05

Table 2: Formulation and nutrient compositions of experimental diets.

Ingredients(g/kg)	**Control %**	**T1 %**	**T2 %**	**T3 %**
Soybean meal	468.8	468.8	468.8	468.8
Wheat	283.7	282.3	281.9	279.5
Wheat flour	200.0	200.0	200.0	200.0
Soybean oil	10.0	10.0	10.0	10.0
Added lysine	0	1	2	3
Added Methionine	0	0.4	0.8	1.2
Premix	25	25	25	25
Limestone38% ca	6.3	6.3	6.3	6.3
MCP 22.7	5.9	5.9	5.9	5.9
SUR*FACE	0.3	0.3	0.3	0.3
Proximate composition of Experimental Diets Dry Mater (%)	92.08	92.08	92.08	92.08
Moisture (%)	8.77	8.27	9.34	8.70
Protein (%)	31.75	31.30	31.30	31.05
Lipid (%)	6.55	6.90	6.75	6.75
Ash (%)	6.35	5.90	6.10	6.00

1. All ingredients were supplied by Erbil Feed, Kirkuk Rd, Erbil, Iraq.
2. Premix; Calcium,Phosphorus,Phosphorus avail. (calc.) Sodium (Na),Chloride (Cl),M.E. Poultry (calc.),Tryptophane ,Threonine, Isoleucin ,Valine ,Argini +vitamins added (Vitamin A ,Vitamin D3 ,Vitamin E ,Vitamin B1 , Vitamin B2,Vitamin B6 , Vitamin B12, Biotin ,Niacin ,Folic Acid, KCAL/KG Vitamin K3 ,Calcium D-pantothenate ,Choline Chloride ,Choline + Trace

elements added Fe (from Iron Sulphate) Cu (from Copper Sulphate), Mn (from Manganese Oxide), Zn (from Zinc oxide), I (from Calcium Iodate),Se (from Sodium Selenite)+ antioxidants added(B.H.T. (E321) Propyl Gallate (E310) Citric Acid (E33)).
3. SURF.ACE is an emulsifier action.

Table 3: Effects of supplementation of lysine and methionine on growth performance of common carp (*Cyprinus carpio*) fingerlings.

Parameters	Control	T1	T2	T3
Initial body Weight (g)	22.78 ±0.19	23.11 ± 0.38	22.22 ± 0.39	22.89±0.38
Final body Weight (g)	42.91 ± 0.25 ^{b}	45.15 ± 0.52 ^{a}	43.22 ± 0.22 ^{b}	41.60 ± 0.58 ^{c}
Weight gain (g)	20.13 ± 0.07^{b}	22.04± 0.37 ^{a}	21.00±0.18 ^{b}	18.71 ± 0.87 ^{c}
Specific growth rate (%day¹)	0.90 ± 0.04 ^{b}	0.96 ± 0.02 ^{a}	0.95 ± 0.02 ^{a}	0.85 ± 0.04 ^{c}
Feed conversion ratio	4.17 ± 0.10 ^{b}	3.92 ± 0.06 ^{a}	4.00 ± 0.15 ^{ab}	4.39 ± 0.04 ^{c}
Feed conversion efficiency (g)	24.02 ± 0.57 ^{b}	25.52 ± 0.36 ^{a}	25.01 ± 0.96 ^{ab}	22.78 ± 0.20 ^{c}
Protein efficiency ratio	0.76 ± 0.02 ^{b}	0.80 ± 0.01 ^{a}	0.79 ± 0.03 ^{ab}	0.72 ± 0.01^{c}
Total feed intake (g)	1258 ± 33.36	1295.92 ± 26.55	1260.72 ± 51.07	1231.60 ± 57.15
Protein intake (g)	26.63 ± 0.70	27.43 ± 0.49	26.69 ± 0.98	26.07 ± 1.02

- Data are presented as mean ±S.D.
- Same letters are not significant different (P>0.05).

Table 4: Effects of supplementation of lysine and methionine (g/kg diet) levels on Whole body percentage of common carp (*Cyprinus carpio*) fingerlings.

Parameters	**Control**	**T1**	**T2**	**T3**
Moisture	71.49±1.50^{ab}	69.79±1.63^{b}	71.35±2.46^{ab}	72.76±1.26^{a}
Protein*	58.50±0.70^{b}	60.50±0.70^{a}	61.50±0.70^{a}	61.00±1.41 ^{a}
Lipid*	21.50±0.70	21.15±0.21	22.30±1.13	21.21±1.28
Ash*	15.85±0.63^{b}	17.00±0.28^{a}	16.65±0.35^{a}	16.50±0.28^{a}

- *Dry matter basis.
- Same letters are not significant different (P>0.05).

Table 5: Effects of supplementation of lysine and methionine (g/kg) diet levels on Haematological characteristics of common carp (*Cyprinus carpio*) fingerlings.

Parameters	control	T1	T2	T3
WBC (103/µL)	65.80 ± 3.50^{c}	72.27 ± 0.55^{b}	87.00 ± 2.00^{a}	65.33 ± 2.25^{c}
LYM (%)	69.97 ± 0.84^{c}	78.32 ± 0.1.25^{a}	75.93 ± 0.35^{b}	75.67 ± 1.53^{b}
MON (%)	7.08 ± 0.89^{c}	11.41 ± 1.35^{a}	10.43 ± 0.43^{ab}	9.01 ± 0.46^{b}
GRA (%)	6.55 ± 0.38^{b}	8.24 ± 0.61^{a}	5.91 ± 0.75^{b}	5.64 ± 0.91^{b}
RBC (10^2/L)	1.40 ± 0.17^{b}	1.91 ± 0.05^{a}	1.98 ± 0.03^{a}	1.31 ± 0.03^{a}
Hb (g/dL)	9.40 ± 0.26^{c}	12.32 ± 0.1.21^{a}	11.03± 0.49^{ab}	10.55 ± 0.78^{bc}
HCT (%)	38.87 ± 1.64^{c}	47.53± 1.27^{a}	43.57 ± 1.00^{b}	43.43 ± 0.97^{b}
MCV (fl)	105.23±2.85	114.33±12.16	109.67 ± 12.03	98 ± 7.71
MCH (pg)	53.60 ± 0.60^{c}	62.20 ± 1.30^{a}	59.93 ± 2.86^{ab}	57.97 ± 1.47^{b}
MCHC (g/dL)	29.00 ± 3.00	31.00 ± 1.00	29.33 ± 6.11	29.00 ± 4.36
RDW (%)	28.77 ± 3.54	24.50 ± 3.30	25.33 ± 1.99	30.27 ± 2.38
RDW-SD (fl)	118.00± 15.72	101.67±4.93	104.00 ± 4.36	117.66 ± 6.11
PLT (10^9/L)	3615.67±1964.82	4120.33±683.75	4770.67±1237.88	3610.67±480.57

- Data are presented as mean ± S.D.
- Same letters are not significant different (P>0.05).

Table 6: Effects of supplementation of lysine and methionone (g/kg) diet on serum biochemical Indices of common carp (*Cyprinus carpio*) fingerlings.

Parameters	**Control**	**T1**	**T2**	**T3**
Cholesterol (mg/dL)	117.67±9.75[b]	126.17±8.58[ab]	124.50±17.73[ab]	141.33±9.77[a]
Triglyceride (mg/dL)	178.33±8.52[b]	252.33±9.67[a]	238.33±9.37[a]	184.33±27.92[b]
HDLD (mg/dL)	29.80±1.73[b]	35.03±3.71[ab]	33.45±6.17[ab]	37.87±7.80[a]
LDLD (mg/dL)	23.31±3.16[b]	32.60±1.35[a]	24.48±2.46[b]	35.08±3.50[a]
ALP (U/L)	265.67±32.29[ab]	184.83±8.80[c]	279.67±21.78[a]	240.83±33.25[b]
VLDL (mg/dL)	40.00±4.24[b]	50.00±2.37[a]	47.17±6.85[a]	37.00±3.79[b]
GOT (U/L)	741.67±47.74[d]	1235±57.87[a]	851.50±32.10[c]	913.83±22.71[b]
GPT (U/L)	294.17±63.74	399.5±187.66	285.00±75.42	261.67±36.72

- Data are presented as mean ± S.D.
- Same letters are not significant different (P>0.05).

4. Discussion

The importance of monitoring water quality in freshwater pond fish farming is due to the fact that the quality of the fish depends on the quality of the aquatic environment in which they live (Ramadani, 2021), means of water temperature, dissolved oxygen (DO), salinity and pH . Also EC and TDS were in range with Syed et al. (2022). Similarly, the quality of the water for aquaculture refers to the extent to which it permits growth and production of the appropriate organisms. In addition Goran et al. (2016), found that appropriate water temperatures ranged from21.4 to 26.7°C with a mean of 24.51°C were suitable for *C. carpio* aquacultures. Therefor water quality parameter did not affect growth performance, feed utilization and blood parameters during the duration of study.

In the present study, dietary lysine and methionine supplementation has improved growth performance and feed utilization, the best growth and feed utilization were observed in fish fed a diet containing (1 lysine and 0.4 methionine g/kg) in T1 compare to the control diet.The growth performance and feed utilization statistics Table (3) also demonstrate that lysine and methionine influence the performance of common carp fingerlings in T1 and significantly affect with Compared to the fish fed control diets. In agreement with this study Sardar et al. (2009) found that supplementation of both lysine and methionine has significantly affect weight gain, FW and SGR for Indain major carp. Also Prabu et al. (2019), showed that feeding lysine as feed additives for GIFT tilapia in PER and FCR high significant different compare to the other and control diet. In contrast the present study is in disagreement with the results found by Yaghoubi (2020), who obtained that partial replacement of fish meal (FM) by soybean protein (SP) and the adding of lysine and methionine in Silvery Black Porgy juveniles high soy protein diet resulted in weight gain being less than that of the control group that did not improve weight gain of fish fed diet and all treatment were significant effect compare to the control diet. Similarly Yuan et al. (2011) found supplementation of crystalline or coated lysine and methionine for Chinese sucker, *Myxocyprinus asiaticus* on feed intake has not significant affect compare to the control diet. In contrast to our current results Mohammed et al. (2020), they reported five level of methionine (0.5, 1, 1.5, 2, 2.5) for Nile Tilapia fingerlings on PER the higher level was1.89 in D3 all treatment not significant different compare to the control diet. In the present study, Growth performance (FW, WG, and SGR) and feed utilization (FCR, FCE and PER) in common carp fingerlings were significantly improved in T1 followed by no effect in T2 but poor growth in T3 compare to control group that could explain poor growth performance and nutrient retention efficiency by different fish species when amino acid is substituted could be attributed to long exposure to high pressures and processing techniques or diet manufacturers, who consequently reduced availability of amino acids (Rawles et al., 2006).

All treatments were affect protein and ash on whole-body composition lysine and methionine supplementation in the diet but have not significantly affect whole body lipid content. Protein content of whole body composition increased gradually in our study and this confirmed by the results of Mukherjee et al. (2011). Also Ahmed et al. (2003), reported that *Labeo rohita* can completely replace fish meal by soybean meal with supplementation of methionine and fortified with minerals to improve body composition. A similar finding was recorded by Sardar et al. (2009), who found that supplement lysine and methionine for Indian major carp have effect on the moisture and ash compared to the control diet, the high value was 72.76 in T3 when compared to the control diet.

A similar finding was recorded by Prabu (2019), that supplementation lysine lipid contain of the whole body composition for GIFT tilapia has not significant different compare to the control diet. In disagreement with our study El-Husseiny et al. (2018), found that the effect of dietary L-lysine supplementation on whole body composition for African catfish fingerlings moisture and ash has not significant affect all treatment compared to the control diet.The results of this investigation were reported by Sardar et al. (2009), that dietary supplementation with lysine and methionine effect on the ash for Indian major carp, rohu (*Labeo rohita*) ash did not has effect compare to the control diet but lipid has significant effect compare to the control diet.

In the present study, erythrocyte RBC and WBC count had significant effect compare to the control diet. The best value was observed from the level of T1 and T2 in comparison with control. The hematocrit (HCT) all treatment increase a significant effect compare to the control diet. Increasing HCT within a normal range can represent a good sign of optimized oxygen transport and health but not any unlimited increase (Esmaeili, 2021). The MCV, RDW, RDW-SD, PTL and MCHC contain on blood parameters all treatments has insignificant effect compare to the control diet. The blood parameter values acquired from the present study were in agreement with the finding of Badawi and Said (1971) on blood parameters of *Oreochromis niloticus*, *Tilapia zilli*, *Tilapia galilaea* and *Tilapia aureus*. The present study were in agreement with the findings of Sardar et al. (2009) found that haematocrit, erythrocyte, leucocyte levels on blood parameters for Indian major carp, rohu, *Labeo rohita* fed lysine and methionine-added soy protein-based diets were significantly ($p < .05$) higher compare to the control diet.In contrast to our current results Han et al. (2013), that the diet with higher methionine supplementation in juvenile Japanese flounder was significantly better performances hemoglobin on blood parameters. Present result agreement with the result Elmada et al. (2016), they methionine supplementary in the diet effect on hemoglobin for juvenile yellow catfish all treatments has significant different ($P < 0.05$) compare to the control diet. The values for Hb was similar to the values achieved in *Heteropneustes fossilis* fed graded concentrations of L-lysine (Khan and Abidi, 2011). In contrast, no significant affect changes was perceived in the haematological and biochemical responses of Nile tilapia fed graded levels of dietary histidine- (Michelato et al., 2017) and arginine (Yue et al.,2015). Similarity Buentello, et al. (2007), they found that haemoglobin, haematocrit and erythrocyte values were inclined by high dietary arginine supplementation in channel catfish supplemented in the diets. The blood parameter values obtained from the present study were in disagreement with the findings of Priyadarshini et al**.** (2018), which dietary supplementation of methionine effected on immune response for Indian major carp, *Labeo rohita* the RBCs and WBCs counts on blood parameters lower than the control diet. In disagreement with our result of Prabu et al. (2019), reported that supplementation of lysine levels of the MCV and MCHC contained of the blood parameters for GIFT tilapia has significant different all treatments compare to the control diet. Also reported by Al-Mayah (2006) who found that methionine supplementation in the diet for broiler chicks effect of MCV and MCHC achieved on the blood parameters has significant increase compared to the control diet.

Supplementation of lysine and methionine in the diet for common carp (*Cyprinus carpio*) fingerlings on serum biochemical has significant effect compared to the control diet while GPT has insignificant effect compare to the control diet. Our results is in agreement with Wang et al. (2005), shows that lysine supplementary in the diet for juvenile grass carp effect on the triglycerides all treatment has different compare to the control diet. In agreement with our result of Prabu et al. (2019), reported that supplementation of lysine levels of the CHO and TG contained of the biochemical parameters for GIFT tilapia has significant different all treatments compare to the control diet. Conforming to Bouyeh (2012), effect the highest level of lysine and methionine in the diet for broiler chick has Significant increase in plasma cholesterol, LDL and HDL compare to the control diet. Also Ji et al. (2021),reported that increasing levels of dietary lysine in zero fish meal diets for (*Carassius auratus gibelio*) effect on Plasma total triacylglycerol (TG) and Aspartate aminotransferase (AST) content were significantly affected compare to the control diet but Alanine aminotransferase (ALT)content has not significant affect compare to the control diet. Similarly our result of Yun et al. (2016) effect of the dietary lysine requirements for rainbow trout based on plasma free lysine concentrations. The serum biochemistry achieved from the present study were in agreement with the findings of Han et al. (2013), that the higher methionine supplementation in the diet for juvenile Japanese flounder plasma GOT has significant effect compare to the control diet while plasma GPT has insignificant effect compare to the control diet.

5. Conclusion

It is concluded from results of this study that limiting amino acids supplementation lysine and methionine to be used in fish diet of common carp *Cyprinus carpio* fingerlings is up to (2 Lys+0.8Met g/kg) treatment diets showed better growth performance and feed utilization.whole body protein and ash. Some haematological parameters namely; Lym, MON, RBC, Hb and MCH in *Cyprinus carpio* were higher in fish fed supplemented diets than in the control fish fed diet. The biochemical status was affected positively in fish fed dietary supplemented with Lys and Met in comparison with fish fed control diet.

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