EFFECT OF REPLACEMENT OF FISH MEAL WITH SILKWORM (*BOMBYX MORI*) PUPA MEAL ON ENZYME ACTIVITY IN COMMON CARP

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Abstract : An experiment was conducted to determine the effect of replacement of fishmeal with silkworm (Bombyx mori) pupa meal (SWP) on enzyme activity and feed utilization of Common carp. six serious of diets of silkworm pupae meal about 40% crude protein with varying levels of replacement of fish meal SP0,SP1,SP2,SP3,SP4 and SP5(0,10,20,30,40 and 50%) were provided at 40 % live fish body weight for 60 days. Fish enzyme activity and feed utilization parameters was higher in fingerlings fed the diets with mixed fishmeal and SWP (the highest was 40%) and lower in those fed 0% of SWP or fishmeal. Significant differences were reported for respiratory and digestive enzyme activity, when increasing silkworm pupae meal diet increasing enzyme activity SDH enzyme also decrease.40% SWP suitable for fish growth in aquaculture.

Keywords: GDH, SDH, amylase, protease, lipase, silkworm pupa meal,

INTRODUCTION

In aquaculture, determinative share in running cost is expended on feeding the cultured fish. Protein is the most expensive component in fish feeds. Aquaculture system becomes economically profitable with the input of low cost nutritionally balanced feed. As fish feed occupies about 40-60% of total cost of fish culture (Akiyama *et al*, 1992). Fish meal is most important feeding ingredient as dietary protein source for cultured fish. Shortage and high cost of fish meal make fish feed expensive hence the search for alternative sources of protein in fish feeds. Stressed that insect in various development stages has been used to feed fish and farm animals (Hickling 1962). Generally, the feed stuffs of animal origins are considered better alternative protein source if fish diets because of their higher content and other superior indispensable amino acids than the plant origins. Culture experiments have proven that these hydrolysates are ideal nutrient sources and can improve weight gain, feed conversion, immune function, digestive ability, and the intestinal development of fish when added within a suitable range (Kotzamanis *et al*, 2007).This study was, therefore, envisaged to evaluate the efficiency of integrated component technologies in terms of productivity, income increase and employment generation to help in strengthening the base of sericulture farmers / rearers at their work place with following objectives: Analysis shows that a silkworm pupae is rich protein (48.25%), Ether extract (16.43), as well as ash and crude fibre (12.03 and 8.42%)) noted that silkworm pupae have been an important component of carp diet in Japan and China (Newton *et al*, 1977). This study aimed evaluating silkworm pupae as dietary protein source and to determine its levels of replacing fish meal in the diet of common carp.

MATERIALS AND MATHODS

In the present study the experimental was conducted for 60 days to study, the effect of six different levels of silkworm pupae SP0, SP1, SP2, SP3, SP4 and SP5 (0, 10, 20, 30, 40 and 50%) on enzyme activity in *Labeo rohita*. Well acclimated *Labeo rohita* were selected from the stock and divided in to six groups of its individual each triplicate were maintained for each group. They were not fed for 24 hours before commencement of the experiment.

Estimation of some Respiratory and digestive enzyme

The use of Triphenyl Tetrazolium Chloride (TTC) as an artificial electron acceptor had been introduced by (Kun and Abood, 1949). The Amylase activity was determined by (Bernfield, 1955). The Protease activity was determined by (Jany, 1976). The lipase activity was determined by titrimetric method (Feits and Friedrick, 1966)

RESULTS

Table 1 Fig 1 shows that GDH content of *L. rohita* was increased increasing levels of SWP diet. For instance, the content of control *L. rohita* 23.45 increased to 25.46, 28.34, 32.36, 37.27, and 35.24 in fish consumed SP0,SP1,SP2,SP3,SP4 and SP5(0, 10, 20, 30, 40 and 50%) of SWP diet respectively. The GDH content of *L. rohita* fed on 40% SWP diet significantly. The result shows that SDH content of *L. rohita* was decreased increasing levels of pupae. For instance, the content of control *L. rohita* 65.15 decreased to 64.14, 68.76, 62.44, 54.36, and 58.36 in fish consumed 0,10, 20, 30, 40 and 50% of SWP diet respectively. The SDH content of Fig 2 *L.rohita* fed on 40% SWP diet significantly decreased. The results shows that amylase content of *L.rohita* was increased increasing levels of silkworm pupae. For instance, the content of control *L.rohita* 285.49 increased to 312.82, 343.45, 377.14, 466.74, and 386.37 in fish consumed 0, 10, 20, 30, 40 and 50% of SWP diet respectively. The amylase content of *L.rohita* fed on 40% SWP diet significantly. The results shows that protease content of *L.rohita* was increased increasing levels of silkworm pupae meal. For instance, the content of control *L.rohita* 182.24 increased to 234.97, 273.83, 362.14, 385.14, and 372.14 in fish consumed 0,10, 20, 30, 40 and 50% of SWP diet respectively. The protease content of *L.rohita* fed on 40% SWP diet significantly. The results shows that lipase content of *L.rohita* was increased increasing levels of pupae. For instance, the content of control *L.rohita* 52.16 increased to 84.79, 128.15, 133.66, 157.87, and 123.42 in fish consumed 0, 10, 20, 30, 40 and 50% of SWP diet respectively.

Table.1 Effect of partial replacement of fish meal with Silkworm Pupae meal on respiratory and Digestive enzyme activities (µg reduced TTC / 100 mg wet weight tissue hr^{-1}) in *Labeo rohita*. Each value is the mean (Ẋ±SD)

Rearing Period	SP0	SP1	SP2	SP3	SP4	SP5
GDH						
0	19.24±2.32	19.24±2.32	19.24±2.32	19.24±2.32	19.24±2.32	19.34±2.32
20	21.66±1.35	23.46±1.28	26.47±1.14	28.64±2.15	32.32±2.28	30.33±2.29
40	22.15±1.26	25.33±2.56	27.27±3.12	29.74±2.15	34.44±1.96	33.16±1.58
60	23.45±1.84	25.46±3.52	28.36±2.38	32.36±1.75	37.27±2.32	35.24±2.27
LDH						
0	72.58±1.24	72.58±1.24	72.58±1.24	72.58±1.24	72.58±1.24	72.58±1.24
20	70.15±2.32	68.34±2.36	68.76±1.85	64.44±1.56	62.36±1.92	64.49±1.87
40	59.18±3.54	57.14±3.25	52.16±5.63	50.23±2.45	48.03±1.40	51.32±2.14
60	45.15±3.25	44.14±2.24	43.76±2.42	42.40±2.45	40.36±1.26	41.23±2.19
Amylase						
0	226.40±1.48	226.40±1.48	226.40±1.48	226.40±1.48	226.40±1.48	226.40±1.48
20	238.68±2.41	253.10±4.94	291.81±3.45	335.89±2.55	411.58±2.47	315.16±3.27
40	252.17±2.49	284.89±3.45	322.50±4.78	347.78±4.37	437.84±3.42	354.27±4.58
60	285.49±5.52	312.82±6.29	343.45±7.18	377.14±5.82	466.74±6.30	386.37±7.63
Protease						
0	118.65±6.38	118.65±6.38	118.64±6.38	118.64±6.38	118.64±6.38	118.64±6.38
20	126.07±5.36	192.12±4.31	236.38±2.51	318.40±3.23	358.04±3.13	286.13±1.64
40	144.57±4.46	212.88±3.51	250.45±10.84	268.61±7.46	368.78±3.47	342.80±2.45
60	182.24±4.80	234.97±5.32	273.83±3.26	362.14±3.48	385.14±4.48	372.14±3.56
Lipase						
0	41.67±1.94	41.67±1.94	41.67±1.94	41.67±1.94	41.67±1.94	41.67±1.94
20	43.45±3.14	72.46±2.19	98.91±3.47	125.95±4.62	128.50±4.18	111.93±3.44
40	48.22±2.14	78.46±2.15	126.5±4.15	129.20±5.16	135.80±6.50	120.5±2.55
60	52.16±3.21	84.79±3.77	128.15±3.45	133.66±2.86	157.87±3.49	123.42±3.73

DISCUSSION

This result shows that enzyme activity like GDH, Amylase protease, and lipase in *Labeo rohita* increase increasing levels of silkworm pupae meal diet when 40% SWP diet is better compared to other levels of SWP diet in otherwise SDH 40% decrease the enzyme activity. All the six diets were accepted and utilized for enzyme activity for *Labeo rohita*. Enzyme activity was achieved at 40% silkworm inclusion level (SP4). Hong Ji et al 2013 reported 50% SWP suitable for growth and protease activity in Jian carp Smith et al 1987 Observed that the size of shrimp, the source and the level of protein concentration in the diet all affected the proteolytic activity to certain shrimp fed 30% protein displayed the highest activities. Gopal 1986 and Ali 1988 showed that an increase in the protein concentration in the diet, improved the final percentage survival of the post larvae. Thus the post larvae the survival rate of 92% was obtained at a dietary protein concentration of 30 to 40%. Fish, 1955 Nagase, 1964 suggested that, high protease and comparatively low carbohydrate activities in the secretion of white sturgeon and other carnivores species and even in herbivorous and omnivorous fish that fishes are adopted to high protein and low carbohydrate diets. Wilson 1989 reported if too much protein is supplied in the diet only part of it will be used to make new protein and remainder will be converted in to energy. Bages Solane 1981 also found the need for the incorporation of enough carbohydrate to compensate for the light quantity protein in the diet. The decline in the growth rate associated with an excess of dietary protein concentration, may also be attributed to the increased rate of catabolism of protein for energy production. Vijayakumar, 1987 and Das *et al* 2012 investigated and found that in fry and adult of *Liza parsia* protease, amylase and lipase are present in different regions in liver and animal canal and liver protease activity higher, while amylase activity is a little less compared to that of the adults.

CONCLUSION

The present study showed that the 40% protein level had exhibited the highest enzyme activity in the fishes. The growth rate improved, as the dietary protein level resulted in a decline in the growth rate of the animal. These findings quite interestingly indicate that, there is no significant added advantage in feeding the Common carp with diets having 40% protein concentration, These observations are important from the point of view of commercial aquaculture.

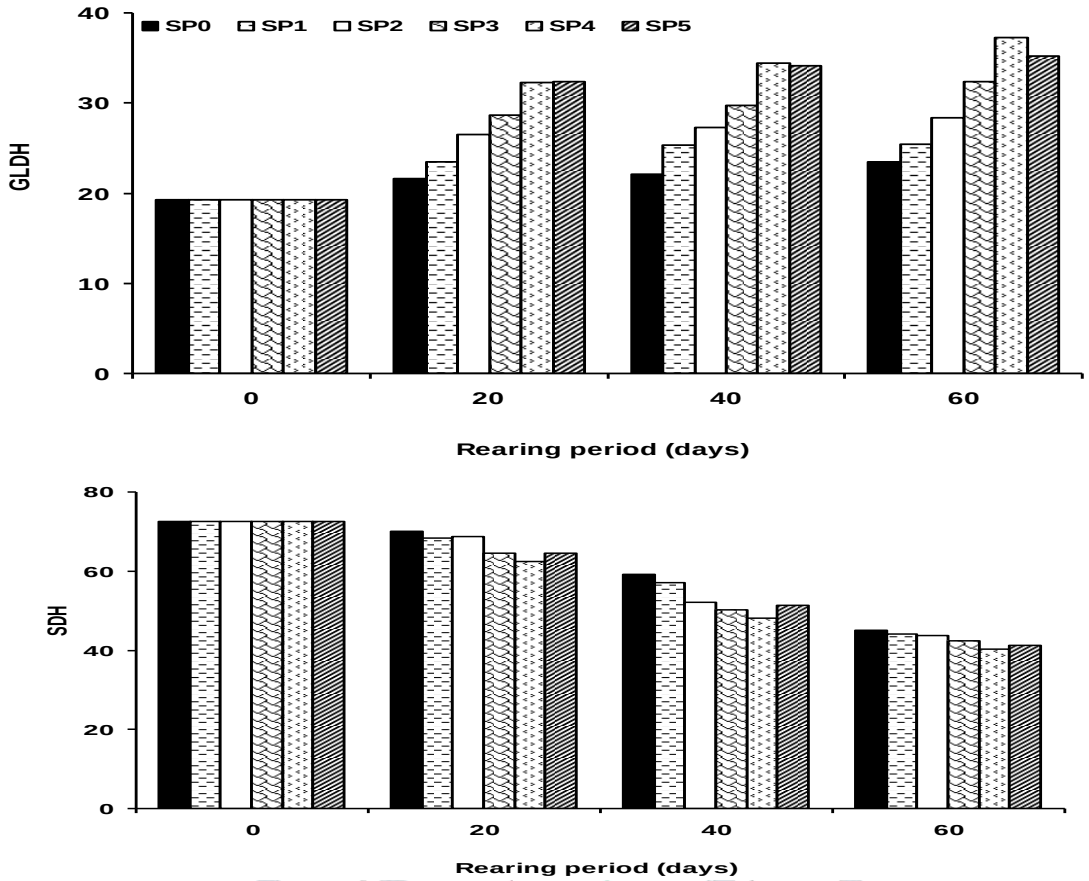

Figure 1: Effect of partial replacement of fish meal with Silkworm pupae meal diet on GLDH and SDH in *Labeo rohita* reared for 60 days.

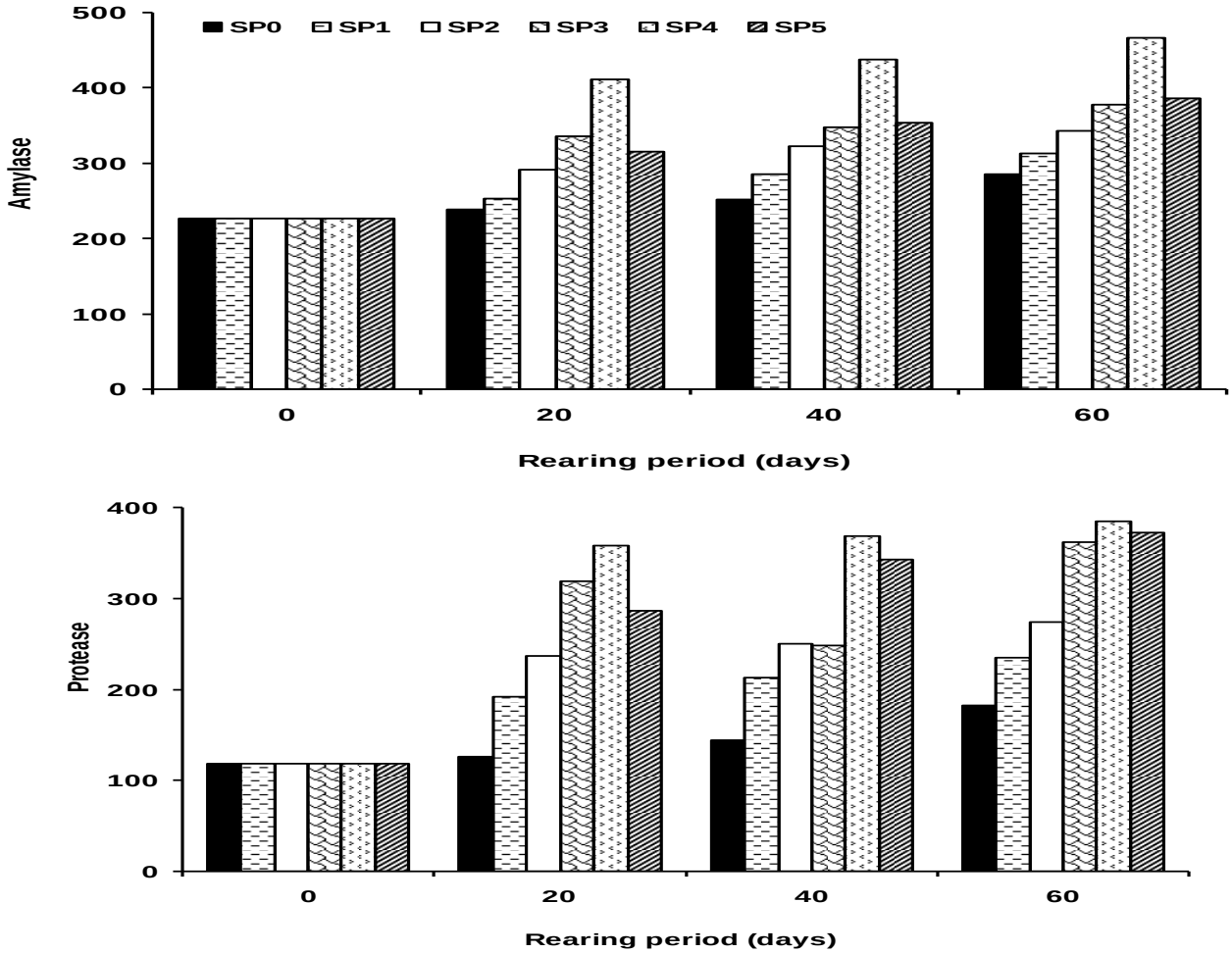

Figure 2. Effect of partial replacement of fish meal with Silkworm pupae meal diet on amylase and protease in *Labeo rohita* reared for 60 days.

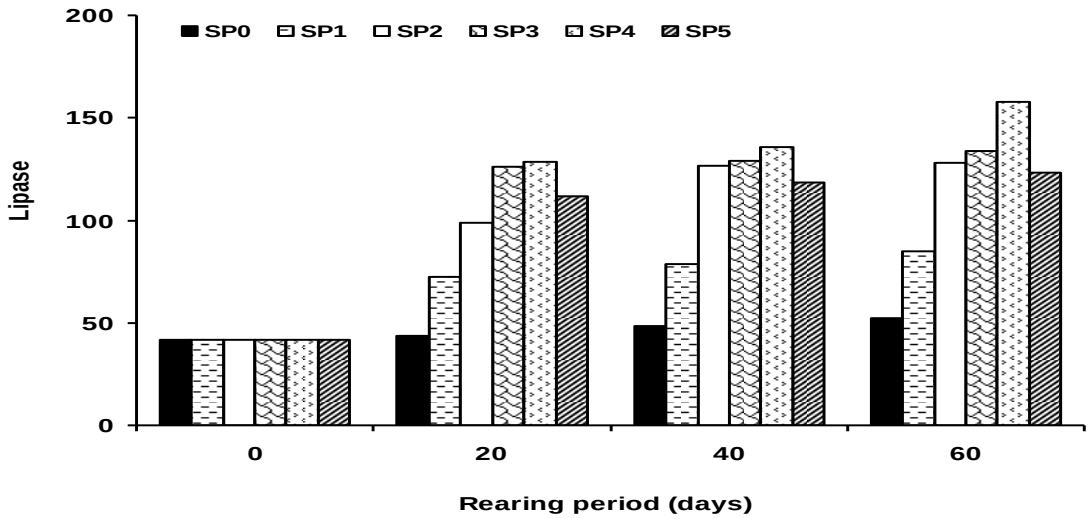

Figure 3. Effect of partial replacement of fish meal with Silkworm pupae meal diet on lipase in *Labeo rohita* reared for 60 days.

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