



Effect of Aquatic Weed *Ulva Rigida* on Growth and Proximate Composition of Sailfin Molly, *Poecilia latipinna*

Felicitta J^{1*}, Sornaraj.R¹

1. Dept of Advanced Zoology and Biotechnology, Kamaraj college, Tuticorin- 628003

ABSTRACT

The impact of different concentrations (5, 10, 15 and 20%) of the seaweed, *Ulva rigida* on the growth performances and proximate composition on *Poecilia latipinna* was examined. Better growth performances in terms of weight gain, FCR, SGR, ADG and RWG were recorded in E2 (10%) *Ulva rigida* group. Beyond that concentration, the growth started declining. As far as the body composition was considered, E2 showed the highest and significantly different ($p < 0.05$) protein content. There was no significant difference ($p > 0.05$) in the carbohydrate and lipid levels among the groups.

Key words: *Ulva rigida*, growth performances, proximate composition, *Poecilia latipinna*.

*Corresponding Author Email: drjfelicita@gmail.com

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INTRODUCTION

Ornamental fish keeping is one of the most popular hobbies in the world today. The growing interest in aquarium fishes has resulted in the stable increase in aquarium fish trade globally. An estimated trade with a turnover of 5 billion US\$ and an annual growth rate of 8 percent offer a lot of scope for its development¹. The ornamental fish trade earns foreign exchange, besides serving as a source of employment. It has a significant role in the economy of developed and developing countries. Three of the top 10 species of ornamental fishes imported into the USA are viviparous Cyprinodontids of the family Poeciliidae. In India Poeciliids account for fifty percent of the market share in ornamental fishes^{2,3}. The live bearing *Poecilia latipinna*⁴, commonly known, as the Sailfin molly is a popular ornamental fish bred commercially in many countries, including tropical India⁵. In view of its hardy nature and ease of breeding in simple holding facilities, this fish is highly recommended for beginners in ornamental fish breeding. The feed cost makes up the highest proportion (approximately 60%) of an intensive aquaculture production regimen. Nutritionally balanced fish feeds generally contain fishmeal, soy products meal and wheat meal. The fish meal has traditionally been used as a major ingredient in commercial aquatic feeds as the most important source of protein. However, fish meal is an expensive feed ingredient and the supplies often vary unpredictably because of overfishing or large-scale transient oceanic changes. The rising cost of fish feed worldwide necessitates the consideration of every possible natural resource as a potential ingredient in aqua-feed preparation. Investigations for cheaper alternative feedstuffs as protein and energy source for fish diets have become a priority in order to produce low-cost pelleted feeds available for the small-scale aqua farmers both in developed and developing countries. Algae meals are plant feedstuffs that are increasingly being used in aqua feeds because of their nutritional quality, lower cost and availability⁶. Wong and Cheung⁷, stated that high protein level and balanced amino acid profile of seaweeds appeared to be an interesting potential source of plant food proteins. Moreover, Basemir, *et al.*⁸ and Nakagawa and Montgomery⁹ reported that macro algal lipids contain a wide variety of fatty acids, including long chain polyunsaturated important to neural function and health. Although algae represent the World's third-largest aquaculture crop behind finfishes and molluscs¹⁰, few of the algae used for human food and many have been studied for their possible use as feed additives for fish. For instance, sea lettuce, *Ulva* are available as fish feed supplements¹¹. Fishes exhibit large variations in their biochemical compositions among each other and among different body parts. The proximate composition of fish is of paramount

importance in relation to nutritive value and physiological condition¹². The biochemical composition of an individual fish is the result of interactions between physical and biological factors like size, sex, temperature, feed availability and reproductive stage¹³. In the present study an attempt was made to investigate the effect of a Seaweed, *Ulva rigida* on growth, survival and proximate composition of *P.latipinna*.

MATERIALS AND METHOD

Preparation of sea weed meal

The sea weed, *Ulva rigida* was collected from coastal areas of Hare island. This species was chosen because of its abundance, distribution and proximity of areas. *Ulva rigida* samples were thoroughly washed with sea water, dried at 40° C and then ground to powder.

Experimental design

The experimental fish of Sailfin molly (*Poecilia latipinna*) of uniform size group (0.357 ± 0.1 g) were purchased from a Jude's aquarium, Tuticorin and were acclimatized to laboratory conditions for one week before the start of the experiment. The experiments were conducted for a period of 30 days and were carried out in 15 plastic troughs of 20 liter capacity. Triplicates were maintained. The weight gain of the fishes were weekly calculated and recorded. For the present investigation, the feed was prepared in the form of dry pellets. The experimental diets composed of the basic ingredients like fish meal, corn flour, soy bean meal, rice bran, wheat meal, sunflower oil and multivitamin (Table.1). Using the ingredients, diet with 40% protein was prepared using the square method. A dough was made by mixing all the ingredients with water and the pellets were produced by using pelletizer. Four types of feed were prepared using different concentration (5,10, 15 and 20%) of *Ulva rigidameal*.

E1 diet	-	5% <i>Ulva rigida</i>
E2 diet	-	10% <i>Ulva rigida</i>
E3 diet	-	15% <i>Ulva rigida</i>
E4 diet	-	20% <i>Ulva rigida</i>

The Control diet was devoid of sea weed. The prepared feed were provided two times daily (9.00am and 4.00pm) to the experimental fish. The unfed was collected from the tank and partial water exchange was done daily.

Growth performance

The Fish growth performance in terms of Weight gain (WG,%), Specific growth rate (SGR), Feed conversion ratio(FCR) was determined using the formulae given below:

- Weight Gain = Final Weight – Initial Weight
- FCR = Feed Intake (g) / Weight gain (g)
- SGR = Log Final Weight – Log Initial Weight X 100 / Number of days
- Average Daily Growth = Final Weight – Initial Weight / Number of days
- Percentage Weight Gain = Final Weight – Initial Weight X 100/ Initial Weight

Table 1: Feed formulation of Control and Experimental feed

Feed ingredients (g/100g)	C	E1 (5%)	E2 (10%)	E3 (15%)	E4 (20%)
<i>Ulva rigida</i>	-	5	10	15	20
Fish meal	35	35	35	35	35
Corn flour	12	12	12	12	12
Soybean flour	10	10	10	10	10
Rice bran	5	5	5	5	5
Wheat meal	34	29	24	19	14
Sunflower oil	2	2	2	2	2
Multi vitamin	2	2	2	2	2

Estimation of proximate composition

The carcass protein, carbohydrate and lipid were estimated based on Lowry *et al.*¹⁴, Dubois¹⁵ and Bradgon¹⁶ respectively.

Statistical Analysis

The data on growth, feed conservation rates and carcass composition of fish were expressed as Mean with S.D. Data from each experimental diet were analyzed by One-Way ANOVA at 5% level of significance and Tukey's post hoc test.

RESULTS AND DISCUSSION

The Survival rate of Sailfin molly remained high, ranging between 96 and 99 % in the experiment without a significant difference ($p > 0.05$) among the treatment groups (Table 2). The fish mortality was less than 4% for the duration of the experiment. The highest weight gain (0.553 ± 0.05) was observed in fish fed with E2 (10% *Ulva rigida*) diet and it was followed by the fish fed with E1 (5% *Ulva rigida*) diet (0.450 ± 0.03). The decreased growth was reported in E3 (15% *Ulva rigida*) and E4 (20% *Ulva rigida*) diets. The best SGR (1.341 ± 0.04) was recorded in E2 (Table 2) was significantly ($p < 0.05$) different from the rest of the experimental groups. The rate of SGR started decreasing thereafter. Significantly different FCR 0.545 ± 0.04 and 0.691 ± 0.06 were recorded in E2 and E1 respectively. In relation to ADG and RWG E2 showed significantly ($p < 0.05$) different values. The highest ADG and RWG values were recorded in E2 and it was 0.018 ± 0.01 and 152.6 ± 4.27 respectively. In this study, growth performance of fish

was tended to decrease with an increase in algae meal concentration beyond 10% inclusion level. The growth rates recorded in this experiment for groups fed the diets supplemented with various levels of *Ulva* meal were in accordance with the findings of Mensi *et al.*,¹⁷ who fed *Oreochromis niloticus* fry a 30% dietary protein containing 9% and 18% *Ulva* meal for 45 days. These results were similar to previous studies of black sea bream (*Acanthopagrus schlegeli*)¹⁸ and snakehead (*Channa striatus*)¹⁹. Wassef *et al.*,²⁰ contrarily indicated that the best weight gain in striped mullet (*Mugil cephalus*) was obtained with a diet including 20% *Ulva*. The present study indicated that 5% to 10% dietary *Ulva* supplementation enhances the growth rate, but the determination of optimal supplementation level depends on both the *Ulva* and fish species. The highest protein content 19.24 ± 1.14 recorded in E2, was significantly ($p < 0.05$) different from control and other experimental groups (Table.3). As far as lipid content of *P. latipinna* was concerned, the rate was decreasing from E1 to E4 and the highest value was recorded in the initial (6.72 ± 0.15). The highest ash content (4.32 ± 0.12) was reported in E1 (5% *Ulva rigida*). Protein content in the present study increased gradually with increasing *Ulva* level in the diet. This agrees with the results obtained by Elmorshedy²¹ with gray mullet, protein content increased significantly with increasing seaweeds level *Ulva sp* up to 28% in the fish diet. The lipid and carbohydrate contents in fish body shows that there were no significant differences among treatments ($P > 0.05$). Fish maintained at 10% *Ulva* level in the diet get significantly the highest lipid value. These results are nearly similar with what Diler *et al.*²² found for common carp at the level of 15% *Ulva* meal in the diet. The quality of fish in terms of higher weight gain could capture attention of fish producers by inclusion of *Ulva* meal at the concentration of 10% in *P. latipinna*. The fibre content blocks the access of digestive enzymes and affecting the utilization of nutrients^{23,24}. Since the diet material *Ulva rigida* is rich in fiber, the other essential nutrients in the diet were unable to be absorbed by the fish in higher concentration levels of the diet and this may be the reason for the decreased growth performance of fish beyond 10% inclusion level of *Ulva rigida*.

Table 2: Effect of fish fed with *Ulva rigida* on growth performances of fish fed with control and experimental diets. Each value is the Mean (X±SD) of three observations

Treatments	Initial Weight (g)	Final Weight (g)	Weight Gain (g)	FCR	SGR (%)	Average Daily Growth (g)	RWG (%)	Survival Rate (%)
C	0.357 ± 0.06	0.719 ± 0.05	0.362 ± 0.04^c	0.691 ± 0.06^d	1.183 ± 0.09^b	0.011 ± 0.009	90.1 ± 2.13^c	97
E1 (5%)	0.354 ± 0	0.804 ± 0	0.450 ± 0	0.545 ± 0	1.341 ± 0	0.015 ± 0	127.3 ± 3	98

	.07	.06	03 ^b	04 ^c	04 ^a	008	17 ^b	
E2	0361±0.	0.914±0	0.553±0.	0.921±0.	0.996±0.	0.018±0.	152.6±4.	99
(10%)	04	.05	05 ^a	03 ^b	06 ^c	01	27 ^a	
E3	0.349±0	0.694±0	0.345±0.	0.886±0.	0.945±0.	0.011±0.	97.4±2.3	97
(15%)	.05	.04	06 ^c	06 ^b	04 ^c	01	6 ^c	
E4	0.348±0	0.581±0	0.233±0.	1.303±0.	0.741±0.	0.007±0.	66.0±1.2	96
(20%)	.04	.05	05 ^d	09 ^a	05 ^d	004	9 ^d	

The values with different superscripts in the same column are significantly different (p<0.05).

Table 3: Effect of different concentrations of *Ulva rigida* on body composition (%) of *Poecilia latipinna*. Each value is the Mean (X±SD) of three observations

Component	Initial	C	E1 (5%)	E2 (10%)	E3 (15%)	E4 (20%)
Protein	16.27±1.23 ^c	17.04±0.95 ^b	17.89±1.02 ^b	19.24±1.14 ^a	18.16±1.13 ^a	18.05±0.67 ^b
Lipid	6.72±0.15 ^a	6.23±0.21 ^a	6.13±0.05 ^a	6.01±0.08 ^a	5.84±0.09 ^a	5.32±0.03 ^a
Carbohydrate	4.11±0.09 ^a	4.14±0.23 ^a	4.32±0.12 ^a	4.18±0.23 ^a	4.12±0.17 ^a	3.92±0.21 ^a

The values with different superscripts in the same row are significantly different (p<0.05).

CONCLUSION

Now a days, seaweeds are gaining importance as a fish feed. *Ulva rigida* is one of the seaweeds which is very cheap and easily available. The 10% *Ulva rigida* meal showed better growth performances in terms of weight gain, average daily growth, relative weight gain, SGR and FCR and higher protein content in the fish. Hence 10% *Ulva rigida* meal is recommended for *P.latipinna* to get better growth performances and protein content in the carcass.

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