Article

Effect of different temperatures on food consumption of juveniles shrimp *Metapenaeus affinis* (H. Milne Edwards, 1837)

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Abstract

This study is based on rearing of juveniles of the shrimp *Metapenaeus affinis* collected from shatt Al-Ararb in Garmmat Ali river. The period of juveniles existence during the study was found extend from November to July in 2008. During the catch and the transportation of shrimps from the field to laboratory in rearing ponds. Several essential experiments were conducted aiming to understand the feeding habit and food preference of juveniles. Three temperatures were tested (15, 20 and 25 °C) for food consumption. In both cases (i.e. the live food *Artemia franciscana* and the artificial diet), the food consumption was highest at 25 °C. However, direct increase was found between temperatures and food consumption at this temperature. The elementary canal fullness and was excretion at the three temperatures was examined too. The time (minutes) was found to be shorter when shrimps feed on *A. franciscana* (live food) compared with the artificial diet, the value were 51.4 - 194.15 for *A. franciscana* between 15 °C and 25 °C, while were 56.6 - 202.05 for artificial diet at similar that temperatures.

Keywords *Metapenaeus affinis*; different temperatures; food consumption; juveniles shrimp.

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1 Introduction

The type of *Metapenaeus affinis* extends to the inland waters of the Shatt al-Arab and the marshes where it is hunted and displayed on the markets. Also, there are two species of flocks, one of which is from Iraqi inland waters and the other from the coastal mud bottoms of the northern Arabian Gulf. It has two breeding seasons in the spring. Fishing in autumn, and its members enter the nets in spring (Ali, 1997). The shrimp larvae feed on microbial and animal microorganisms, while adolescents and adults feed on their omnivorous diet, including various plant and animal foods from plant flora, worms, small crustaceans and small nests (Anderson, 1966; Wickings and Beard, 1978). Food sources are identified in the stomach *M. affinis* Most of the organic crumbs were found to be 72-100% (Su and Liao, 1984).

Nutrition is a key element in the success of any aquaculture project and a good shrimp feed program gives the highest growth. Food ingredients include protein, carbohydrates, fats, vitamins and minerals. Food that is made up of the optimum shrimp needs is one of the reasons for successful pond culture. Dietary requirements differ among different species. For example, diets for diets require high protein and fat content, compared with the species of alkalinity and herbal nutrition (Takeuchi and Murakami, 2007). The cost of food is high in intensive farming systems and half the intensity of shrimp and fish, accounting for half or more of the cost of farming (Pascual and Bandonil, 1977). Protein requirements vary in additional foods for banyan family members. In some species, 27-57% are: *Metapenaeus macleay* 27%, *Litopenaeus vanname* 38-40% and *Penaeus monodon* 35-50% and *Metapenaeus monoceros* 55% and *Marsupenaeus japonicus* 40-57% (Allan and Smith, 1998).

Fodder industry is one of the most important factors in the establishment of aquaculture farms. Fodder is important for any shrimp farm, whether intensive or semi-intensive. Shrimp is characterized by high protein intake in its diet compared to other animals. Protein is influenced by several factors, Its source and quantity, and the animal's ability to use other nutrients as a source of energy (Al-Daqour, 1985).Most shrimp do not prefer floating foods and prefer submersible food. Float foods are expensive because of their high processing costs but are more beneficial for farmers. They can directly observe food intensities and adjust daily food rates, both in high or low feeding rates, to achieve the highest growth and optimum utilization of food. Different sizes and food of a very small size leads to inefficient feeding by spending too much energy to find it and more consumption of food, while the large-size diet causes lack of nutrition and eventually the occurrence of a case of suffocation (Craig and Helfrich, 2002).

The aim of the study is determine the best temperature at which food is consumed by shrimp, as well as to identify which shrimp prefer live food or artificial food during that best temperature.

2 Materials and Methods

Juveniles of shrimp were collected from the small canals in Garmmat Ali river of the Shatt al-Arab dredging from November to July in 2008, using the Dredge bulldozer at a distance of 55 × 50 × 30 cm, which was made locally and consisted of a metal frame surrounded by a metal latch Mm, connected by a rope length of 25 m and throw the bulldozer for a distance of 3 m and pull and isolate juveniles shrimp *M. affinis* depending on the color of transparent and swimming and the shape of her body. While the *Artemia* was collected from the pond water in the Indian houses-Basrah using a hand net and placed in a 20 liter plastic container and when it was delivered to the laboratory, it was placed in an experiment ponds.

It was made to feed juveniles of shrimps depending on the general grounds they were given in Chow (1984) (fish meal, soybean meal, flour, rice bran, vitamins and minerals) was chosen for its abundance, ease of manufacturing, food balance and its ingredients and substitutes available in local markets. And used Local maize substitute forRice bran, and the proportions of each component were based on dry weight.

The experiments were carried out at three levels of heat (15, 20 and 25 °C). Three replicates each were distributed at 5 ppm. These experiments were carried out on two types of food: live food and industrial food, the first time to catch the larvae and the first time to fill the digestive tract Whether the shrimp continues to feed when its gut is filled or not and determines the time of replenishment after release. The amount of food consumed, the metabolic rate and the efficiency of metabolism were measured on the basis of dry weight. For this purpose, a container system was used for 5 ponds (500 ml for each one) purchased from the local market and equipped with air by a ventilator. Water temperature was recorded using mercury.

2.1 Metabolic calculations

By both metabolism and intake of food based on dry weight and metabolic efficiency depending on Crisp(1984):

Metabolism (mg) = dry weight of food consumed (mg) - dry weight of wastes (mg).

Dry weight of food consumed (mg) = Primary dry weight (mg) - Dry weight of residual food (mg) at the end of the experiment.

Efficacy of metabolism (%) = (average dry weight of food consumed - average dry weight of wastes / dry weight ratio of food consumed) x 100.

2.2 Statistical analysis

Results were statistically analyzed using SPSS.StatisticalPakage Social Science, Version 16 of 2007, and tested the factors studied using the least significant difference L.S.D and below the level of 0.01.

3 Results

3.1 Metabolism

The highest values of dry weight for food consumed by young girls feeding on *Artemia* and larvae were recorded at 25 °C and lowest at 15 °C when placed in 500 mL space. And the adolescents consumed the largest amount of *Artemia*compared to the amount of consumption of the diet, while the waste from the young children fed on *Artemia* less than those fed on the diet in different heat bikes (15, 20 and 25 °C). When comparing the values of the representation of adolescents fed on *Artemia* to those fed on the diet at different temperatures, it was found that their values were higher in *Artemia*compared to the diet (74, 77, 84, 18, 22.5 and 28), respectively. It has also been observed that shrimps continue to feed even when the digestive tract is full and the waste is released.

The results of the statistical analysis showed significant differences ($p<0.01$) between the dry weight of the food consumed and the food remaining by the young girls fed on *Artemia* and lactation during different temperatures. And no significant differences ($p>0.01$) in the amount of excreted waste from young children fed on *Artemia* and larvae during different temperatures (Table 1).

Table 1 Metabolism, metabolic efficiency (%) and dry weight of the food consumed (mg) juveniles of shrimp (Number of juvenile= 20), fed on two types of food, *Artemia* and lactation under the influence of different temperatures (15, 20 and 25 °C).

Efficacy of metabolism (%)	Metabolism (mg)	Extruded waste	average dry weight of food consumed (mg)	Remaining food (mg)	Tem. (° C)	Pri. food weight (mg)	Type of food
94.87	74.0	5±4[a]	4.1±78.0[a]	4±12.0[a]	15	90	***Artemia***
92.77	77.0	5±6[a]	4.7±83.0[b]	5±7.0[b]	20		
93.33	84.0	5±6[a]	0.0±90.0[c]	0.0±0.0[c]	25		
69.23	18.0	4±8[a]	3.2±26.0[a]	3±20.0[a]	15	46	**Diet**
67.16	22.5	11±11[a]	5.5±33.5[b]	6±13.0[b]	20		
70.00	28.0	4±12[a]	5.0±40.0[c]	5±6.0[c]	25		

3.2 Effect of temperature on feeding juveniles of shrimp

Table 2 shows the effect of three different temperature levels (15, 20 and 25 °C) on the predation time for food and the fullness of the stomach and the appearance of the residues of the shrimps feeding on the *Artemia* and the larvae, and the minimum time for fertilization, fullness and release at 25 °C, while the longest time at

15 °C For both treatments. The results of the statistical analysis showed no significant differences ($p>0.01$) between the different temperatures of each type of food at the time of predation, while no significant differences ($p>0.01$) were found between the temperature of 20 °C and 25 °C which recorded significant differences ($p<0.01$) with the heat at 15 °C at the time of the filling of the stomach and the time of the appearance of the litter of juveniles of shrimp feeding on *Artemia* and observed significant differences ($p<0.01$) between the three temperatures at the time of filling the preparation and the time of the appearance of waste on the feeds fed on the diet.

Table 2 The time of prey and fullness of the stomach and the appearance of the wastes of *M. Affinis* (Number of juvenile= 20) with a length of 3.5 - 4.0 cm and feeding on *Artemia* and larvae at different temperatures(mean ± standard deviation).

Time appearance of the wastes(minutes)	**Time of fullness of the stomach (minutes)**	**First prey (minutes)**	**Temperature (° C)**	**Type of food**
83.05±194.15[a]	83.11±191.65[a]	5.19± 6.45[a]	15	*Artemia*
12.52±62.90[b]	12.41±60.90[b]	2.74±3.60[a]	20	
9,36±53.80[bc]	9.35±51.40[bc]	2.27±2.00[a]	25	
25.07±202.05[a]	24.52±198.85[a]	4.16±5.85[a]	15	Diet
43.81±120.00[b]	43.57±117.10[b]	5.86±7.20[a]	20	
8.50±58.65[c]	8.58±56.60[c]	3.94±4.70[a]	25	

4 Discussion

The larvae of the Penaeid were given in different stages of their life efficacy of metabolism In the early stages of plant nutrition, there was a lack of metabolic efficiency compared to subsequent stages of nutritious nutrition (Kurmaly et al., 1989; Jones et al., 1993). The values and efficiency of inertia in invertebrates may vary depending on the type of food, the quality of nutrition, the size of the animal, sex, sexual maturity and temperature (Grodzinski et al., 1975).

The current study showed that shrimp *M. affinis* consumed and represented a greater amount of *Artemia* than was consumed by the food of the blackberry, reflecting the preference of shrimp for live food, and the values of the metabolism of shrimp feeding on *Artemia*was higher than in the diet (74; 77; 84) (18; 22.5; 28), respectively. These values were correlated with different temperatures (15, 20 and 25 °C), with the highest values at the highest temperature of 25 °C, indicating a positive relationship between the efficiency of metabolism and the optimum temperature for the feeding of shrimp.

The values of metabolic efficiency were high in the various degrees of temperature, but were higher in the *Artemia* (94.87; 92.77; 93.33)%, than in the diet (69.23, 67.16 and 70.0)%, which corresponded to the results of Paul and Fuji (1989) who found the values of metabolic efficiency of *Chionoecetes bairdi* cancer more than 90%. The results of the current study of the adolescents fed on *Artemia* are not consistent with the results obtained by Kurmaly et al. (1989). The results of the efficacy of *Elamenopsiskempi*, which feeds on two types of food, were 69.47%, slightly higher than the vegetarian diet, 65.7% (Doncan and Kleowiski, 1975), which agreed with the results of the study the current of the feeding on the feed. The current study confirmed that shrimp shampoos continue to feed when the digestive tract is full because it feeds and releases waste at the same time.

Water temperature is one of the most important factors affecting the feeding and consumption of shrimp (Van Wyk et al., 1999). The current study showed that the best thermal temperature suitable for the feeding of shrimps was at 25 °C, which is an approach to the optimal thermal level of food consumption (27-31 m) for shrimp *L. vannamei* (Van Wyk et al., 1999).

The juveniles of shrimp feeding times have been reported to be a little nutritious on the diet at different temperatures, due to the nature of the shrimp feed, the type of feed, and the type of food. While the gut-feeding times of the animals feeding on *Artemia* and elixir were close at 25 °C and close at 20 °C to feed on much less *Artemia* than feeding on the diet, while the gastrointestinal times increased at 20 and 15 °C respectively for adolescents fed on *Artemia* The time of litter release was associated with the times of gut filling due to the short time between the first fullness of the channel and the first release of the waste was between 2 - 4 minutes. Several studies confirmed that the lower the water temperature than the appropriate limits for shrimp growth, Consumer and food waste at hand, and therefore less growth (Wyban, 1995; Wasielesky, 1999, 2000).

While Wong et al. (1993) There is a significant correlation between consumer food and both the growth and survival of the shrimp *Metapenaeus ensis*. The difference between food and *Artemia* is the ease and speed of digestion of *Artemia* compared with the difficulty of digesting the cellulose found in the diet, which is found in soybean and wheat germ. The digestion factor may also be reduced to 15% due to the cohesion of the ingredients of the diet (Kumlu, 1999; Abi-Ayad and Kestmont, 1994).

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