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Effects of Different Feeding Percent on Growth Indices and Survival of Oriental River Prawn *Macrobrachium nipponense* (De Haan, 1849)

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ABSTRACT

This study was carried out in accordance with identification of efficient feeding percent in fostering *Macrobrachium nipponense*. According to this study, 135 prawns, Macrobrachium nipponense with mean weight about 1.40±0.11 g were collected and randomly distributed in 9 tanks with 3 groups and 3 replicates. The first group prawns, with feeding 2% during a day, second group prawns with feeding 3% during a day and third group prawns with feeding 3% during a day were fed during 4 weeks. The value of definite food for each group was on average 2% of body weight during a day that was divided into number of feeding. Finally, prawns were weighed and weight growth, Feed Conversion Ratio, survival rate, special growth rate were calculated for each group. Results indicate utility of feeding 2% during a day (third group) that has a significant difference with other groups.

Key words: Feeding percent, oriental river prawn, fostering prawn, growth indices

INTRODUCTION

During the last centuries, some anatomical descriptions were published over intestinal tract of crustaceans, that performance complexity of specific organs related to feeding process of crustacean specimens was evaluated in current study. Furthermore, this kind of animals was considered just in a few cases such as magnitude and variability of crustaceans subcategories, where initial studies have been conducted in the field of intestinal tract physiology of initial crustaceans, knowledge basis and today's understandings. Hence, in recent years, global accessibility to these studies wasn't possible. Study increased in the case of prawns feeding needs by studying and analyzing economic specimens over last decades, but the basic study was not carried out and comparative physiology is considered as main policy of zoologists and Biologists. These analyzes were restricted into studies in the course of digest physiology and enzyme biology in aquaculture. After initial descriptions in accordance with prawns feeding, prawns and their transmittals were considered, since the subject of this study was related to *Macrobrachium nipponense* (Wickins and Lee, 2008).

The oriental river prawns are one of the fresh water prawns belong to *Macrobrachium* that have been reported for the first time in Golestan Rivers at 2008. It exists in some puddles and north east and west rivers. This species have been observed in Japan and China for a long time, but then were reported in Hong Kong, Vietnam, Singapore and Philippines. Aquaculture was always been cared in China that annually more than 15000 aquatics were produced in this country. This specie spawns easily in fresh water and passes short larval stage (Kutty, 2005).

One of the important factors in growth and survival of aquatics such as fresh water prawn is to receiving protein, especially in larval stage. Furthermore some studies have been conducted in the course of feeding and effects of protein on other species, which belongs to *Macrobrachium*, that

the oriental river prawn also belongs to *Macrobrachium*. The information of this species is limited because the history of aquaculture and the importance of oriental river prawns development have been passed less than one decade (New, 2005).

Determining the efficient level of protein in prawn diet is necessary for efficient usage and decrease of costs. Overall use of protein leads to decrease of protein efficiency and irrational increase of diet costs and finally increase of Ammonium in environment leads to decrease of water quality. On other hand the fewer rate of necessary protein avoids producing new fibers and results in growth disturbance (Zhang *et al.*, 2008).

However, fresh water prawns with diet oriented vegetables use fewer protein than other prawns. But yet it has not been determined and is not related to feeding needs of oriental river prawns adapted with North Rivers. In accordance with acceleration into young prawn growth and its growth criteria, an evaluation has been carried out on effects of different levels of protein on diets. In accordance with weather conditions of regions, necessarily more studies should be done on energizing nutrients of this species that a commercial and rational formulation for aquaculture has been achieved (Salman *et al.*, 2006).

Production costs are always accounted as main share in total costs of fostering. The rate of daily feeding percent is the key factor of effective feeding management in growth and feed conversion ratio (De Silva and Anderson, 1995).

Information proposes that the rate of foods and efficient feeding percent are determined for different amounts and different environmental condition such as body weight of prawns and density and quality of water that proper strategies on water quality can be effective in health and increase of prawns feeding percent (Burford and Williams, 2001).

The feeding percent technology and its amounts have so complex instruments, but its technology and generally food management in most countries were remained constant (Nunes and Suresh, 2001). On other hand, the determination of proper feeding percent that result in efficient growth and foods usage can decrease diets and lead to decrease of efficiency (Carvalho and Nunes, 2006).

Hence, qualitative factors of water will be effective in stability of food, thus the period that foods have physical stability in water is attractive for prawns. So, the feeding percent and its numbers are adjusted that even by wasting foods stability, its amounts can supply some prawn needs and have no significant effect on growth and growth quality of prawns. Otherwise after decrease of food quality, the possibility of using it by prawns will be fewer and finally have negative effects on growth (D'Abramo and Sheen, 1994).

Little information exist in order that efficient conditions of broiler fostering, needs of food and proper feeding especially in larval and breeding stages that these limit the development of prawn growth in future. The commercial production, effective and efficient require feeding with best diet and cheaper combinations is effective and also necessary for proper growth and lowest rate of FCR (New, 1995).

Prawn species in accordance with their fast growth in Iran, efficient quality of meat and its coordination with palate of human society are so important that this specie requires high values of protein in order that broiler diets. The protein is accounted as a necessary material for growth and maintenance. Hence, different information has not been provided in order that needs and growth and fostering indices of Oriental River prawn. In order that fostering of *Acipenser stellatus*, results earned by experts have been used in order that other species during fostering period by diet with 40% of protein, 13-15% of fatness, 13.5% of carbohydrates, 1% fiber, 9.5% ash and 5 kcal energy (Coyle *et al.*, 2004).

Results of practical evaluations indicate that determination of proper and efficient value is necessary in order that maximum growth and more efficiency. The rate of body metabolism and growth of fishes is affected by water temperature. Hence efficient foods are different in different water temperature. The knowledge of prawn food needs and correct management of fostering and by adjusting needs with weather conditions of region are the major issues in fosterage. It is necessary that the important factor was not individually for proper production and economic efficiency of growth, furthermore equal growth of population means more economic efficiency (Tidwell *et al.*, 1993).

Evaluations into increase of body weight rate, special growth rate and food efficiency in fostering period are the most reasons for proper performance of growth in lower feeding percent. Prawn growth and feed conversion ratio are affected by different factors such as food quality, its consumption and water temperature. The efficiency of using food in some cases depends on correctness of food adjustment and the discipline of feeding and feeding technology. The feeding is not over and over economic and biological because it leads to wasting foods and decrease of water quality. The lower values of foods lead to decrease of production and higher values of foods lead to water pollution and disease occurrence that for solving them, other costs are required. Controlling the prawn foods, used slightly at bottom of the tank is difficult. The food plays an important role in aqua fosterage and production and consists 50% of costs. An evaluation into food cost indices indicates that increase of feeding has no effects on economic efficiency. On other word, proper diets with harmful feeding percent, decrease production and damages prawn health (Akiyama and Dominy, 1989; Yamasaki-Granados *et al.*, 2012).

Analyzes indicate that development of proliferation and fostering performances of south cities of Iran, especially Hormozgan had a significant growth that the rate of producing fosterage prawn in this city had got from 0.8 t in 1992 with cultivation level of 2.5 ha to 1200 t in 200 with cultivation level of 668 ha. In order to growth of prawn in north cities of Iran, any attention has been paid to fresh water resources that were used for development of aquaculture industry of fresh water prawns from Palaemon family (Sadek *et al.*, 2002).

A main challenge in commercial industry of aquaculture is efficiency for formulated diets for improving the growth and increase of prawn health that different factors can be effective in prawn efficiency, but decrease of death or pathogens is the important factor that should be considered. Experts believe that the increase of efficiency for prawn production depends on diet formulation and energetic foods (proteins etc.).

MATERIALS AND METHODS

This study was carried out in proliferation and fostering hall of Natural Resources department of Guilan University. The 9 cube-shaped tanks were provided with dimension of 38×26×18 and each tank was filled by 17 L of fresh and dechlorinates water. Each 5 days, 50% of waters were changed for the withdrawal of the remaining waste. Within each tank, an air stone has been set that was connected to air pump and aerates. Inside tanks, PVC pipe part were set there as a hideout.

The oriental river prawns are collected from Siahdarvishan River, Sowme'eh Sara were transferred to department hall in efficient conditions. After compatibility with conditions of hall water, they were transferred to tanks with a volume of 30 L and were kept about 48 h without feeding for discharge of intestinal tract. After this, 3 river prawns with mean weight of 3.8±0.11 g were randomly released into each tank.

The water temperature in each period was 18°C. The growth factors like Weight Growth or absolute growth (WG), Feed Conversion Ratio (FCR), Survival Rate (SR) and Special Growth Rate (SGR) were calculated by followed equation:

$$\text{Weight growth (WG)} = \text{Final weight (g)-Initial weight (g)}$$

$$\text{Survival rate (SR)} = \frac{\text{Final numbers}}{\text{Initial numbers}} \times 100$$

$$\text{Feed Conversion Ratio (FCR)} = \frac{\text{Amount of dried foods (g)}}{\text{Amount of wet meat (g)}}$$

$$\text{Special Growth Rate (SGR)} = \frac{\text{Log}_n \text{ final weight-Log}_n \text{ initial weight}}{\text{Fostering time}}$$

The used food in this study that has been made in aqua feeding laboratory of Natural Resource Department of Guilan University consist 30.4% of fish meal, 55% of soy flour, 6% of wheat flour, 4% of cornstarch, 2% of vitamin supplements (multi vitamins, amine acid), 2% of mineral supplements (with commercial name of Aras Mineravit), 0.1% of Vitamin C (with commercial name of Aras Aquavit C) and 0.5% of Calcium phosphate (that helps prawns shell building). For building food, at first the soy flour and cornstarch were passed from 500 μm sieve and then they were used for diets.

After sifting soy flour and cornstarch, they were combined with other elements of food that were considered above. During combining, the big particles of oyster from fish meal were separated by hand then after combining components into a bucket some waters were added to the combination and were combined by hand. Then, after combining, the combinations were passed from a meat grinder and were put into a tray and were left there till became dry then the food was put in room temperature then after weighting, it was packed.

Three groups were considered for testing the rate of feeding percent of oriental river prawn that each group consist 3 replicates. In each group, a definite biomass was kept. The average of biomass in each replicate was 11.15 and each group was feed in accordance with the percent of body weight (mean weight 2%). For determining the feeding percent, 3 groups and 2 replicates were in experiment design that in first group, 2 times a day and second group, 3 times a day and third group, 4 times a day were feed:

- First group: 8 am-6 Sunset (1%)
- Second group: 8 am-12 pm-6 Sunset (2%)
- Third group: 8 am-12 pm-6 Sunset-8 pm (3%)

The total value of calculated food for each group in one day divided on numbers of feeding. For feeding, the value of definite food was set into Petri Dish and was released into water tank. The Petri Dish can be placed in proper locations and the food was slightly released into water of Petri Dish that the food was fallen into Petri Dish because of its weight. By this method the waste foods were collected and were placed into proper location that become dry and then were weighed and then were separated from total value, this data provides correct values of used food by prawns that was used into calculations of Feed Conversion Ratio. After 4 weeks, prawns of each group and each replicate were weighed and the related calculations were carried out.

Statistical analysis: Analyzing of data was carried out by SPSS (version, 16) the normality of data was investigated with Kolmogorov-Smirnov test. One-way analysis of variance (One way-ANOVA) was used to compare the means of groups data and EXCEL 2007 software that all the Weight Growth (WG), Feed Conversion Ratio (FCR), Survival Rate (SR), Special Growth Rate (SGR) were calculated for each group.

RESULTS AND DISCUSSION

Confirm the results of studies (Fig. 1, 2) in order to decrease water temperature and finally, decrease feeding percent. Results indicate that the efficiency of interactions and as a result the need of oxygen and feeding of specie were decreased (Cheng *et al.*, 2003).

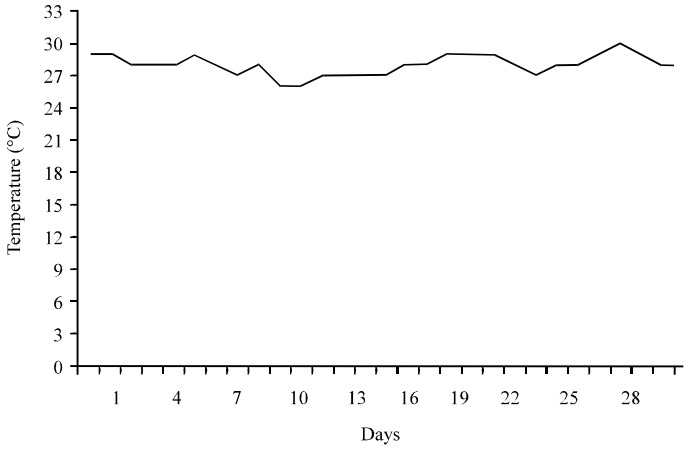

Fig. 1: Daily changes of water temperature into tanks during experiment. no significant changes were observed in water temperature. So, this factor has no significant effect on experiment results and physiology of prawn food

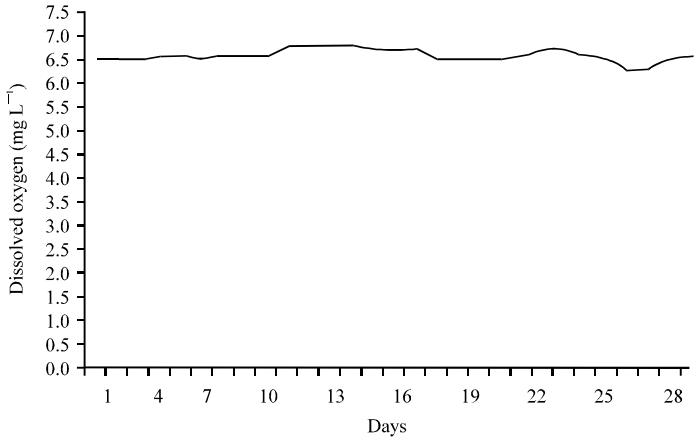

Fig. 2: Daily changes of dissolved oxygen into tanks during experiment. no significant changes were observed in Dissolved oxygen. So, this factor has no significant effect on experiment results and physiology of prawn food

Hence, the consumption of food and water was not accounted as economic factor but the rate of feeding and consumption water will decrease by decrease of water temperature, even in some cases the need of water will decrease 4 or 5 times. Furthermore the above results are related to L (Koksal *et al.*, 1998), which is in order that Sturgeon species and describes that the rate of feeding decreases by decrease of water temperature.

In accordance with identical fosterage conditions, in addition to consuming foods in third and fourth groups does not lead to growth increase and probably was excreted without any absorptions. in this specie, increase of feeding percent causes in excitation of searching performances and increases the food consumption (D'Abramo and Sheen, 1994).

Furthermore, the above results are relate to (Kaushik and Medale, 1994), indicates that the standard of longitudinal changes factor is more than 6% and weighted factor is more than 20% that the increase from this value, indicates harmful fosterage and feeding conditions. Because the effects of external factors increase the changes factor and finally individual reactions of prawns indicates effects. In contrast to this issue indicates that there is no negative effect of hostel diets on prawn growth.

The higher values of growth were happened definitely in prawns that have proper rate of foods (Fig. 3) (Second group, in First stage of fostering and First group, in Second stage of fostering). The high efficiency of foods in different conditions of temperature in Phil Fish indicates that the probability of wasting foods is low, even if food level will be a little more than the rate of food. In current study by decrease of temperature, the rate of food effectiveness on growth of prawn decreases because metabolism energy will decrease in this time. By analyzing the values of WG, SGR, FCR in second stage of fostering was indicated that the lower rate of FCR related to first group that has a significant difference with other groups except second one (Fig. 4) ($p<0.05$).

Furthermore, the above group has the higher value of WG, SGR, FCR and lower rate of food cost indices was consumption and Feed Conversion Ratio. By analyzing the values of WG, SGR, FCR in second stage of fostering (Fig. 3-6) was indicated that the lower rate of FCR related to second group that has a significant difference with other groups. On other hand the above group

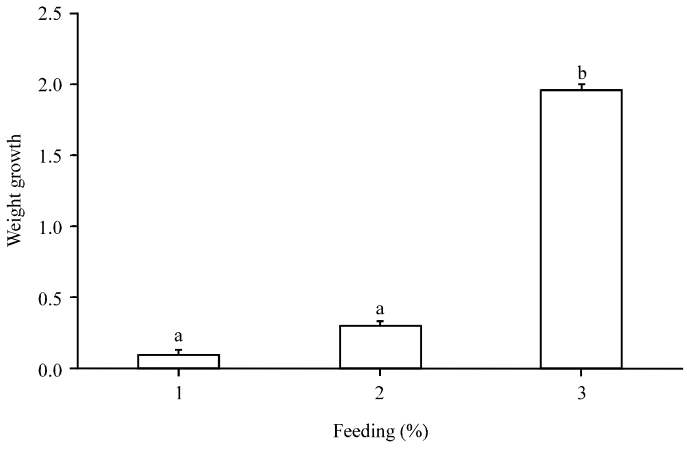

Fig. 3: Average of weight growth (g) of oriental river prawn (*Macrobrachium nipponense*) in different groups (by different feeding percent). Columns with different name have significant difference ($p<0.05$)

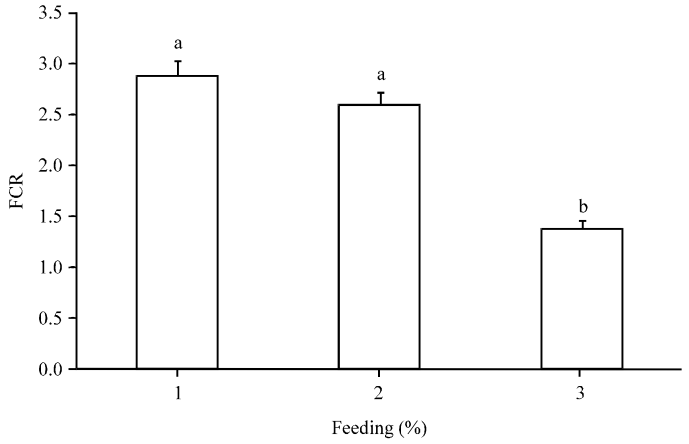

Fig. 4: Average of feed conversion ratio of oriental river prawn (*Macrobrachium nipponense*) in different groups (by different feeding percent). Columns with different name have significant difference ($p<0.05$)

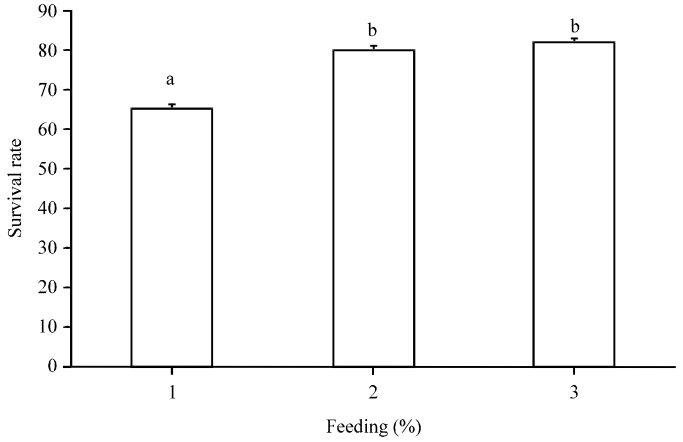

Fig. 5: Average of survival rate percentage of oriental river prawn (*Macrobrachium nipponense*) in different groups (by different feeding percent). Columns with different name have significant difference ($p<0.05$)

has the most rate of WG, SGR and then has the lower rate of consumption in feed conversion ratio that in this stage the first group is better than other feeding groups. Increase of feeding percent causes in excitation of searching performances and increases the food consumption.

By increasing the feeding in next groups, the above factors will be decreased. Furthermore when the feeding is lower than the proper level, these factors will be decreased ($p<0.05$).

In current studies, prawns that were feed by harmful percent have lower growth and survival in system and furthermore in analyzing of growth results, food groups 1 and 2 have been observed in fosterage stage than other groups that in addition to increase the growth by higher feeding percent (third group) the weight stage in these groups is more than first and second groups (Fig. 1). It can say that the wrong selection of quantitative and qualitative food combinations in accordance with food needs of prawn can lead to individual differences in weight and number of

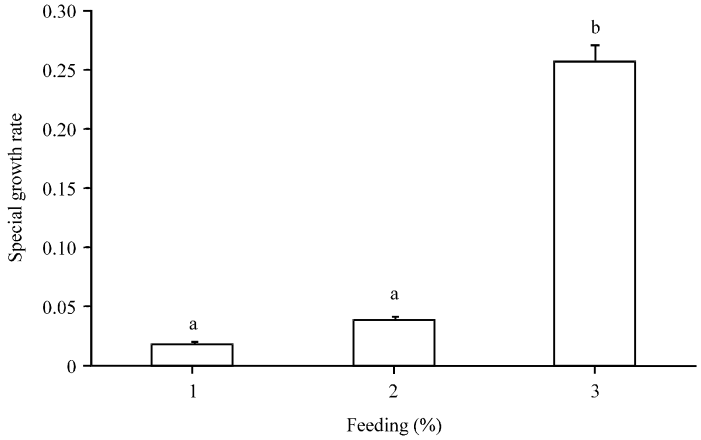

Fig. 6: Average of special growth rate of oriental river prawn (*Macrobrachium nipponense*) in different groups (by different feeding percent). Columns with different name have significant difference ($p<0.05$)

prawns, sometimes wasting foods and finally pollution of fosterage tanks and decrease of production efficiency. The effects of diet rate and feeding percent on *Macrobrachium nipponense* were generally evaluated and results indicate that prawns with 3% of feeding during a day have more velocity in growth than prawns with 1% of feeding during a day and generally the increase of feeding percent from 1-3% has a significant effect on growth of prawn survival by changing diets and the rate of growth has been increased in this prawns (Fig. 2).

The results indicate that *Macrobrachium nipponense* have a fast growth when they use prepared foods with higher values of feeding percent (3%). Furthermore indicates that the prawns in different groups grew with different rates. Furthermore other important factors of growth that environmentally will be effective such as temperature and oxygen have no significant effects on prawn growth. On other hand, just growth increases from 1% of feeding to 3%, that indicates the increase of feeding percent and value of foods will lead to increase of growth rate.

REFERENCES

Akiyama, D.M. and W.G. Dominy, 1989. Penaeid Shrimp Nutrition for the Commercial Feed Industry. Vol. 1, American Soybean Association, St. Louis, MO., pp: 198-203.

Burford, M.A. and K.C. Williams, 2001. The fate of nitrogenous waste from shrimp feeding. Aquaculture, 198: 79-93.

Carvalho, E.A. and A.J. Nunes, 2006. Effects of feeding frequency on feed leaching loss and grow-out patterns of the white shrimp *Litopenaeus vannamei* fed under a diurnal feeding regime in pond enclosures. Aquaculture, 252: 494-502.

Cheng, W., S.M. Chen, F.I. Wang, P.I. Hsu, C.H. Liu and J.C. Chen, 2003. Effects of temperature, pH, salinity and ammonia on the phagocytic activity and clearance efficiency of giant freshwater prawn *Macrobrachium rosenbergii* to *Lactococcus garvieae*. Aquaculture, 219: 111-121.

Coyle, S.D., R.M. Durborow and J.H. Tidwell, 2004. Anesthetics in aquaculture. Southern Regional Aquaculture Center Publication No. 3900, November 2004, pp: 1-6.

D'Abramo, L.R. and S.S. Sheen, 1994. Nutritional requirements, feed formulation and feeding practices for intensive culture of the freshwater prawn *Macrobrachium rosenbergii*. Rev. Fish. Sci., 2: 1-21.

De Silva, S.S. and T.A. Anderson, 1995. Fish Nutrition in Aquaculture. Springer Science and Business Media, London, UK., ISBN-13: 9780412550300, pp: 31-37.

Kaushik, S.J. and F. Medale, 1994. Energy requirements, utilization and dietary supply to salmonids. Aquaculture, 124: 81-97.

Koksal, G., F. Rad and M. Kindir, 1998. Growth performance and feed conversion efficiency of siberian sturgeon juveniles (*Acipenser baeri*) reared in concrete raceways. Proceedings of the 1st International Symposium on Fisheries and Ecology, September 2-4, 1998, Trabzon, Turkey, pp: 216-223.

Kutty, M.N., 2005. Towards sustainable freshwater prawn aquaculture-lessons from shrimp farming, with special reference to India. Aquacult. Res., 36: 255-263.

New, M.B., 1995. Status of freshwater prawn farming: A review. Aquacult. Res., 26: 1-54.

New, M.B., 2005. Freshwater prawn farming: Global status, recent research and a glance at the future. Aquacult. Res., 36: 210-230.

Nunes, A.J. and A.V. Suresh, 2001. Feeding tray technique improves shrimp feed management in Brazil. Global Aquacult. Advocate, 4: 23-26.

Sadek, S., R. Rafael, M. Shakouri, G. Rafomanana, F.L. Ribeiro and J. Clay, 2002. Shrimp aquaculture in Africa and the Middle East: The current reality and trends for the future. Report Prepared under the World Bank, NACA, WWF and FAO Consortium Program on Shrimp Farming and the Environment, Published by the Consortium, pp: 1-42.

Salman, S.D., T.J. Page, M.D. Naser and A.A.G. Yasser, 2006. The invasion of *Macrobrachium nipponense* (De Haan, 1849)(Caridea: Palaemonidae) into the southern Iraqi marshes. Aquat. Invasions, 1: 109-115.

Tidwell, J.H., C.D. Webster, D.H. Yancey and L.R. D'Abramo, 1993. Partial and total replacement of fish meal with soybean meal and distillers' by-products in diets for pond culture of the freshwater prawn (*Macrobrachium rosenbergii*). Aquaculture, 118: 119-130.

Wickins, J.F. and D.O.C. Lee, 2008. Crustacean Farming: Ranching and Culture. 2nd Edn., John Wiley and Sons, New York, USA., ISBN-13: 9780470995075, Pages: 464.

Yamasaki-Granados, S., M. Ruiz-Fregozo, F. Vega-Villasante, L.D. Espinosa-Chaurand, E. Cortes-Jacinto and M. Garcia-Guerrero, 2012. Contributions to the biology of molting and growth of the Longarm river prawn *Macrobrachium tenellum* (Decapoda: Paleamonidae) in mexico. Arch. Biol. Sci., 64: 651-658.

Zhang, L.Y., J.Y. Ye, Y.H. Wang, J.L. Guo and J.M. Chen *et al*., 2008. Effects of dietary protein levels on growth of oriental river prawn *Macrobrachium nipponense*. J. Shanghai Fish. Univ., 6: 668-673.