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-Research Paper-

Intensive culture of *Artemia urmiana* in semi-flow through system feeding on Algae *Dunaliella* and Wheat bran

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Abstract

Artemia is a tiny crustacean that lives in salty lakes. *Artemia urmiana* is one of the important species of it. Its high nutritional values and various forms with many applications have caused this creature to be considered as the most valuable live food for the cultured aquatic animals. Current research was carried out in order to find out the bio-technique for intensive culture of *Artemia* with semi-flow through system using unicellular algae (*Dunaliella*) and wheat bran as food source. The tanks inoculated with 5000 newly hatched *Artemia* larvae/liter. *Artemia* were harvested for 14 days. The average production of live *Artemia* in each three tanks reached to 7116.7 g. The mean length of *Artemia* in the last day of culture period was 4.09 mm and mean survival rate 42 percent. It was concluded that partial removal of waste material from culture medium helps in higher production rate of live biomass.

Key word: *Artemia urmiana*, *Dunaliella*, Urmia Lake, survival, growth.

Introduction:

The expansion of aquatic industry in world, need to provide the suitable food for aquatics in the different stages of grow up. *Artemia* is a valuable alive food and in addition the natural habitation in all around the world, the solid, concreted and Poli Etilinic pool that made artificially was produced. Urmia lake *Artemia* for the first time has reported by Günter in 1900, and in 1976 has named *Artemia urmiana* by Bowen and Clark (Günter, R.T. 1900).

Depending upon the objectives and the opportunities, different culture procedures for superintensive *Artemia* production may be applied. The final selection of one or other type of installation will be subject to local conditions, production needs and investment possibilities. However, two basic options are: should water be renewed (open flow-through) or not. Furthermore, in the latter case, should a particular water treatment be applied (closed flowthrough) or not (stagnant or batch system). Obviously there are all kinds of transition types ranging from open flow-through with 0% recirculation to closed flow-through with 100% recirculation. In reality, even at complete recirculation, a small part of the

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culture water must be regularly renewed. The culture system should be designed in such a way that the water quality can be maintained as optimal as possible. This means that the concentration of particles and soluble metabolites should remain minimal as to prevent toxicity problems, proliferation of microorganisms and interferences with the filter-feeding apparatus of the brine shrimp.(Lavens and Sorgeloss1996)

A very simple semi flow-through system has been developed by Dhert et al. (1992). The system does not require the use of feeding pumps and involves minimal care. This technique involves minimal sophistication and appears to be very predictable in production yields which are between those obtained in batch and flow-through systems (Lavens and Sorgeloss1996). Undoubtedly yield best culture results but rarely available in sufficient amounts at a reasonable cost. As such the mass culture of suitable algae for *Artemia* is not economically realistic, so their use can only be considered in those places where the algal production is an additional feature of the main activity. Moreover, not all species of unicellular algae are considered suitable for sustaining *Artemia* growth (d'Agostino, 1980).Non-soluble waste products from agricultural crops or from the food-processing industry (e.g. rice bran, corn bran, soybean pellets, lactoserum) appear to be a very suitable feed source for the high-density culture of *Artemia* (Dobbeleir et al., 1980). The main advantages of these products are their low cost and universal global availability.

Current research was carried out in order to find out the bio-technique for intensive culture of *Artemia urmiana* with semi-flow through system using unicellular algae (*Dunaliella)* and wheat bran as food source.

Materials and methods:

Three cubes tankers with 1000 liter capacity used for *Artemia* culturing. Circulation of water in the tankers is achieved through AWL (Air Water Lift) aeration system around a glass wall dividing the tanker incompletely into left and right sides. Maximum new hatched nauplii are incubated per litter. the temperature water tanker was preserve and controlled with several heaters which located inside the tankers the must be between 26 upto 28° C. filter is one of the most important part of system in semi-flow through system , because of this 3 inch PVC pipe cut with the length of 60 cm and then separate the middle side of the. Instead of these pipes we set nylon filter (100,150, 250μ) that connected to the end of them. Aeration has been done in the filter. The wheat barn powders pour in 35 ppt water and then pass it from the 50 micrometer sieve. Food solution prepared every day then transferred to the tankers 2 times. Thus in each time at first we poured 1 liter *Dunallila tertiolecta* algae (with 18 million accumulation in liter).for each cultivation tanker and then feeding has been done with wheat bran, this act continued up to water transparency remain between 20 up to 25 cm. every day the amount of water (300 liter) filtered before feeding in 2 time and replaced with the neat water. Circumstance factors (temperature, oxygen and pH), measured and controlled every day. *Artemia* cultured for 2 weeks and at the end of period the water of tanker, was passing from 400 microns sieve and all the *Artemia* preyed and collected. Sampling was done from the each tanker every 2 days for determining the survival percentage and *Artemia* growth.

Result:

The obtained results, from the survey of length growth of *Artemia* and survival percentage, shows that with increasing of culturing days the larva's growth rise (figure,1), and also the percentage of survivors reduced (Figure,2).the measure of dissolved oxygen and pH in water , before and after feeding (0.5 hour before feeding and 0.5,1,2,3,4 hour after feeding) shows that the rate of these two factors after feeding decrease and remain for hours at the low level (Figure 3 and 4). Table 4 shows the amount of produced biomass in 3 tankers and the average of them after culturing period.

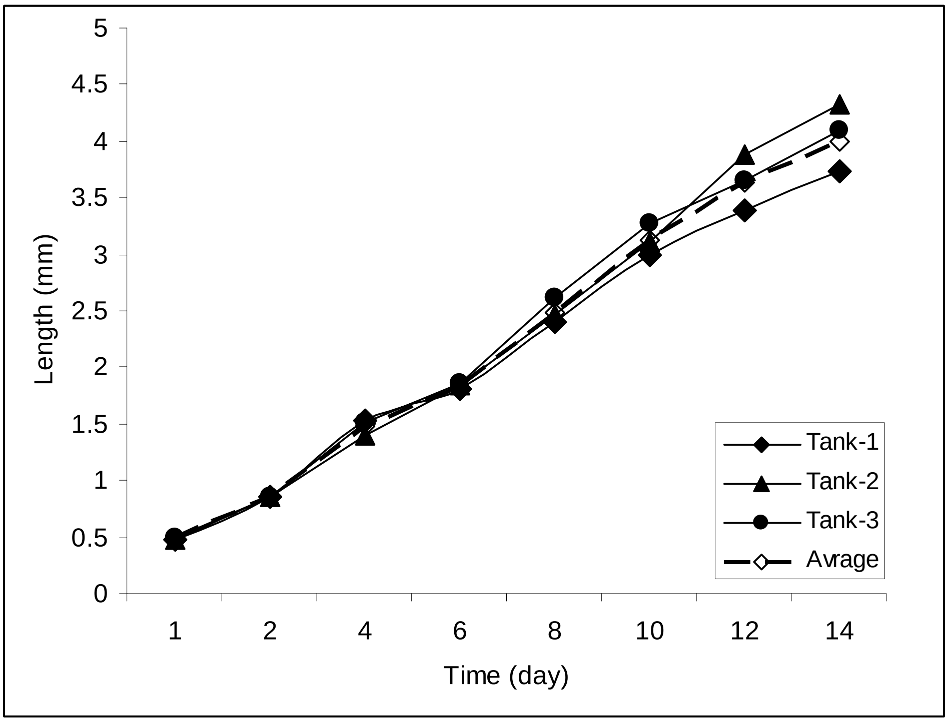

Figure 1: Length of *Artemia* 14 days breeding.

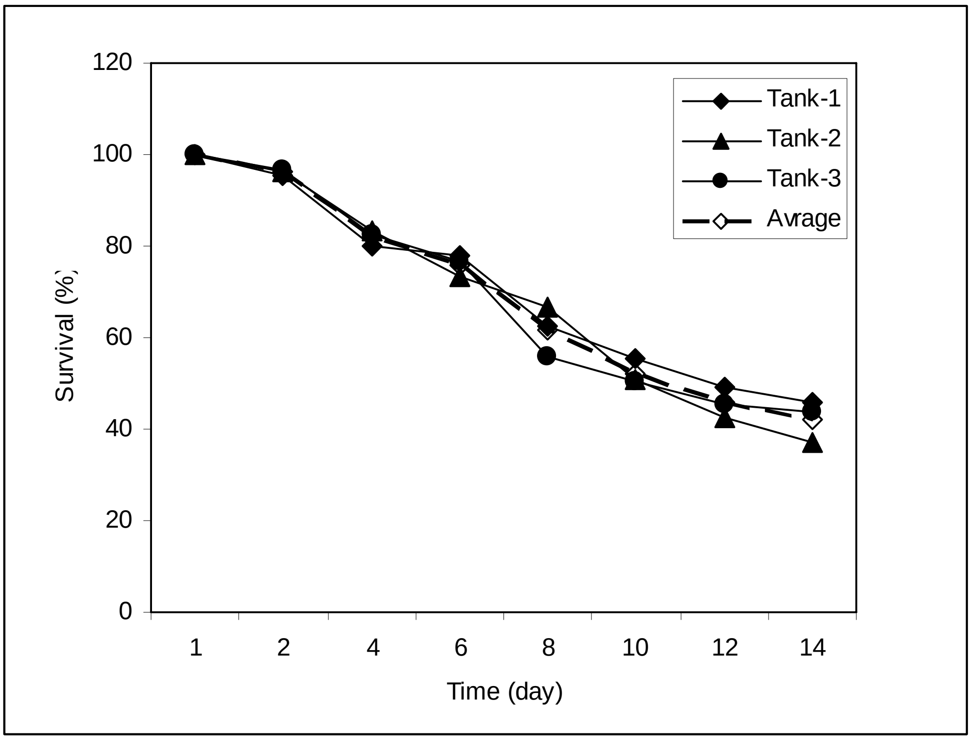

Figure 2: Survival percentage of *Artemia* 14 days breeding.

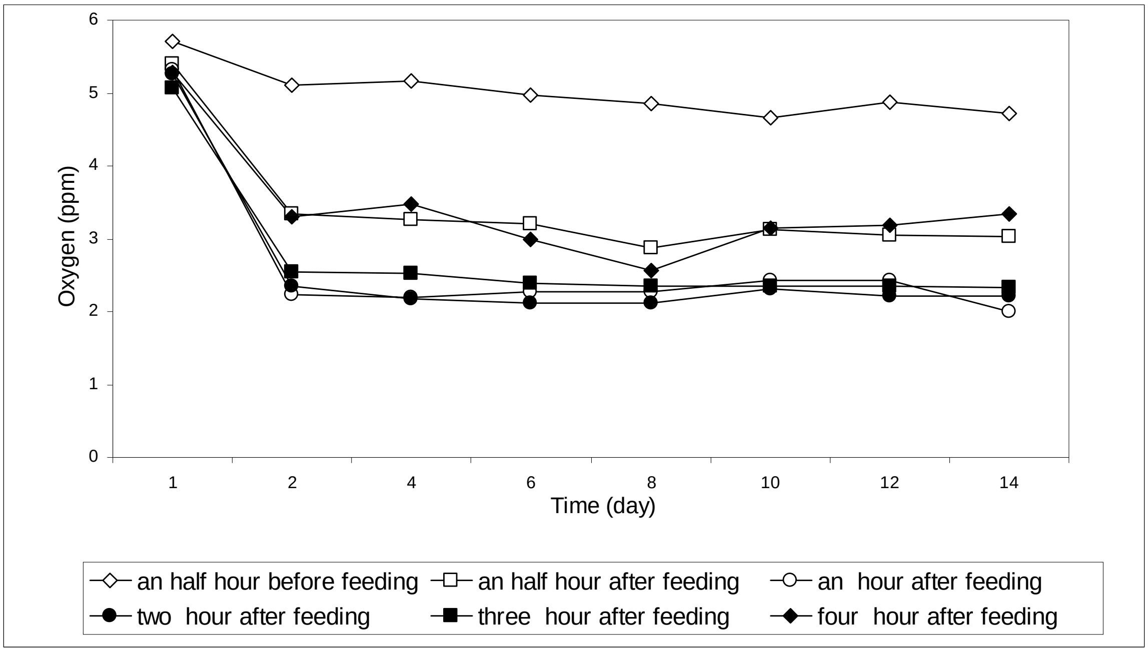

Figure 3: The mean of dissolved oxygen variations before and after feeding time in the tankers during the culturing.

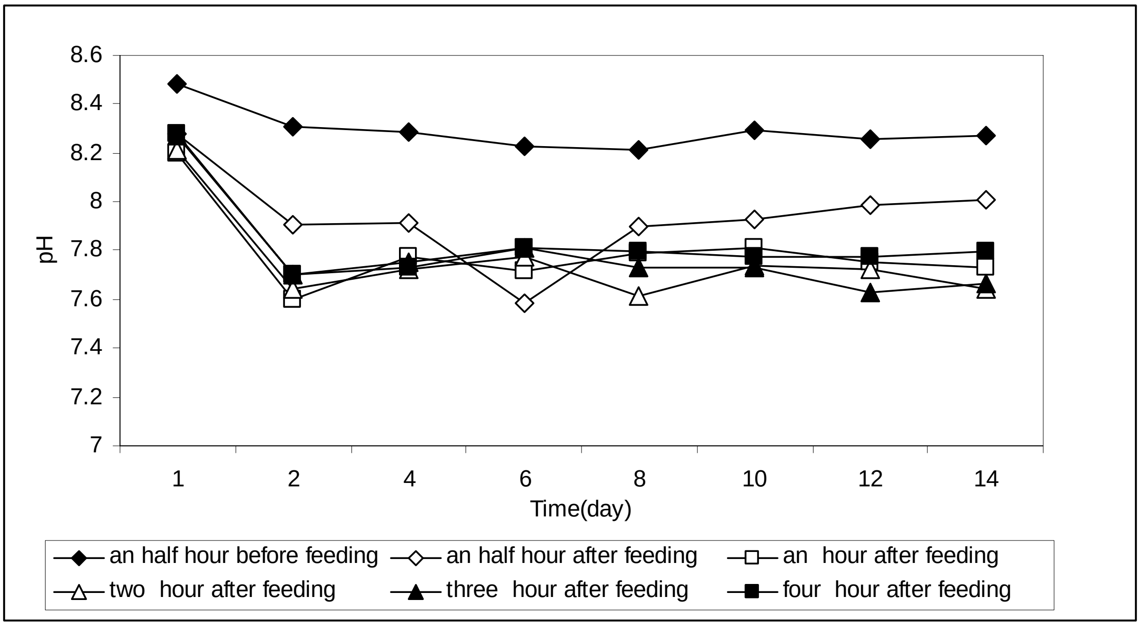

Figure 4: The mean of pH variations before and after feeding time in the tankers during the culturing.

Table 1: The average of produced *Artemia* biomass in three tankers and number of stored and survivor larvae at the end of period.

	number of stored larvae (per liter)	number of larvae at the end of period (per liter)	Period (day)	Total biomass (gr)
tank-1	5000	2290	14	7400
tank-2	5000	1850	14	6800
tank-3	5000	2180	14	7150
Average	5000	2106.67	14	7117.67

Discussion:

Because of the *Artemia* alive mass important for cultivation of different kind of aquatics and also it is impossible to transfer them from the natural habitat to far land , because of these problems a lot of straggle has been done in the world via experts, to produce *Artemia* with high accumulation, in different size and finally in different tankers.

For example in Belgium expert by use of macaroni foods and unicellular algae capable to increase the rate of alive mass of *Artemia* fransiscana in the open – flow system by store 5000 up to 18000 larva in 1 liter with 15.5 up to 25 kg in each cubic meter, in this research the average rate of grow and larva survivor was in order: 6.1 millimeter and 585 Bengtson, et al1991.; Bossuyt and Sorgeloss, 1987.; Dhert et al, 1992,; Lavens and Sorgeloss, 1996). *Artemia* cultivation in Iran and culturing aquatic larvae has started for around two decades , as Azari Takami succeed to cultivation *Artemia urmiana* larvae for sturgeon larvae in 1990 also in 1997 Agh succeed in producing 2 kg alive pile in one tanker with 1000 liter capacity . in the same research Katuk and Agh in one closed system with use of handy food in order to determination the appropriate amount of salt for *Artemia* culturing, they could produced 1.2 kg alive pile of biomass in one tanker with the capacity of 1000 liter. in the continue of this research Tokmachi and Agh in closed circuit system in the same situation could produce 3200 gr *Artemia* alive mass in one cubic meter (Tokmachi, 2003.; Katuk and Agh, 1996) . In this research they use from semi-flow system and cultivated for 14 days in 1000 liter tanker. The obtained result is the maximum growth of *Artemia* is 4.1 millimeter and the percentage of *Artemia* survive is 45.7% and the end of the period 7600 gr biomass was produced. With regard to the decreased and the grow of reducing of accumulation in tankers increased , also this ways influenced in find product of *Artemia* alive mass (1-2 chat).so different factors has effect in reducing the survivor and growth of *Artemia* in the cultivation environment with high accumulation for rising of Nitrogen materials, suspended solid which produced by *Artemia* (cause to reduce the nutrition) *Artemia* growth have a opposite relationship between cultivation environment and accumulation (Lavens and Sorgeloss1996). On the one hand because of the amount of protein in the agriculture wasting(wheat barn), the rate of Ammoniac in the environment increase straggly and it cause *Artemia* growth reduced, specially increase second and third days (1 up to 3 days) (Hanaoka H.1973). Bacteria's (specially Vibrio bacteria's) increasing in the water lake with increasing Nitrogen materials in the environment, and also cause to reproduction these materials, Nitrification cause to decries the oxygen in the environment and this situation caused the competition between *Artemia* and bacterias get more oxygen (chart 2), Decrease the amount of oxygen cause the rate of Ammonia increase and make a poison impression *Artemia*. If the vibrio bacterias has reduced in cultivation water, these bacteria stick to *Artemia* nauplii and completely prevent from them swimming activity.

The pH tends to decrease during the culture period as a result of denitrification processes (Persoon and Sorgeloss,1980) which reduce in cultivation environment with feeding (feeding with wheat bran)(Chart 3), but these reducing is not capable to produce heavy casualty , because *Artemia* naturally live in the neutral to alkaline water.

So with regards to this fact increasing *Artemia* alive mass in the semi-flow through system was distinguished, which changing the one part of culturing environments water , from one side cause to adjustment of pH , from other side cause to decreasing bacterias and also omit Nitrogenic materials from the cultivation environment which this act cause to produce a good and suitable situation for living *Artemia* in the accumulation cultivation system , by using of unicellular algae and agricultural waste cause to (specially wheat bran) as one part of daily food , from one hand cause to rising the biomass of *Artemia* rather close system (completely close system, close system with using of biofilters) in the other hand cause to increase the *Artemia* feeding value and produce less pollution in the cultivation environment.

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