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-Technical Report-

Semi-intensive culture of parthenogenetic population of *Artemia* and *Artemia urmiana* Günther, 1899 (Crustacea: Anostraca) on the fertilized ponds in Fesendooz district (near of Urmia lake, Iran)

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Abstract

To select the suitable *Artemia* populations for culturing and high cysts and biomass production, two populations of local *Artemia* of Urmia Lake and its suburbs (*Artemia urmiana* and parthenogenetic population) were compared. The harvested cysts of each population from Urmia lake and its periphery Lagoons as a treatment hatched and inoculated equally on 2 similar ponds with (0.7 ha) and (0.3 ha) area, on the same time and with same conditions. Also the same management on ponds preparation and inoculation and fertilization was applied to all 4 ponds, finally the cyst production on each pond measured and registries daily during cultural period. The results indicated that the parthenogenetic population of *Artemia* habitat naturally on temporal salty lagoons near of Urmia lake with about 100 kg/ha dry cysts production annually had the better ability to cyst production than the *A. urmiana*, and also they can produce smaller cysts and nauplii. But *Artemia urmiana* on low salinities (about 80 ppt) had higher potential for biomass production about (8-12) ton/ha.

Key Words: Parthenogenetic population, *Artemia urmiana*, Semi-intensive culture, Iran

Introduction

The selection of suitable cultural populations and also breeds to access for higher production on aquaculture is a more important problem (Lavens and Sorgeloos, 1996).

Nowadays *Artemia* culture as a best way to providing valuable live food for shrimps and sturgeon fishes is the main step (Hoa, 2002). Commonly *Artemia* culture needed to providing two basic aims, one of them is providing enough *Artemia* cysts to use on fish and shrimp propagation farms and the second aim is the production great amount of *Artemia* biomass to feed by fish and shrimp culture, therefore the selection of suitable populations of *Artemia* is the most important needs to achievement these targets (Leger *et al.*, 1986).

It is evident that the *Artemia* populations with high level ability to oviviparous reproduction and with large size of cysts and nauplii are preferred to biomass production but on the other hand the *Artemia* populations with high oviparous reproduction and small size of cysts should be selected to cyst production (Sorgeloos, 1988).

The main prospect of this project was the culture of *A. urmiana* and parthenogenetic population with semi intensive cultural system on the fertilized ponds (Lavens and Sorgeloos, 1996) and determines their cysts and biomass yields with analytical methods to find and compare their cultural characteristics.

Materials and Methods

Because the designed *Artemia* culture ponds, only available on special areas with particular characteristics, therefore this study was carried out on Fessendooz district near of Urmia Lake in Miandoab city (IRAN).

Pond preparation

In order to prevent cysts from sticking on water vegetation, and on the pond bottoms herbs, all aquatic herbs on ponds walls and bottom was removed before filling them with water. The water pH measurement of local brines showed that it was lower than 7. Because about 500 kg/ha liming recommended for each 0.1 unit reduction with suitable pH value 7.6-7.8 (Boyd, 1976; Boyd, 1998; Tunsutapanich, 1979) therefore about 5 tons small limestone was spread over the entire bottom per hectare of examined ponds.

Screening of water intake

To intake brines to the examined ponds, first a well with 20m depth was dug with polyethylene rotary system near the ponds, and the underground water (120 ppt salinity) pumped into ponds with a 11 kW and 3 inch floating water pump (pump Iran model 803).

This water pump can normally pump 16lit/sec water from 20m depth. The brine with 120ppt salinity mixed with local drain fresh water to reduce its salinity to 80ppt, and after 2-time filtration with 100mic mesh size net was entered into the ponds.

Ponds fertilization

To prevent from benthic plants and macro-algal growth on the ponds bottom, the fertilization was carried out after filling the ponds with water up to 1 m depth. Then, organic and inorganic fertilizers were dissolved in the water and the mixed suspension was sprayed on the ponds surface.

The used fertilizer was a combination of 60 kg ammonium nitrate and 30 kg ammonium phosphate that dressed to the ponds weekly. After enough algal bloom with green-brown color created and transparency reached to less than 20 cm on the ponds, *Artemia* nauplii was inoculated into the ponds and the fertilization was continued with inorganic fertilizers such as 20 kg sugar cane malloses and 50kg chicken manure suspensions on daily intervals in order to stimulate enough phytoplankton and algal bloom.

Inoculation of *Artemia*

Inoculation of *Artemia* nauplii was carried out after creation of enough algal bloom with transparency of less than 20 cm on fertilized ponds. The inoculation density was 10 nauplii per liter. The quantity of cysts to provide the number of needed nauplii with taking into account % 30 mortality was calculated with regard to the pond volume and the

hatching efficiency of the selected cysts (*A. urmiana* or parthenogenetic population) (Lavens and Sorgeloos, 1984).

The following standard aspects were taken to reach the better results: Temperature 25 ˚C; PH 8; Salinity on hatching medium 32 ppt; Illumination of hatching containers 2000 lux; Cysts density on hatching medium 1g/L; Permanent aeration with compressor.

Finally, about 700 gr *A. urmiana* cysts that were harvested from Urmia Lake and also about 700gr parthenogenetic *Artemia* cysts that was harvested from periphery lagoons of the lake on Fesendooz district were selected. The nauplii emerged from hatched cysts were adapted to ponds ionic and thermal conditions in 300 L tanks before inoculated to the ponds.

Monitoring of environmental conditions and food production in ponds

During the culture period, all environmental factors such as algal bloom (transparency), water temperature, pH, salinity, pond water color, depth were recorded daily. In order to provide suitable environmental conditions on cultural ponds, the *Artemia* population density was estimated weekly.

All the ponds were surrounded by branches and plastic plates on the interface of their walls with water surface either as a wave breaker or to prevent from sticking of *Artemia* cysts on the pond walls.

Treatments and Replications

The presence of two populations of *Artemia* in Urmia Lake was first reported by Sorgeloose in 1989. In this study, these two populations were selected to culture in out-door ponds in similar conditions. The parthenogenetic and *A. urmiana* cysts each were inoculated into two ponds with same areas (i.e. 0.7 ha ponds), and repeated on two another ponds with 0.3 ha area.

Results

During the culture period from the same ponds with 0.7 ha area 20.9 kg dry cysts (per month) was harvested from the ponds inoculated with parthenogenetic *Artemia*. But the 0.7 ha-pond which inoculated with *A. urmiana* only 10.7 kg cysts was harvested. The analysis of daily production on ponds with independent T-test method showed that the difference between daily production means was significant (sig = 0.000).

Similar results were also obtained from two other 0.3 ha ponds so that 12 Kg dry cysts and 6.6 kg cyst was harvested from the pond with parthenogenetic and *A. urmiana* respectively (Tab. 1).

Table1: The cyst production on the studied ponds

Cultural ponds are (ha)	Inoculated population	Dry cysts yield(Kg per month)
0.7	Parthenogenetic population	20.9
0.7	*A. urmiana*	10.7
0.3	Parthenogenetic population	12
0.3	*A. urmiana*	6.6

The results indicated that with very large probability the parthenogenetic population on cultural condition could be produced two times more cysts than the *A. urmiana*. The analysis between 2 treatments on tow 0.3 ha ponds also showed the large difference between the production means (sig = 0.003).

Discussion

On the recent years different opinions propounded about the mode of reproduction and switch the oviviparity to oviparity on *Artemia.* Okazaki and Hegecock (1987) suggested that the decline in cyst production in (Macau, Brazil) may be due to harvesting of cysts leading to a removal of the genotypes predisposed towards oviparity from the lake population. They suggested that cyst production

could possibly be revived by geniculation of the lake with a highly oviparous population.

Also Gajardo and Beardmore (1988) suggested that oviparity in *Artemia franciscana* is under genetic control and is associated with the level of heterozygosity found in the females. The selection a population with high heterozygosity levels should be taken into account for cyst production.

Finally, as mentioned earlier, Sorgeloose (1996) stressed that *Artemia* differed widely in ecological tolerance ranges and characteristics for use in aquaculture. Therefore, the selection of the population best adapted to the particular ecological conditions of the region most suitable to their later applications. Therefore, a population exhibiting maximal growth and high oviviparity should be selected for biomass production. On the other hand, populations that produce small cysts and nauplii should be preferred to cyst production.

The results of this project showed that the parthenogenetic population of *Artemia* habitats on the Salinas near of Urmia lake have the high availability to smaller cysts and nauplii production and can be selected to this purpose on this region. Also, *A. urmiana* habitats on Urmia Lake has very high availability to ovivipareous reproduction on cultural ponds and produces large nauplii and biomass, and can be used for *Artemia* biomass production.

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