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FIRST SUCCESSFUL INOCULATION OF *ARTEMIA* AND PRODUCTION OF CYSTS IN THE COASTAL SALTPANS OF BANGLADESH

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Two experiments were made to introduce production of *Artemia* cysts in the coastal saltpans of Bangladesh. The second attempt gave success for the first time in this country to produce *Artemia* cysts in the coastal saltpans as a byproduct of salt extraction. Field experiment was done between Dec. 1988 and Mar. 1989 on a small plot of land (1000m^2) at Chanua, Banskhali. A total of 517g (dry weight) of cysts and 2.6 tons of salt; i.e. 2.10 kg of dry cysts and 10.83 tons of salt/ha/month were produced.

Key words: *Artemia*, Cyst production, Saltpans.

Introduction

The brine shrimp, *Artemia* is widely used by aquaculturists as an excellent live food for crustacean and fish. It constitutes the principal ration and frequently the only food for the larvae and juveniles of many cultured species, such as freshwater prawns (*Macrobrachium* sp.), shrimps (*Penaeus* sp.), lobsters (*Homarus* sp.), crabs and various finfishes [1-3]. In extreme salinity conditions of earthen saltpans constructed all over the world in the tropical and sub-tropical belt for solar salt extraction only few plant and animal species can live, the most popular organism being the *Artemia* [4].

In Brazil a great potential for commercial scale integrated production of salt + *Artemia* + shrimp production in saltpans has been demonstrated [5]. Now it has been proved that salt extraction and *Artemia* production go hand in hand. In many thousands of hectares of salinas in the tropical and sub-tropical belt, in fact often in climates that favour farming of crustacean and fish, this new type of vertically integrated aquaculture has most interesting prospects. Furthermore, in many developing countries, it can lead to extra income for family size salt operations that often run at limits of profitability [6].

There is a great possibility of *Artemia* culture as a byproduct of salt production in the coastal saltpans of Bangladesh. Favourable environmental conditions do occur at least during the post and pre-monsoon seasons (Nov. - March).

This is an important and most timely needed aspect of research in respect of establishment of prawn, *Macrobrachium rosebergii* and shrimp, *Penaeus monodon* hatcheries. With increasing number of shrimp and other aquaculture oriented industries, the demand of *Artemia* is rising. Thus local production of *Artemia* will be very lucrative especially in view of costly importation.

Although successful attempts have already been made to produce cysts in different countries of South-East Asia having no natural population of *Artemia* by inoculation in existing or renovated evaporation ponds of salt works [7,8], no such attempt has yet been made in our coastal saltpans except the present endeavour. Earlier, two indoor laboratory scale rearing experiments were done [9,10]. Periodic and cyclic culture of *Artemia* in the normally empty evaporation compartments of the salt works will tend to enhance utilization of the available space and provide additional source of income for the saltpan operators. The main objective of this venture is to find ways and means to introduce production of *Artemia* cysts in our coastal salt pans atleast for local consumption, to utilize the existing salinas to the maximum, and to gain experience in culture of *Artemia* outside our laboratories.

Materials and Methods

The experiment was scheduled to be completed within the dry period of the year (Nov. - Mar.). Field preparations were started in Dec. 1988, on a small plot of land (1000 m^2) owned by a private salt production farm at Chanua, Banskhali (Fig. 1); where a reservoir, two *Artemia* production ponds (45 m^2 each) and a series of evaporation compartments were constructed (Fig. 2) On Jan. 1, seawater of 28%. was pumped in the reservoir, gradually passed through the evaporation compartment to the *Artemia* production ponds (App) where salinity concentration of about 55%. was attained on 8th Jan. This water was fertilized by adding urea and dry chicken manure at the rate of 180g and 3.6 kg respectively in each pond at start, followed by weekly replenishment at the rate of 45 g and 900 g respectively. 30 Grams of *Artemia* cysts (Great salt lake brand) were put in a container and 3 litres of seawater (35%) were added with provision of continuous aeration. After 60 hrs of incubation nauplii were inoculated to the APPs. Environmental parameters such as water temperature, dissolved oxygen, salinity and pH were recorded at frequent intervals following standard procedures. Simultaneously samples for estimation of population density (individuals/l),

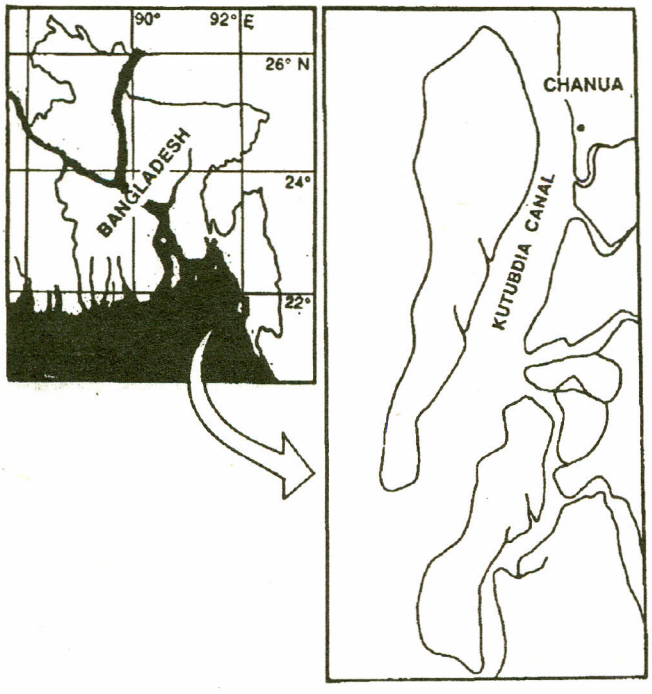

Fig. 1. Geographical location of experimental *Artemia* cyst production ponds in a coastal saltpan of Chanua, Banskhali, Chittagong.

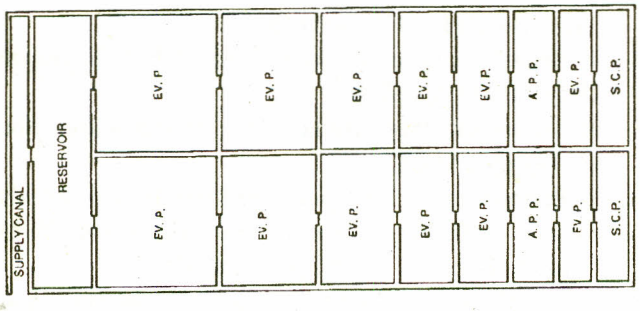

Fig. 2. Layout of experimental *Artemia* cyst production and evaporation ponds (over 1000m²) in the coastal salt producing area of Chanua, Banskhali, Chittagong. (Ev. P. = Evaporation pond, A.P.P. = *Artemia* Production Pond, S.C.P. = Salt crystallisation pond).

and aggregated floating cysts against the cyst barriers were collected. From time to time, concentrated brine from the APPs were drained to the salt crystallisation ponds to produce salt.

Result and Discussion

Average data on environmental parameters of the 2 APPs, and the population density of *Artemia* and cyst harvest records have been shown in Tables 1 and 2 respectively. During this experiment water temperature varied between 17 and 28°, dissolved oxygen between 3 and 6.6 ml/1, the water depth ranged from 22 to 30 cm having an alkaline pH (7.6-7.9). Salinity gradually increased to as high as 120%. A continued and steady increase in population density of *Artemia* is

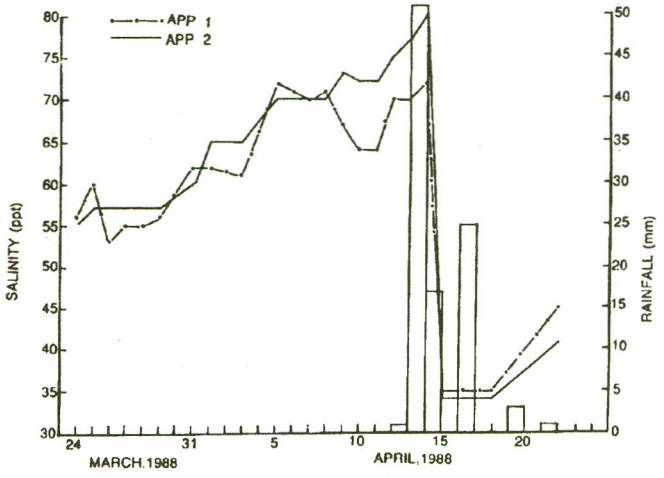

Fig. 3. Effects of rainfall on salinity of two *Artemia* production ponds (APP) during the experimental period [11].

also apparent from the data, highest density (257 individuals/1) was recorded on Mar. 18. Cysts were found to accumulate against the cyst barriers on 27th of Jan. 1989, collection was started on 30th Jan. and continued till Mar. 28. A total of 517 g (dry weight) of cysts and 2600 kgs of common salt; i.e. 2.15 kg of dry cysts and 10.83 tons of salt/ha/month were produced during the course of this experiment.

The two experiments conducted to introduce production of *Artemia* cyst in the coastal saltpans of Bangladesh suggest that the dry period between winter and spring, i.e., from Nov. through Mar. is suitable for culture of *Artemia* . Favourable climatic conditions such as absence of rainfall and presence of high salinity in seawater are useful to create an environment for culture of *Artemia* and production of cysts in the coastal saltpans. In our earlier experiment [11] lowering of salinity in the saltpans following rainfall in Apr., 1988 placed a strong and unmanageable limitation in the way of production of *Artemia* cyst. Since more and more rainfall caused continued lowering of salinity (Fig. 3), the field experiment had to be suspended. Following this path finding failure, the experiment was re-scheduled and designed to start our activities in the beginning of the next winter season, and thus the desired success was attained to produce and harvest *Artemia* cysts.

Although cysts production trial met with success for the first time, some more works remain to be done on performances of different geographical strains of *Artemia* in our climate and soil, nutritional value of local cysts, cyst collection and preservation; and transfer of technology to the farmer level.

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TABLE 1. ENVIRONMENTAL PARAMETERS IN THE EXPERIMENTAL *ARTEMIA* CYST PRODUCTION PONDS DURING PREMONSOON DRY SEASON OF 1989.

Date		Salinity (%)	Water temperature (°C)			Dissolved O_2, (ml/1)				pH	Water depth (cm)
			6 A.M.	12 A.M.	Mean	6 A.M.	12 A.M.	6 P.M.	Mean		
Jan.	16	60	12	22	17	4.0	8.0	7.5	6.5	7.9	22
"	21	87	11	23	17	3.9	7.5	6.6	6.0	–	25
"	23	90	13	22	17.5	4.1	8.8	6.9	6.6	–	–
"	24	81	14	23	18.5	4.8	7.0	5.9	5.9	7.8	–
"	27	85	14	23	18.5	2.0	4.4	3.9	3.4	–	25
"	30	90	13	24	18.5	2.9	4.7	3.9	3.8	–	28
Feb.	2	94	14	28	21.0	3.1	5.5	5.0	4.5	7.8	–
"	7	97	16	29	22.5	2.9	4.1	5.4	4.1	–	–
"	10	98	17	30	23.5	3.0	5.0	4.7	4.2	–	30
"	13	100	18	28	23.0	2.3	4.7	4.3	3.8	7.7	28
"	20	110	22	26	24.0	2.1	5.3	4.2	3.9	–	27
"	28	120	19	31	25.0	1.4	3.5	4.2	3.0	–	–
Mar.	2	120	20	32	26.0	2.9	4.6	3.9	3.8	7.9	
"	6	110	21	33	27.0	1.1	4.1	4.5	3.2	–	25
"	10	110	20	30	25.0	3.0	4.8	4.0	3.9	–	25
"	14	116	21	30	25.5	3.3	5.1	4.2	4.2	7.8	27
"	18	120	19	30	24.5	2.5	5.6	4.1	4.1	–	–
"	22	120	22	34	28.0	3.0	5.5	4.3	4.3	–	–
"	28	118	21	34	27.5	3.7	5.7	4.2	4.5	7.6	25

TABLE 2. *ARTEMIA* DENSITY AND CYST HARVEST RECORD OF THE EXPERIMENTAL PONDS DURING PREMONSOON DRY SEASON OF 1989.

Date		Population density indivs/1	Cyst havrvest	
			Cyst wt.(g)	Dry wt.(g)
Jan.	16	*Nauplii released*	-	-
"	21	25	-	-
"	23	-	-	-
"	24	70	-	-
"	27	-	-	-
"	30	160	43	20
Feb.	2	-	-	26
"	7	210	60	30
"	10	-	79	37
"	13	-	72	35
"	20	227	80	39
"	28	-	80	40
Mar.	2	240	77	38
"	6	-	83	42
"	10	-	81	39
"	14	-	83	40
"	18	257	87	44
"	22	-	101	48
"	28	250	83	39
Total:			1009 g	517 g

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