

NOTES

INFLUENCE OF SALINITY AND TEMPERATURE ON THE HATCHING OF BRINE SHRIMP, *ARTEMIA SALINA* CYSTS

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Cysts of brine shrimp, *Artemia salina* were exposed to different salinities ranging from 5 to 100‰ and different temperatures (20 to 35°C). Maximum hatching occurred at 35‰ salinity and 30°C.

Artemia salina is widely used as food of the larvae of fish, decapod crustaceans, cephalopods and many other invertebrates. All over the world experiments are in progress to mass culture this organism. The principal reason for brine shrimp larvae being so widely used in mariculture is that their culture can be started from an apparently dormant source namely dried eggs which need only to be hatched.

The occurrence of *Artemia salina* was reported for the first time in India from the salt pans at Vadala near Bombay by Kulkarni (1953) and subsequently from the salt pans near Tuticorin on the South Eastern Coast of India (Rayan, 1970). Since these animals occur in large storage tanks as well as in the shallow salt pans, there is every possibility of culturing them in the salt pans around Goa. Before actually trying them in the natural environment, laboratory studies are necessary to determine a few physical and chemical parameters which are conducive to the culture of brine shrimp in salt pans. Hence, in this paper effect of salinity and temperature on the hatching of *Artemia salina* cysts is indicated.

The cysts used in the present experiments were collected from the salt pans of Veppalodai Salt Corporation, Tuticorin. To study the effect of salinity, five replicates of 100 brine shrimp cysts were kept in beakers containing 200 ml of millipore-filtered sea water of different salinities prepared by using the common salt. For temperature studies, ten replicates of 100 cysts were also kept in beakers containing 200 ml of millipore-filtered sea water with a salinity of 35‰ and maintained at different temperatures. From salinity experiments, maximum hatching was found to occur at 35‰, hence this salinity was chosen for the effect of temperature. In both the experiments, the total number of nauplii hatching and the time taken were noted. An incubator was used to maintain different temperatures. Care was taken to see that the cysts were kept well aerated.

Tables 1 and 2 give the results of percentage of hatching and time taken at different salinities and temperatures respectively. It is evident in the present study, that 35‰ was found to be the

most optimum salinity in which maximum hatching occurred. The percentage of hatching and the time taken to hatch showed an increasing trend at salinities ranging from 5‰ to 35‰. At 35‰ maximum hatching (50%) was obtained. No hatching occurred at 75‰, 90‰ and 100‰. Von Hentig (1971) also reported that hatching was optimal at 35‰ and decreased with increasing salinity. Sorgeloos and Persoone (1974) noted

that the ideal hatching conditions are obtained in salinities ranging from 5 to 90‰.

A review of literature shows that the percentage of hatching of brine shrimps varies with different strains. This is very obvious from the work of Sorgeloos (1973) in which the percentage of hatching of the strains from Bulgaria, Utah and California in 35‰ were 40, 73 and 95 respectively.

TABLE I. *Percentage hatching and time taken to hatch at different salinities*

Salinity ‰	Percentage of hatching	Time taken (Hours)
5	19.2	27.00
15	29.0	35.30
25	43.0	36.30
35	50.6	41.00
45	29.0	38.30
55	8.2	39.00
65	2.0	36.00
75	No Hatching	—
90	„	—
100	„	—

TABLE II. *Percentage hatching and time taken for hatching at different temperatures.*

Temperature (°C)	Percentage of hatching	Time taken (Hours)
20	—	—
25	5	96
30	50	41
35	—	—

Royan: Salinity temperature and hatching of brine shrimp

The percentage of hatching of *Artemia* cysts at different temperatures (Table II) showed that 30°C was the optimum temperature at which maximum hatching occurred; 25°C there was only 5% hatching in four days. At 20°C and 35°C there was no hatching even after 7 days. Urbani (1959) gave the optimum hatching temperature as 20°C whereas Boone and Baas Becking (1931) gave it as 30°C. Von Hentig (1971) while working on the Utah (USA) strain, found that maximum hatching was obtained between 20°C and 30°C. However, the hatching rate was faster at 30°C (50% hatching after two days against 50% hatching in three and a half days at 20°C). From these works, it is clear that different

strains of *Artemia* have different optimum temperatures for hatching. This has been also indicated from the experiments of Sorgeloos and Persoone (1974). They reported 50% hatching after 36 hours for the California strain at 28°C, Utah strain at 30°C and the strain of People's Republic of China at 35°C.

From these preliminary studies, it is evident that the Indian strain of *Artemia* cysts requires 35‰ salinity and 30°C for maximum hatching.

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REFERENCES

- Boone, E. and L. G. Baas Becking. 1931. Salt effects on the eggs and nuplii of *Artemia salina* L. *J. gen. Physiol.*, 14: 753-763.
- Kulkarni, C. V. 1953. Occurrence of the Brine Shrimp, *Artemia* sp. in Bombay. *Bombay Nat. Hist. Soc.*, 51 (4): 951.
- Royan, J. P. 1970. Occurrence of *Artemia salina* in Southern India. *Curr. Sci.*, 39 (1): 14.
- Sorgeloos, P. 1973. First report on the triggering effects of light on the hatching mechanism of *Artemia salina*. *Mar. Biol.* 9 (2): 145-182.
- Sorgeloos, P. and G. Persoone. 1974. Technological Improvements for the cultivation of Invertebrates as food for fishes and crustaceans. II. Hatching and culturing of the brine shrimp, *Artemia salina* L. Communication at the fifth Annual workshop of the World Mariculture Society held at Charleston, USA, January, 1974.
- Urbani, E. 1959. Portidi glucidie lipidi nello sviluppodi *Artemia salina*.
- Von Hentig, R. 1971. Einflub von Salzgehalt und Temperatur auf Entwicklung, Wachstum, Fortpflanzung und Energiebilanz von *Artemia salina* dry cysts. *Mar. Biol.*, 22 (1): 75-76.