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The Use of a Solution of Superoxidized Water: The Effect of Electro Oxidized Water on the Viability of Eggs and Larvae of the White Shrimp (*Litopenaeus Vannamei*).

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ABSTRACT

The toxic effect of EOW on eggs of the white shrimp *(Litopenaeus vannamei)* was studied. Gravid healthy females (n= 20) of White shrimps were netted, and transferred to 50 liters holding tanks with low aeration for spawning. With the use of filters, 500 eggs were selected at random for each treatment. Group 1 was considered as control with no treatment. Group 2 was disinfected using iodine-PVP (50-100 ppm/10-60 sec) before rinsing again with abundant clean seawater in another recipient. To group 3, 50 mL of EOW diluted 1 : 50 was added to their holding tank. To group 4, 50 mL of EOW diluted 1: 100 was added to their holding tank. Group 5 received 50 mL of a dilution of 1:200 of EOW to their holding tank. Eggs hatching in the control group was in the order of 86%, and when eggs were treated with iodine-PVP percentage of survival was on the order of 91%. In the holding tanks where eggs were treaed with EOW in different solutions it was observed that hatching was >98% (P>0.01). In this work it was concluded that EOW was effective as first choice treatment for eggs of the White shrimp when used in different concentrations without producing a deleterious effect on hatchability, results that show that EOW should be considered as important sanitizer and disinfectant for this purpose.

KEYWORDS: White Shrimp, eggs, hatchability, disinfection, electrolyzed water

INTRODUCTION

Within the scope of the Veterinary Curricula, aquaculture has acquired an important site. Shrimp culture is an important asset for countries that need the economic benefits of this industry. Marketing of cultured and fished shrimp represents a challenge to the production chain related to this industry.

When shrimps are delivered to the marketing chain, the latter has to deal with natural decay and enzymes together with bacterial and fungal growth of normal flora present in the recently harvested shrimps. Among the many factors that influence shrimp deterioration are a number of enzymes such as proteases, indentified as responsible of deterioration and disintegration of muscle proteins during the storage process [11]. Collagenase after harvest induce muscle softening thus reducing shelf life to 3 – 4 days [1, 4; 16,18, 13].

Among the factors that reduce shelf life of shrimps blackening melanosis is commonly present during posmorten storage, the consumption of this shrimps in not harmfull, but reduces market value [2. 3, 15].

Among the pathogens that cause the greatest problems in aquacultures shrimp are bacteria, fungae and viruses [5] infestation with the latter will develop diseases such as: white spot syndrome, Taura syndrome, infectious hypodermal and haematopoietic necrosis, baculoviral midgut gland necrosis and *Vibrio* infections. Therefore the shrimp industry has recurred to several methods to increase bioavailability and shelf life of this highly productive species. Against the occurrence of melanosis PPO inhibitors such as 4-hexylresorcinol and other Chemicals such as Kojic acid (5-hydroxy-2-hydroximetil-4H- pyran – 4- one), organic acids, sodium benzoate, sulfiting agents, etilenediamino tetra acetic acid and disodium dhidrogen pyrophosphate have beib used and reported [9. 14].

In recent work in this laboratories it was observed that Electro Oxidising Water (EOW) inactivates bacteria such as E. C*oli*, *Candida albicans*, *Staphylococcus aureus*, and *Bacillus subtilis* [Paez and Fuentes 2013] results that are

similar to those observed by Venkitanarayanan et al. (1999). This and many other findings show that EOW is an emergent tool both as a sanitizer agent and for the preservation of perishable goods from the food industry [10].

Due to EOW sanitizing and antibacterial properties, it was considered of interest to study the effect of EOW on the survival of eggs and newly hatched larvae of the whitw shrimp (*Litopenaeus vannamei*).

The objective of this work is to observe the toxic effect of EOW on eggs of the white shrimp (*Litopenaeus vannamei*) previous to hatching. The hypothesis to pursue will be: The addition of EOW to recently spawned eggs of White Shrimps will increase viability for further cultivation and growth as compared with non treated controls and eggs treated with povidone iodine PPV.

MATERIALS AND METHODS

For these experiments five groups of recently spawned eggs were used. Gravid healthy females (n= 20) of White shrimps were netted, and transferred to 50 liters holding tanks with low aeration for spawning. Female containing tanks were covered with black plastic and were constantly monitored using a flashlight until the shrimps spawned. After spawning females were removed from the tanks so that eggs could be collected. They spawned an average of 100,000 each. With the use of filters, 500 eggs were selected at random for each treatment. Using a prefilter made from 300-500 µm mesh, eggs were collected into a receptacle with a large, mostly submerged mesh of < 100µm pore size in order to retain them without damage. Once harvested and counted, the selected eggs were washed with clean seawater and therafter they were treated as follows: Five 20 liter plastic containers were used to carry out the experiment. Group 1 was considered as control with no treatment. Group 2 was disinfected using iodine-PVP (50-100 ppm/10-60 sec) before rinsing again with abundant clean seawater in another recipient. To group 3 50 mL of EOW diluted 1 : 50 was added to their holding tank. To group 4, 50 mL of EOW diluted 1: 100 was added to their holding tank. Group 5 received 50 mL of a dilution of 1:200 of EOW to their holding tank.

The percentage of hatching nauplii of each tank was determined individually counting the number of nauplii and unhatched eggs from each treatment:

$$\% \text{ hatch} = (\text{number of nauplii} + \text{eggs}) * 100$$

To document viability of eggs, hatching was assessed 24 – 48 hours after spawning. The survival and signs of disease was recorded at 96 h, using the appropriate filter, non hatched eggs were counted, and the data were analyzed using student T test.

RESULTS AND DISCUSSION

During our experiments it was observed that the percentage of hatched larva (nauplii) in the control group was in the order of 86%, and when eggs were treated with iodine-PVP percentage of survival was on the order of 91%. In the holding tanks where eggs were treaed with EOW in different solutions it was observed that hatching was >98% (P>0.01) (Figure 1).

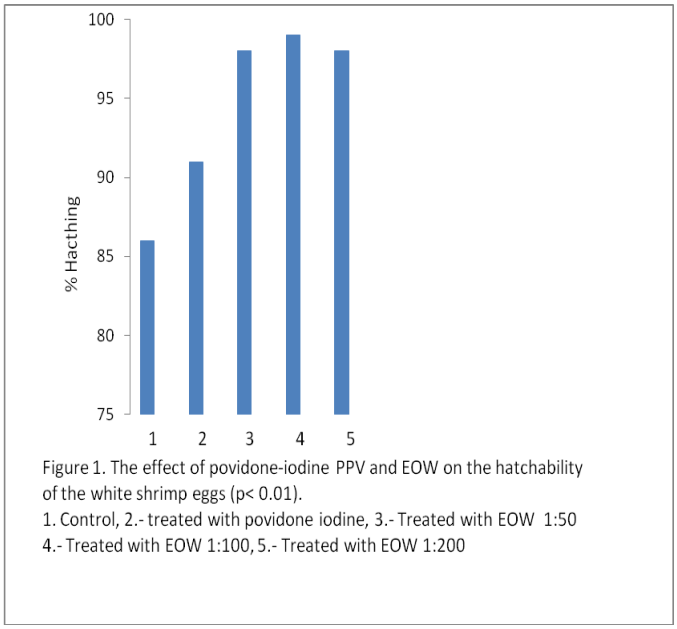

Figure 1. The effect of povidone-iodine PPV and EOW on the hatchability of the white shrimp eggs (p< 0.01).
1. Control, 2.- treated with povidone iodine, 3.- Treated with EOW 1:50
4.- Treated with EOW 1:100, 5.- Treated with EOW 1:200

When eggs are released after spawning, shells are the site of choice for the attachment of many possible microbes. Therefore many shrimp producers use different chemicals to disinfect eggs after spawning, with the aim of obtaining maximum hatchability. When released; eggs are still good and only the surface of the eggs may be contaminated with different bacteria and virus, this microbiota must be maintained in equilibrium, action that is recognized by shrimp producers, because this microbiota may enhance host growth and survival by producing some digestive enzymes [17]. Different treatments have different effects on hatching, treatment of eggs with povidone iodine have being used in eggs and larvae without affecting the hatching rate of eggs or survival rate of larvae [7], the disadvange of povidone – iodine treatment is its short time effect and the need of carefull monitoring of the used concentration. In this work EOW shows that at different concentrations is effective to promote good hatching rate and larvae survival. The sanitizing and disinfecting effect of EOW is well documented in different foods, both in agriculture [6] the food industry [19] and in Veterinary Medicine [8].

CONCLUSIONS

In this work it was concluded that EOW was effective as first choice treatment for eggs of the White shrimp when used in different concentrations with out producing a deleterious effect on hatchability, results that show that

EOW should be considered as important sanitizer and disinfectant for this purpose. And more research must be oriented towards it use and applications of EOW to take full advantage of its properties.

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