Eco. Env. & Cons. 27 (3) : 2021; pp. (1180-1185)
Copyright@ EM International
ISSN 0971–765X

Diagnosis and control of Epizootic Ulcerative Syndrome (EUS) in the Snake Head, *Channa punctatus*

K. Thirunavukkarasu*, P. Damotharan and V. Ravi

CAS in Marine Biology, Faculty of Marine Sciences, Annamalai University, Parangipettai 608 502, India

(Received 4 December, 2020; Accepted 6 January, 2021)

ABSTRACT

A survey on epizootic ulcerative syndrome (EUS) was carried in *Channa punctatus* and skin ulcerative lesions in three other fishes from irrigational canal near Parangipettai railway station during the period of disease outbreak January 2018 to January 2019. During the present study, a total of 126 specimens of well cultured fish exhibited ulcerative lesions, which included 78 specimens of *Channa punctatus,* 9 specimens of *C. striatus,* 22 specimens *Cyprinus carpio,* 17 specimens of *clarius* sp. EUS infection was the recorded commonly in *Channa punctatus* and the least was observed in *C. striatus.* EUS infection characterized darkening or reddening of the body with small red patched and subsequent skin erosion leading to the development of ulceration on the body surface and the lesions were often pale with peripheral areas of erythema and the central zone of scales lifted away from the body wall. The results revealed that the treatment of EUS is possible with the indigenous herbal plants such as *Azardirachta indica* (neem), *Curcuma longa* (turmeric), *Pongamia pinnata* and *Glycyrrhiza* sp., had good activity against the above disease, which is because of their antimicrobial property against bacteria and fungi. Besides bringing back the infected fish to normal health, the simple and low-cost treatment using locally available plant products helped in disinfecting the irrigation well. On the basis of present study, it is recommended that this treatment can be effectively and safely used to control the EUS infection in large tanks and ponds.

Key words: *EUS, Ulceration, Lesions, Snakehead, Herbal plants*

Introduction

In India, mass mortalities of freshwater and estuarine fished have been occurring seasonally since 1990. The true origin of the disease is unknown and it remains a matter of speculation. The first epizootic ulcerative syndrome was recognized in southeast Asia like Malaysia and southern Thailand, principally in the *Ophiocephalus* sp., and *Puntius* sp., (Tonguthai, 1985). Over 100 different species have variously been reported as susceptible, but tilapia fishes have consistently been found resistant to the disease. The economic losses due to the disease outbreak in southeast Asia have not been quantified. However, In India, Gopal Rao *et al.* (1996) estimated that 40 million Indian rupees were lost due to the disease and associated problems.

Although a cause-effect relationship has not yet been established, a recent work carried out at the Institute of Aquaculture in Scotland has revealed that the disease appeared to be an infectious one caused by specific, invasive fungus and a range of opportunistic aquatic bacteria, Besides, the microbes, Virus was also reported from the diseased sand goby

(*Oxyeleotrix marmoratus*) (Hedrick *et al.* 1986) and an IPN virus from snakeheads (Wattanavijarn *et al.* 1988) as well as the more consistent isolation of a rhabdovirus from occasional diseased fish (Frerichs, *et al*., Ahne *et al.*, 1986). However, the viral pathogen could not be confirmed experimentally to cause the EUS in fish.

Considering the economic losses associated with the outbreak of EUS, detailed studies regarding the causative agents and mechanism of the disease process along with better understanding of environmental factors, are essential (Kalaiselvam, 1996). This will help not only for assessing the environmental quality but also to develop practical, cost-effective and environment friendly control strategies to the diseases which would be of immense help to aqua farmers for successful management. It is believed that the present preliminary observation may stimulate better investigations in future to develop a new drug, devices and techniques undoubtedly will call for changes in the treatment schedules and possibly some day, in the entire approach to this problem.

Materials and Methods

Description of Study Area

Samples were collected from irrigation well which is located near Parangipettai railway station which is about 7 kilometers away from the Marine Biological Station. The well is almost non-drainable and supplied with water from the irrigation channel of Sethiathoppu Anaicut through a channel measuring 250 meters long and 2-meter-wide, provided with cement pipes. The depth of the well is about 25 feet and the width are about 12 feet. The well water is utilized for the agricultural purposes as well as for the culture of the snakehead, *Channa punctatus* and other freshwater fish.

EUS infected snakehead, *C. punctatus* from the study area

Sample Collection

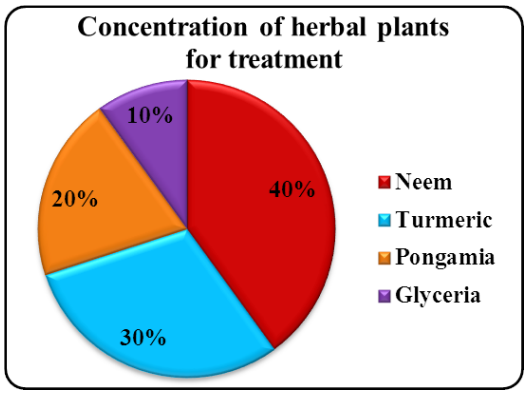
Samples of healthy and EUS infected snakehead, *Channa punctatus* and other fishes with skin ulcerative lesions were collected from the irrigation well during the period of disease outbreak. The collected specimens were brought alive in an air-filled polythene bags to the laboratory, weighed, measured and examined for lesion characteristics of EUS. The fish infected more severely with EUS, was used for the treatment. Prior to treatment, the fishes were held in 1000 l fiberglass aquarium tanks containing well-aerated tap water (Temperature 25 ± 1 f˜ C) and were fed with chiranomus larvae, earthworm, oyster meat etc.

Herbal plants used for Treatment

Plants are known for their traditional medicinal value. The antiseptic and healing properties are too well known and we tried to see whether the plants work on fish or not. In the present study, the herbal plants viz. *Azadirachta indica A. Juss*. (Vembu), *Curcuma longa* (Manjal), Pongamia pinnata (Punkai) and *Glycyrrhiza glabra* (Licorice) were selected for the herbal treatments. Identification of plants and fished was made by using the keys of Kathiresan and Ramanathan, (1997).

Preparation of herbal medicine

For the herbal medicine, the washed leaves of the plants were transferred to clean electrical mixer-jar and ground well for 15 minutes. The resultant plant extract paste was used for the experimental treatment. The concentration of herbal plants paste con-



Concentration of herbal plants for treatment

sisting of 20% pongamia, 40% of neem, 30% of turmeric and 10% of glyceria.

Experimental design

For immersion bath treatment (Experiment I), 60g of herbal paste was transferred as such into a 40 I fiber trough containing tap water of temperature 25 ± 2 ° C served as a treatment solution of immersion bath treatment. A group of 5 fish were exposed to the test solution for 10 minutes and the fish were transferred to the rearing tank.

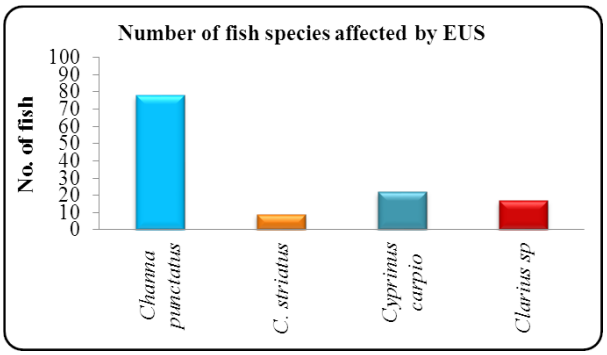
In experiment II, second group of 5 fish took one by one and was applied a thick paste of herbal paste over the ulcerative lesions. The fish were incubated in a trough containing one centimeter of water sufficient to sank half of their body so that the paste dries up well. After 10 minutes, the fish took out from the trough and transferred to the rearing tank. Another set of 5 fish was maintained as control without any treatment. All the treatment experiments were performed at 25 ± 2 ° C and proper aeration was maintained throughout the experimental period. All the experimental and control fish were fed with live chironomous larvae, earthworm, oyster and clam meat, twice in a day. Fish were observed for about 15 days for their behavioral changes and also for the healing of the ulcerative lesions. If any. The survival time for fish in each experiment calculated on the day of death of fish. Each experiment was repeated at least twice.

Results

Species affected: During the present study, a total of 126 specimens of well cultured fish exhibited ulcerative lesions, which included 78 specimens of *Channa punctatus*, 9 specimens of *C. striatus*, 22 specimens *Cyprinus carpio*, 17 specimens of *clarius* sp. Disease respect to manifestation and clinical signs varied slightly with each species and parts of the body affected.

Naturally infected snakehead, C. p1unctatus with the ulcerative lesions

Herbal plant pastes for the treatment of EUS



Number of fish species affected by EUS

Clinical signs

The most common clinical signs were darkening or reddening of the body with small red patched and subsequent skin erosion leading to the development of ulceration on the body surface. In the early stages, the lesions were often pale with peripheral areas of erythema and the central zone of scales lifted away from the body wall.

However, in some cases, the scales were often retained. But in later stages, the ulcer grew in size and led to loosening of a number of adjacent scales, which ultimately exposed the underlying musculature. Surprisingly, the mullets were found to be surviving with much more severe ulcerative lesions, sometimes, even with completely eroded caudal peduncle. Further, it was quite interesting the in fish of both the early and advanced stages, there was white to light brownish cotton-like outgrowth on the infected area of the fishes. This cotton-like appearance, however was seen only when the fished were in water. Fungal mycelia replaced the internal tis-

sues of the infected fish and transmission of the disease was very fast because of the motile zoospores of the fungi. Mass mortalities may occur within two weeks of infection.

Experiment I: The results of the immersion bath treatment are summarized in Table 1. The fish were jumped out immediately after transferred them into the test solution. Fish with mild lesions showed erratic swimming behavior whereas fish with advanced lesions are calm quite and sank to the bottom of the trough. Sometime, the fishes scraped their head to the side of the trough. They did not accept food for about 24th of post treatment and they lost their weight. But healing of ulcerative lesion of EUS was not noticed in any fish.

Fully recovered fish from EUS after the treatment

During the entire period of observation. 100% mortality was observed on the 11th day of post treatment.

Experiment II: Results revealed that the fish exhibited behavioral changes similar to those of immersion bath treatment but they started to feed immediately after treatment. The results were interesting that the fish showed the symptoms of recovery and the ulcerative lesions were completely cured in 5 to 10 days. The recovered fish grew well. The survival rate was almost 100 percent. The control fish showed 30% mortality between 5 to 12 days after the commencement of the experiment but no evidence of cure was observed throughout the experiment.

Discussion

Among all the species studied, the most severely affected estuarine fish by EUS was snakehead, Channa punctatus with severe clinical signs. This is consistent with the findings reported elsewhere (Tonguthai, 1985; Roberts *et al.*, 1989). Further, the snakehead survived for a longer period with advanced levels of ulceration. This prolonged period of survival of snakehead might be due to their robust body and also their ability to tolerate and acclimatize with the fluctuating environmental conditions.

During the course of disease outbreaks, the af-

Table 1. Results of treatment trail experiments EUS in the snakehead, *Channa punctatus*

Exposure route	Herbal plants used	No. Fish died No. Fish tested	Time of death (Days)	Pathological
Immersion bath treatment	*Azardirachta Indica* *Curcuma* *Longa* *Pongamia pinnata* *Glycyrrhiza*	5/5	2 to 11 days	Erratic behavior of swimming resulting skin damage with gaemorrhage 100% Mortalities were observed but no evidence of cure of ulceration were seen in any fish
Herbal paste treatment	*Azardirachta Indica* *CurcumaLonga* *Pongamia pinnata* *Glycyrrhiza*	0/5	–	No mortalities and 100% cure of Ulcerative lesions of EUS
Control	No treatment	2/5	5 to 12 days	Mortalities were observed but no evidence of healing of lesions and fish survive

fected fish manifested the characteristic lesions of EUS as given in the results and this is in accordance with the observations made by earlier workers from different parts of the world. Scientists from south and Southeast Asian countries such as Burma and Lao PDR and Thailand (Tonguthai, 1985), Malaysia (Shariff and Law, 1981) and Philippines (Llobrera and Gacutan, 1987). They described the characteristic lesions in affected fish mostly from snakehead as large deep hemorrhagic ulcers, severe erosion on head, caudal peduncle and abdominal regions and necrosis on various sites.

In the present experiment, the affected fish exhibited certain behavioural signs like decreased feeding and abnormal or complete lethargic and erratic swimming which were similar to those described by Boonyartpalin (1989). Further, the diseased fishes had comparatively weak body condition than the clinically normal fishes and this could be ascribed to the changes in water quality, loss of osmoregulatory functions, severe ulcerative lesion in the locomotory and sensory organ and reduced food intake associated with habitat change and irritations in the lesions.

Prevention and treatment of fungal and bacterial infection of fish have attracted attention for a long time and vast array of chemicals has been tested for effectiveness against these fungi in vitro (Scott and Warren, 1964). The results of the present study reveal that the treatment of EUS is also possible with the indigenous herbal plants. The neem and turmeric have already been proved for their antimicrobial property against bacteria and fungi. This ecofriendly treatment saved the fish from dying and even the recovered fish grow well without mortality. Besides bringing back the infected fish to normal health, the simple and low-cost treatment using locally available plant products helped in disinfecting the irrigation well as well. Although the chemical and antibiotic treatment is popular and widely used, neither of them can be considered as an ideal therapeutant and we hope that research will continue on the development of safer alternatives. In this regard, common herbal plants have not been given the attention they deserve despite the fact that it is inexpensive, safer, and apparently efficacious. On the basis of present study, it is recommended that this treatment can be effectively and safely used to control the EUS infection in large tanks and ponds where fast water renewal is possible.

Conclusion and Recommendation

A strong campaign on the importance of careful and restricted use of drugs in aquaculture should be conducted, not only among fish farmers and technicians but also among drug manufacturers and distributors. Sufficient funding from institutions and governments as well as from private agencies are required to identify the major fish health problems; to develop the simple diagnostic tools for each fish disease; to identify the etiology of disease outbreak; to develop preventive measures; and to evaluate the efficacy of less toxic, and easily biodegradable substances.

References

Aoki, T., Sakaguchi, T. and Kitao, T. 1987. Multiple drug-resistant plasmids from Edwardsiella tarda in eel culture ponds. *Nippon Suisan Gakkaishi.* 53 : 1821-1825.

Austin, B. 1985. Chemotherapy of bacterial fish diseases. In: *Fish and Shellfish Pathology.* A.E. Ellis (ed), p. 9-26. Academic Press, London.

Bhaumik, U., Pandit, P.K. and Chatterjee, J.G. 1991. Impact of EUS on the fish eel, consumption and trade in West Bengal. *J. Inland Fish. Soc.,* India, 23 : 45-51.

Boonyaratpalin, S. 1989. Bacterial pathogen involved in the EUS of fish in southeast Asia. *J. Aqua. Ani. Health.* 1: 272-276.

Chattopadhyay, U.K., Pal, D., Das, M.S. S. and Pal, R. N. 1990. Microbiological Investigations in to EUS in fished. *The National Workshop on Ulcerative Syndrome in fish. 6-7 March 1990*. Calcutta, India.

Das, M.K. 1998. The fish disease, epizootic ulcerative syndrome, an overview. pp.25-30. Souvenir, Inland Fish. Soc Barrackpore, India.

Frerichs, G.N., Millar, S.D. and Roberts, R.J. 1986. Ulcerative rhabdovirus in fish in Southeast Asia. *Nature.* 322 : 216.

Hendrick, R.P., Eaton, W.D., Fryer, J.L., Groberg, W.G. and Boonyaratpalin, S. 1986. Characteristic of a birnavirus isolated from cultured sand goby, (*Oxyeleotris marmoratus*) Dis. *Aquatic. Org.* 1 : 290-225.

Jhingran, A.G. 1990. Status of research on EUS:strategy for containing the disease. *The National Workshop on Ulcerative Syndrome in Fish.* 6-7 March 1990. Calcutta. India.

Kalaiselvam, M. 1996. *Epizootic Ulcerative Syndrome (EUS) in fishes along the Southeast coast of India*. Ph.D. Thesis, Annamalai University, India. 181 p.

Kalaiselvam, M. and Ramaiyan, V. 1994. Experimental studies on EUS in six estuarine Fish. In: *Proceeding*

of International Congress on Quality Vertinary Services for The 21st Century. M.K. Vidyadarn, M.T. Aziz and H. Shariff (eds). Centenary Celebration of Veterinary Services and Animal Industry. Kuala Lumpur, Malaysia. p. 84-86.

Kathiresan, K. and Ramanathan, T. 1997. *Medicinal Plants of Parangipettai Coast.* Vol. 1. Annamalai University. India.

Lloberera, A. T. and Gacutan, R. Q. 1987. Aeromonas hydrophilla associated with Ulcerative Disease Epizootic in laguna de-day. Philippines. *Aquaculture.* 67 (314) : 273-278.

ODA, 1994. *Regional Seminar on EUS.* Roberts. R.J., B. Campell and I.H. Macrae (eds). 25-27 January 1994. The aquatic animal health research Institute, Bangkok. Thailand. P. 282.

Roberts, R.J., Wootten, R., Macrae, I., Millar, S. and Struthers, W. 1989. Ulcerative disease survey, Bangladesh. Final report to the Government of Bangladesh and the Overseas Development Administration. Institute of Aquaculture. Stirling University, Scotland, 104pp.

Shariff, M. 1989. Some basic concepts on fish disease for nutritionists. Pp 101-111. In: *Proceedings of the Third Asian Fish Nutrition Network Meeting.* S.S. De Silva (ed). Fish Nutrition Research in Asia. Asian Fish. Soc. Spec. Publ 4. Asian Fisheries Society, Manila, Philippines.

Scott, H. and Warran, W. 1964. A monograph of the genus Aphanomyces. Technical Bulletin 151, Virginia Agricultural Experiment Station, Blacksburg, VA.

Tonguthai, K. 1985. A preliminary account of ulcerative fish disease in the Indo-Pacific Region (a comprehensive study based on Thai experience). National Inland Fisheries Institute, Bangkok, Thailand. 39p.

Wattanavijarn, W., Tangtronpiros, J., Wattanodorn, S. and Hunnack, P. 1985. Detection Of virus from cell cultures by electron microscope and induction of disease by infected cell culture fluid. *Thailand Journal of Veternary Medicine.* 36 : 143-151.