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Effect of temperature on explosion of epizootic ulcerative syndrome

Akshita Ira* & Pooja Agrahari

P. G. Department of Zoology, C. M. Science College, Darbhanga, Bihar, India.

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Abstract- This paper examines how temperature affects fish explosion of epizootic ulcerative syndrome (EUS) in relation to seasonal variations. The study found that a slow drop in temperature has a direct impact on fish development and survival, and it may be a major predisposing stressor for fish outbreaks of EUS.

Key words: Seasonal variation, Temperature explosion, Epizootic ulcerative syndrome

INTRODUCTION

With an annual growth rate of 9%, aquaculture is the most promising and rapidly expanding farming sector in India, accounting for 70% of all fish produced. One of the main obstacles to the widespread development of large-scale rural aquaculture entrepreneurship is the fish farmers' inadequate understanding of fish health management. Fish always maintain a balance between their surroundings and possible disease-causing organisms. Fish that experience stress as a result of an imbalance brought on by declining water quality are more vulnerable to illness.^{1,2} Fish outbreaks causing epizootic ulcerative syndrome pose a serious concern and challenge to aquaculturists worldwide, not only in India. According to earlier research significant predisposing factors for an outbreak of epizootic ulcerative syndrome include severe rainfall, temperature declines, and low dissolved oxygen.³⁻⁷

MATERIALS & METHODS

The study was carried out in the winter months of November 2022 to March 2023 in order to investigate the effect of temperature on the onset of epizootic ulcerative syndrome (EUS). A perennial pond with a total water spread area of 5 hectares and an average depth of 1.5 metres served as the site of the trials. The pond is located close to Baghmor in Darbhanga Town, Bihar state, with latitudes between 25,5' and 26,27' (North) and longitudes between 85.45' and 86.25' (East).

With a stocking density of 10,000 fingerlings per hectare, the species supplied in the pond were Catla (*Catla catla*), Rohu (*Labeo rohita*), Mrigal (*Cirrhinus mrigala*), Grass carp (*Ctenopharyngodon idella*), Common carp (*Cyprinus carpio*), Silver carp (*Hypophthalmichthys molitrix*), and Calbasu (*Labeo calbasu*). Ricebran and mussard oil cake, ranging from 2 to 5 percent of the fish's body weight, were fed to them. June and July of 2022 saw the seeding of the crop. At the time of stocking, the dissolved oxygen level was 6.8 ppm and the water

*Corresponding author :

Phone : 7909012039

E-mail : sanakashyap@gmail.com

temperature was 28°C. The experiment was set to run for fifteen weeks, from November 19, 2022, to March 3, 2023. Using a mercury thermometer, the temperature was taken each day in the morning and evening, and the average temperature for the week was then determined. Throughout the course of the inquiry, the dissolved oxygen was also determined weekly using Winkler's method, which adheres to the APHA standard (1989).⁸ Throughout the duration of the inquiry, a record of the quantity of diseased fish and their death was kept.

RESULTS & DISCUSSION

The temperature and dissolved oxygen (DO) variation throughout a typical week along considering average mortality and sick fish data from November 19, 2022 to 3 March, 2023 have been displayed in Figs. 1 through 4. It was shown that when the temperature drops, DO reduces. However, the 9th week (i.e., January 15-21, 2023) saw records for the lowest temperature of 9.4 and the lowest DO of 3.6 ppm. The findings showed a favourable relationship between DO and temperature.

Table 1- Average weekly variations in temperature and dissolved oxygen in relation to the average number of diseased fish and the average number of deaths between November 19, 2022, and March 3, 2023.

No. of Week	Average temp. (degree Celsius)	Dissolved Oxygen (in ppm)	Average Infected Fish (no.)	Average Mortality (No.)
1 st (19-25 Nov, 22)	21.45	6.5	50	32
2 nd (26 Nov-2 Dec, 22)	20.8	6.5	58	36
3 rd (3 -9 Dec, 22)	18.5	6.3	62	40
4 th (10 -16 Dec, 22)	18.05	6.1	70	41
5 th (17 -23 Dec, 22)	16.0	5.8	76	52
6 th (24 -31 Dec, 22)	14.7	5.6	75	58
7 th (1-7 Jan, 23)	13.85	5.3	74	63
8 th (8-14 Jan, 23)	9.8	4.1	150	122
9 th (15-21 Jan, 23)	9.4	3.6	170	151
10 th (22-28 Jan, 23)	11.85	4.2	140	125
11 th (29Jan-4 Feb, 23)	13.45	4.5	150	84
12 th (5-11 Feb, 03)	16.75	5.3	170	63
13 th (12-18 Feb, 23)	18.00	5.8	170	44
14 th (19-25 Feb, 23)	20.5	6.1	160	33
15 th (26 Feb- 3 Mar,23)	22.9	6.8	150	20

Wintertime saw the experiment's execution (November 2022 to March, 2023). Up until January 15, 2023, the water's temperature drastically decreased; after that, it began to rise steadily. It was shown that when temperature and DO gradually dropped, so did the quantity of diseased fish and, as a result, fish mortality. The number of diseased fish and death grew dramatically when the temperature dropped starting in November 2022, reaching a maximum of 170 infected fish and 151 fatalities in the month of January. As the temperature dropped, so did the average infection and fatality rates.

Temperature and dissolved oxygen (DO), two physico-chemical parameters that were monitored during the course of the experiment, showed a direct relationship. The investigation period saw the following temperature records: a maximum of 22.9°C and DO 6.8 ppm in the

15th week (26 February to March 2023), a temperature of 21.45°C and DO 6.5 ppm in the 1st week (19-25 November 22), and a minimum of 9.4°C and DO 3.6 ppm in the 9th week (15-21 January 2023). As temperatures gradually increased after that, the number of infected fish and mortality significantly decreased.

According to the current investigation's findings, temperature and DO variations may be contributing factors to the development of EUS outbreaks. By observing the impact of the environment on the outbreak of EUS in freshwater fish, Some researchers have reported similar observations earlier.³⁻⁵

Therefore, the results of the entire study may indicate that it is crucial to properly monitor the physico-chemical characteristics of the water and implement corrective measures in order to stop the outbreak of EUS in fish.

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