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Popular Article

Tilapia Parvovirus: A New Concern in Aquaculture Industry

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Introduction

The global production and demand for tilapia, including in India, have shown an upward trend, indicative of the increasing popularity of this particular fish species. Tilapia is the second most significant cultivated fish worldwide, behind carp, and saw an average production growth rate of 10.1% from 1999 to 2018. The rising demand for tilapia may be attributed to several factors, including shifts in consumer tastes, the convenience of cooking, the accessibility of pre-prepared meals, and the affordability of tilapia. These factors have led to an increased interest in tilapia among consumers across different income levels, ranging from low-income to high-income, in both emerging and established nations. In the context of India, there are unexplored opportunities for increasing fish output by means of tilapia aquaculture. The government has established ambitious objectives to enhance fish consumption and production, with the goal of attaining an annual per capita intake of 12kg by 2024-25 and generating 22 million tons of fish by the same year. Tilapia has been recognized as a viable species for implementation in intensive aquaculture practices and cultivation inside reservoir cages, hence offering a potential avenue for augmenting output and addressing the escalating fish demand in India. In spite of several obstacles, including the scarcity of high-quality seeds, insufficient knowledge among farmers and customers, and restricted market entry, there exists a concerted effort to exploit the potential of tilapia aquaculture via the implementation of awareness initiatives, enhanced seed accessibility, and the provision of incentives to producers and exporters.

India is expected to generate enormous cash from tilapia exports, with projections suggesting that by 2032, the government might earn billions of dollars from these exports, making a major contribution to the total aim for seafood export earnings. Investments in the infrastructure for tilapia production, encompassing hatcheries, grow-out ponds, and reservoir cages, are imperative in order to attain the production objectives established by the government and exploit the economic prospects arising from the escalating domestic and international demand for tilapia.

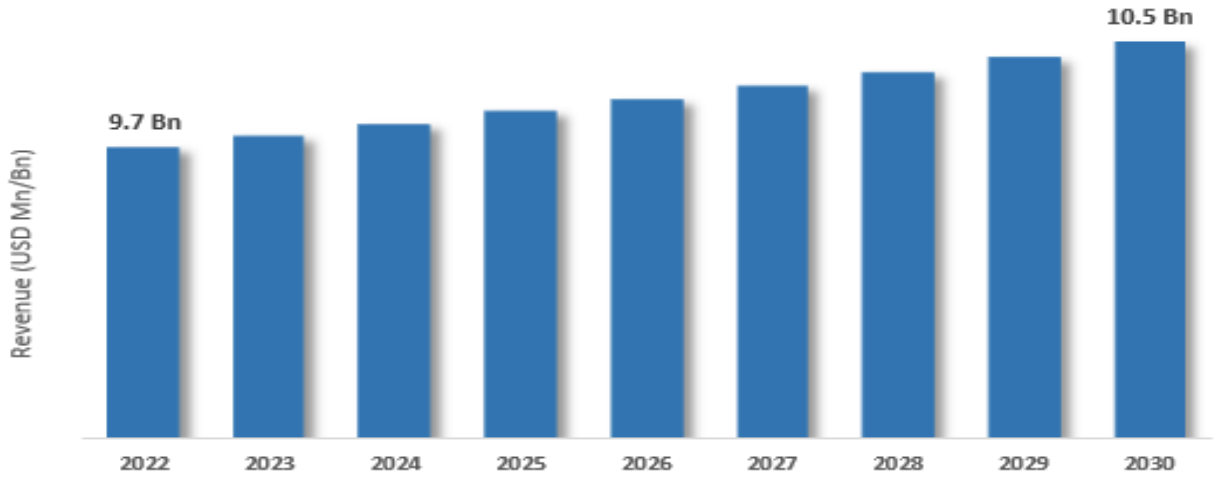

Fig. 1 Global Tilapia Market

Tilapia farming is often affected by diseases caused by bacteria produced by pathogens such as *Streptococcus agalactiae*, *Streptococcus iniae*, *Flavobacterium columnare*, and *Francisella* species. Moreover, viral infections like Tilapia Lake Virus (TiLV) provide substantial risks to tilapia populations, resulting in abrupt fatalities and elevated mortality rates.

Tilapia parvovirus, often known as TiPV, has emerged as a serious danger to the tilapia farming. It is responsible for a large amount of sickness and death among cultivated tilapia populations across the world. This newly discovered parvovirus, which was discovered in tilapia that poses a one-of-a-kind threat to the aquaculture industry all over the world. It has been shown that infections with TiPV are linked with high mortality rates, which may reach up to 60–70% in popu interruptions in production.

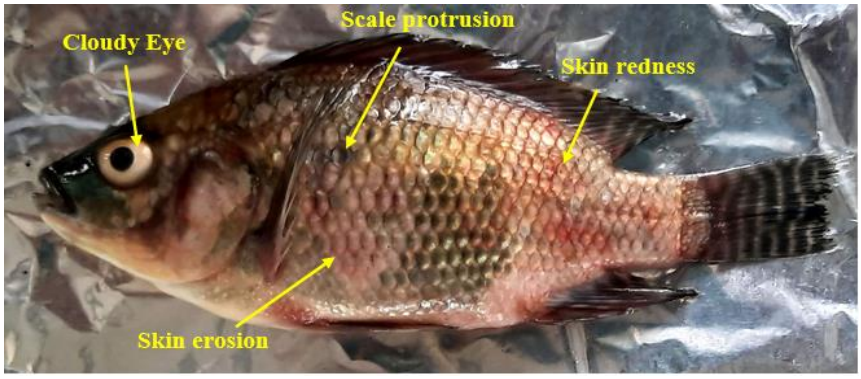

Fig. 2 The clinical signs observed in the infected fish
(Source: AM et al., 2023)

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The Emergence and Impact of Diseases

Tilapia Parvovirus (TiPV) was originally identified in a freshwater fish species known as zander (*Sander lucioperca*) in the year 2022. This new parvovirus, which belongs to the family Parvoviridae, was discovered in farmed adult Nile tilapia in China in 2019, where it caused significant mortality epidemics. TiPV was eventually discovered outside of China, first in Thailand and subsequent instances were recorded in Thailand and India, indicating the fast spread of the virus and its influence on tilapia farming activities throughout the world. demonstrating its growth as a major pathogen in aquaculture environments. According to the first occurrence of TiPV that was documented in India, which occurred in Tamil Nadu, the death rates ranged from 30-50% in agricultural ponds to 100% in the laboratory. The clinical manifestations of TiPV infection in fish are lethargy, scale loss, erythema, hemorrhages, ocular opacity, and a decline in appetite prior to mortality. Due to the spread of this disease, there is an immediate need for preventative measures and study in order to lessen the devastating effect that it will have on the aquaculture business.

Research has identified TiPV as a DNA virus that has distinct genomic characteristics, such as two primary open reading frames that encode NS1 and VP1 proteins. The genetic makeup and pathogenicity of TiPV have been elucidated by the use of modern molecular methods such as SISPA-PCR and RACE. These approaches have yielded valuable insights into the development of TiPV and its possible implications for tilapia populations. There are now efforts being made to develop preventative techniques, such as vaccinations against TiPV, in order to provide assistance to fish farmers in the management and control of the development of this infectious disease.

The signs and symptoms associated with Tilapia Parvovirus (TiPV) infection in tilapia encompass:

1) Appetite Loss: Infected tilapia may have a diminished appetite, resulting in a reduction in feeding activity.
2) The presence of TiPV infection in tilapia might manifest as lethargy, characterized by decreased levels of activity and slow locomotion.
3) Anomalies in Swimming: Infected fish may exhibit atypical swimming patterns, which may suggest underlying health problems resulting from TiPV.
4) TiPV infection often manifests as hemorrhages on the skin and muscular tissues of infected tilapia.
5) Exophthalmia, a condition defined by the protrusion or bulging of the eyes, is seen in tilapia that have been impacted by TiPV.
6) TiPV-infected fish may exhibit widespread anemia, characterized by pallid gills and overall debilitation in the fish population.

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7) Histological Finding: Analysis of infected fish tissues may indicate significant infiltration of lymphocytes, heightened melanomacrophage centers in organs such as the kidney and spleen, erythrocyte depletion in the spleen, and hepatic syncytial cells.

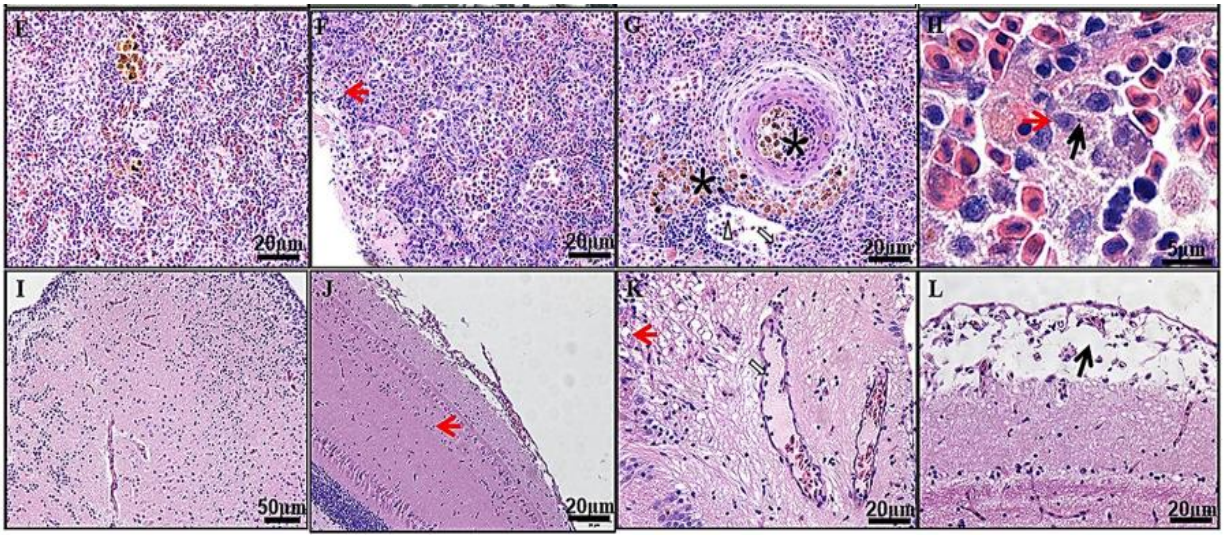

Fig. 3 Histopathological signs in infected fish organs (Source: Liu et al., 2020)

The systemic distribution of both TiLV and TiPV in the body of moribund fish suggests a high prevalence of infection within the fish population. The combined presence of these symptoms leads to the decline of tilapia populations, impairing their health and general welfare. It is essential to promptly identify these symptoms and implement proactive preventative measures in order to effectively manage the transmission of TiPV and mitigate its adverse effects on aquaculture activities.

The risk factors associated with outbreaks of Tilapia Parvovirus (TiPV) in aquaculture encompass:

1) The transmission of TiPV occurs by direct contact with infected fish or contaminated water sources, rendering highly populated fish ponds in aquaculture settings vulnerable to fast transmission.
2) The introduction of infected fish or contaminated equipment has been shown to expedite the spread of TiPV within aquaculture environments, hence augmenting the probability of outbreaks.
3) The strong contagiousness and rapid spread of TiPV may result in substantial economic losses for fish farmers, so affecting the lives of those reliant on aquaculture.
4) The presence of overcrowding in fish ponds gives rise to stressful situations, hence augmenting the probability of disease outbreaks. The use of appropriate stocking density and consistent population thinning may effectively mitigate the fast dissemination of TiPV.

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5) The inadequate management of water quality, including factors such as pH, temperature, and oxygen levels, might exert strain on fish and render them more vulnerable to infections, hence facilitating the dissemination of TiPV.
6) One significant issue in aquaculture settings is the absence of sufficient biosecurity controls. Insufficient disinfection procedures and unregulated access to aquaculture facilities might contribute to the introduction and dissemination of TiPV.

To mitigate the effect of TiPV outbreaks and ensure the sustainability of tilapia aquaculture operations, it is necessary to address these risk factors by enhancing biosecurity, managing water quality, and conducting research.

Conclusion

Timely identification and proactive preventive measures are essential for managing TiPV, given its extremely infectious characteristics. This underscores the significance of rigorous biosecurity protocols and efficient disease management strategies to hinder its transmission and mitigate its effects on tilapia in aquaculture environments. To summarize, the appearance of Tilapia parvovirus presents a substantial obstacle to the aquaculture sector, underscoring the significance of proactive actions, research partnerships, and the formulation of efficient control tactics to protect tilapia populations and maintain the long-term viability of aquaculture methods. The endeavors aimed at addressing TiPV include investigations into preventative methods such as vaccinations, as well as the formulation of control protocols to effectively mitigate the transmission of this viral ailment. Comprehending the occurrence, disease, identification, prevention, and therapy of TiPV is essential for protecting tilapia populations and guaranteeing the long-term viability of aquaculture methods in light of this rising danger.

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