International Journal of Current Science Research
www.drbgrpublications.in

Volume: 2; Issue: 12; December -2016; pp 1019-1025. ISSN: 2454-5422

Prevalence of white faeces syndrome in *Penaeus (Litopenaeus) vannamei* farms in Nagapattinam district

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Abstract

Pacific white shrimp (*Penaeus vannamei*) is the most extensively farmed crustacean species in the world and in India. *P. vannamei* aquaculture has been on the raise since 2011 in Tamilnadu, simultaneously, disease incidences in farmed shrimp due to various causes too are on the raise. White Faeces Syndrome (WFS) in shrimp culture ponds has been causing economic loss to the aquaculture industry in Nagapattinam district. In this context, current study was conducted for one crop from March 2015 to June 2015 in shrimp culture ponds from Sirkazhi, Nagapattinam and Vedaranyam divisions of Nagapattinam district to evaluate the prevalence of White faeces syndrome (WFS). With the introduction of *P. vannamei,* culture practice from traditional form to intensive system has taken place; the complexity of diseases has been equally magnified in Tamil Nadu and all other major culture areas. Among the three selected villages, the maximum prevalence of White Faeces Syndrome (71.75%) was observed from Nagapattinam. It was observed that WFS could be managed by better pond management practices combined with scientific interventions.

Keywords: *Penaeus vannamei*, White Faeces Syndrome

Introduction

Pacific white shrimp (*Penaeus vannamei*) is the most extensively farmed crustacean species in the world and in India. The introduction of Specific pathogen free (SPF) *Penaeus (Litopenaeus) vannamei* in India has led to a quantum jump in shrimp production. Meanwhile, occurrences of disease also are on the raise and have impacted the production and profitability of shrimp aquaculture in India. With the introduction of *P. vannamei*, traditional form of culture practices has been replaced by modern intensive culture practices, along with it the complexity of diseases has been equally magnified in Tamil Nadu and other farming areas. White faeces syndrome (WFS) is one of the most prevalent and serious disease problem encountered in major shrimp farming nations and has caused massive shrimp production losses. WFS is reported to be a serious problem in *P. vannamei* culture ponds in India particularly of Andhra Pradesh and Tamil Nadu.

The appearance of vermiform, gregarine-like bodies within the shrimp HP tubules and midgut was first reported in Thailand by Sriurairatana *et al*. (2014). They are almost transparent in squash mounts with widths and diameters proportional to the HP tubule lumens in which they occur. Despite vermiform appearance, they show no cellular substructures such as nuclei. When present in very high quantity they result in floating white fecal strings. In severe cases, WFS could lead to farm losses due to decreased survival, retarded growth and increased feed conversion ratios referred to as white faeces syndrome (WFS). Researchers further reported that although the cause of Aggregated Transformed Microvilli formation is currently unknown, the transformation and loss of microvilli followed by cell lysis indicate that their formation is a pathological process. If their formation is severe enough to cause white feces syndrome, they may retard shrimp growth and may predispose shrimp to opportunistic pathogens.

Pond level signs of WFS includes white to somewhat yellow, floating faecal strings that sometimes observed to be attached on dead algal mats and also be found on feeding trays. Severely affected ponds exhibit reduction in shrimp survival by 25–35 percent when compared to normal ponds. WFS lead to decrease in feed consumption and growth rates. Srinivas *et al*. (2016) and Mastan *et al*. (2015) reported WFS in *P. vannamei* cultured ponds of Nellore, West Godavari and Prakasam districts of Andhra Pradesh. Incidences of WFS were observed after 50-

60 days of stocking of the post larvae in grow out ponds. In the above context, the present work was undertaken to document the prevalence of WFS of *P. vannamei* in Sirkazhi, Nagapattinam and Vedaranyam divisions of Nagapattinam district in Tamil Nadu, India.

Materials and Methods

Samples (n=87) were collected from Nagapattinam district, Tamil Nadu, India during the study period from March 2015 to June 2015. Cultured *P. vannamei* (7 to15 g) were obtained from shrimp farms in three different areas (Sirkazhi, Vedaranyam, Nagapattinam) in Nagapattinam district and were analyzed for shrimp pathogens associated with the mortality. Shrimp ponds reporting white faeces were selected for the sampling. Samples (n=21) from normal ponds without WFS also were collected. Shrimp samples were preserved for bacteriology, molecular diagnosis and for histology. The samples for PCR were preserved in 95% ethyl alcohol. The samples for histological analysis were preserved in Davidson's fixative and processed for histology (Bell and Lightner, 1988). Live shrimp samples from selected shrimp ponds exhibiting WFS were brought to laboratory for further study.

Results and Discussion

White Faeces Syndrome (WFS) is observed in all the *P. vannamei* culture areas under study (Table. 1 and Fig. 2). Several authors reported white muscle disease in shrimps and prawns (Chen *et al*., 1992; Ravi *et al*., 2009; Sudhakaran *et al*., 2006). WFS was exhibited in shrimp grow out ponds as early as 40 days post stocking of post larvae to 70 days post stocking. In the previous study, incidences of WFS were observed after 50-60 days of stocking of the PLs (Sriurairatana *et al.,* 2014). Further the researchers reported that WFS in shrimp arise from transformation, sloughing and aggregation of hepatopancreatic microvilli into vermiform bodies, which superficially resembles like with protozoan Gregarines. However, causative agent for WFS has not identified yet. It is inferred from the present study that WFS is not attributed to any single cause, in certain cases enteric Vibrio infection alone found associated to be a cause of WFS whereas in certain other cases Blue green algae in the pond led to WFS. In most of the cases, *Enterocytozoon hepatopenaei* (EHP) infection was found to be associated with WFS. Tang *et al*. (2016) have reported that WFS in all cases associated with EHP infection. Limsuwan

(2010) and Durai *et al.,* (2015) reported that Vibrio species have been found in the faecal analysis from infected shrimps.

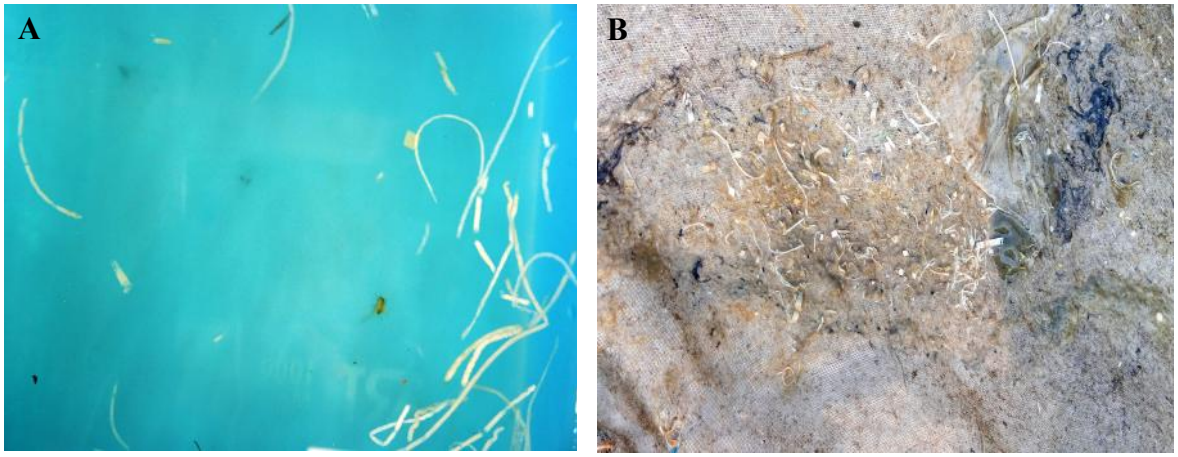

Fig. 1.A. White faecal strings flotting on the water surface. 1.B. White faecal on feeding tray.

Table: 1. Prevalence of White Faeces Syndrome (WFS)

	Prevalence (%)-2015		
Month	**Sirkazhi**	**Vedaranyam**	**Nagapattinam**
March	70	73	69
April	68	69	70
May	72	74	64
June	71	71	71
	70.25	71.75	68.5

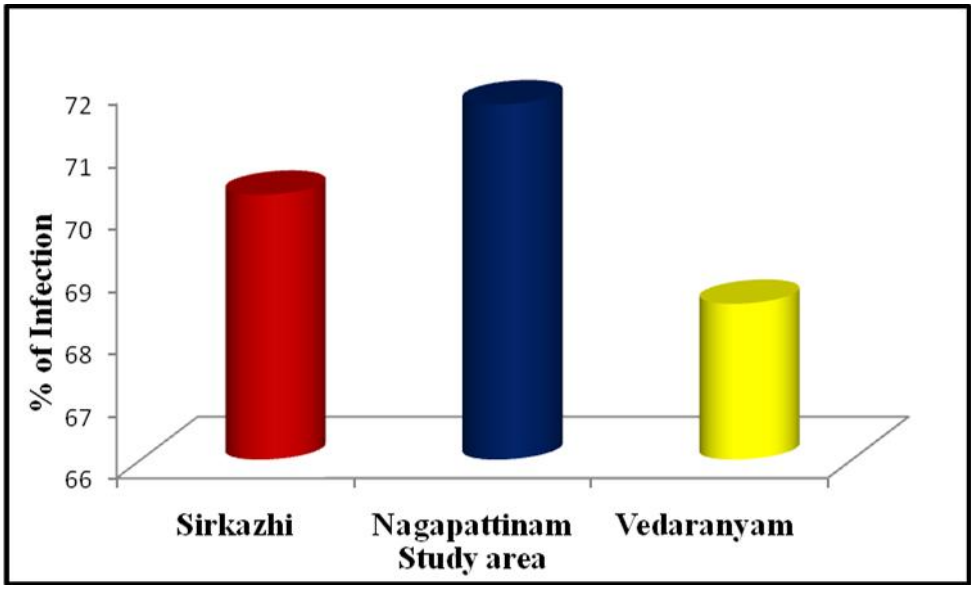

Fig. 2. Prevalence of White Feces Syndrome (WFS)

In the present study, it has been observed that highest prevalence of WFS (71.75 %) was observed in Nagapattinam during 2015, while lowest prevalence was observed in Vedaranyam (68.5%). Gross signs of WFS observed in shrimp cultivation ponds were floating white faecal strings on pond surface (Fig. 1A) and on feeding trays (Fig. 1B). Poor water quality, unhealthy seed, high loads of *Vibrio* spp. and presence of Protozoa gregarines like organisms in the intestine and hepatopancreas are some of reasons for the disease (Mastan, 2015).

The present study also revealed that shrimp ponds with higher stocking density are more prone to WFS as has been reported by other studies. Incidences of WFS is also associated with high stocking densities, poor water quality, poor pond bottom, high plankton blooms and bad feed management and high pollution in pond water. It was observed during the study that various management measures such as providing probiotic through feed, sludge removal from pond bottom, use of good quality feed, managing feed waste, fasting technique, allicin and vitamins application, controlling vibrio dominance in the pond with the application of probiotics as well as water changes to reduce organic matter load in the pond, use of good quality seed are all of help to prevent onset of WFS and manage and recover of WFS.

Based on the present study it is evident that, WFS is widely prevalent in Nagapattinam district and hence shrimp farmers should be advised to adopt management measures enlisted to prevent crop loss due to WFS.

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