Identification of risk factors for WSSV proliferation in the shrimp (*Penaeus monodon*) farms of south-west coastal region of Bangladesh

In the shrimp *(P. monodon)* culture, various diseases, white spot syndrome virus (WSSV) in particular, has become a serious constraint in Bangladesh. Under the study, 72 culture sites from four different locations of Bagerhat (Kochua, Rampal, and Fakirhat) and Khulna (Paikgacha) district were investigated from January to June 2011. Throughout the study period, 20 factors (Table 1) regarding farm management and water quality were keenly considered inferring the association of WSSV outbreak.

Table 1. List of different types of data considered

Sl. No.	Categorical Data	Parametric Data
1	Month	Tem
2	Region	DO
3	Pond Drying	Salinity
4	Ploughing	Ph
5	Sludge Removal	Ammonia
6	Water Source	Alkalinity
7	Water Sharing	Stocking Density
8	Linked With Ghers	Avg. Depth
9	Cattle Accessibility	
10	Pl Source	
11	Liming	
12	Feeding	

The farms either claimed infected or not were confirmed by PCR test. According to the investigation, Pearson Correlation coefficient for salinity (Table 2) found to have significant correlation with the risk of WSSV infection ($r= -0.727$, $p\leq0.01$), followed by temperature (0.624, $p\leq0.01$) and the average depth (-0.618, $p\leq0.01$). Study revealed significant correlation with some factors like accessibility of cattle into the farms ($r=0.630$, $p\leq0.01$), and farms linked up with surrounding water bodies/farms ($r=0.754$, $p\leq0.01$) within a cluster (Table 3).

Among the ghers investigated, 43.1% found to be infected by WSSV where the accessibility of cattle was frequently compared to the ghers free from cattle grazing (4.2%) (Figure 1.). Feeding, however, is an important issue in any kind of cultural practice, farmers in the study area found to be reluctant in feeding showed 38.9% risk of being infected by WSSV which can be reduced to 8.3% by providing supplementary feed (Fig. 2).

Another important factor found to be the source of PL. Risk of WSSV infection to the hatchery PL was up to 6.94% which could be up to 16.67% and 23.61% of the PL of wild source and a mix of wild and hatchery source respectively (Fig. 3).

The most interesting thing found in the study was the source of water. WSSV risk was found up to 38.9% and 6.9% for the ghers having water directly from the rivers and canals which was just nil and 1.4% **of** the underground and rain fed water respectively (Fig. 4).

March to June found to be the disease prone months and out of the four locations, Fakirhat found to be less infected due to better management.

Therefore, to cope with the risk of WSSV infection, proper farm management practice, virus free PL (post larvae), awareness buildup at the farmer level and switch into community based farm management can be broadly brought into practice.

Table 2. Pearson correlation coefficient for parametric data

		Tem	DO	Salinity	pH	Ammonia	Alkalinity	Avg.Depth	Stocking Density
Pearson Correlation	WSSV Infection	**.624(**)**	.070	**-.727(**)**	-.261(*)	.175	-.256(*)	**-.618(**)**	.043
	Sig. (1-tailed)	.000	.280	.000	.013	.071	.015	.000	.359
	N	72	72	72	72	72	72	72	72

** Correlation is significant at the 0.01 level (1-tailed).
* Correlation is significant at the 0.05 level (1-tailed).

Table 3. Spearman's rho correlation coefficient for non-parametric data.

		WSSV Infection	Pond Drying	Ploughing	Sludge Removal	Linked with	Water Sharing	Water Source	Accessibility of Cattle	Feeding	Liming
Spearman's rho WSSV Infection	Correlation Coefficient	1.000	-.273(*)	-.276(**)	-.179	**.754(**)**	.308(**)	**.416****	**.630(**)**	-.219(*)	-.302(**)
	Sig. (1-tailed)	.	.010	.009	.067	.000	.004	.000	.000	.032	.005
	N	72	72	72	72	72	72	72	72	72	72

* Correlation is significant at the 0.05 level (1-tailed).
** Correlation is significant at the 0.01 level (1-tailed).

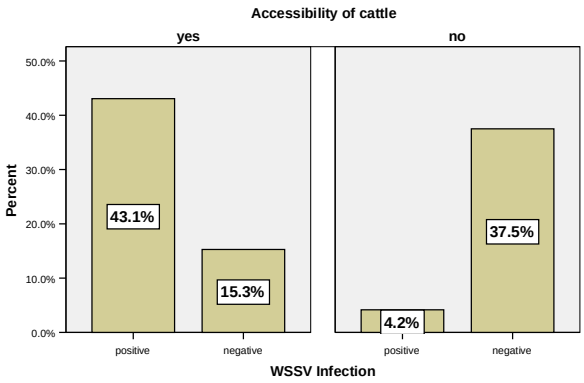

Figure 1. Percentages of WSSV infection and cattle accessibility

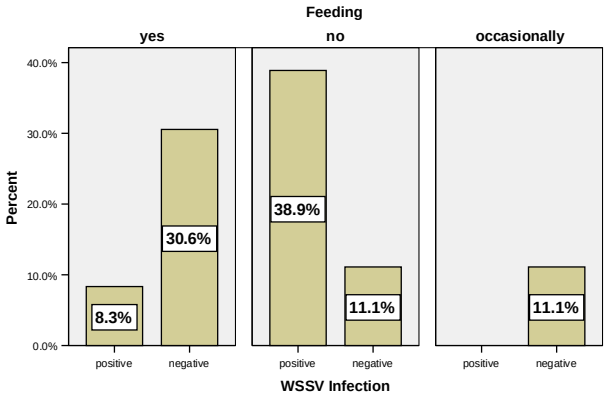

Figure 2. Percentages of WSSV infection and feeding

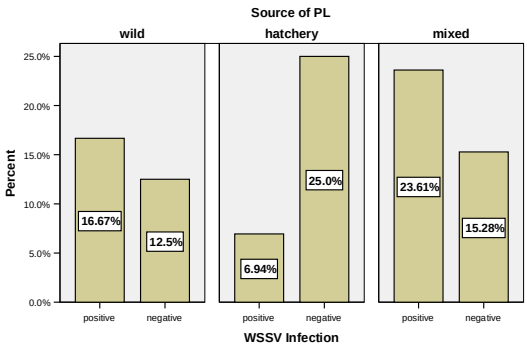

Figure 3. Percentages of WSSV infection and source of PL

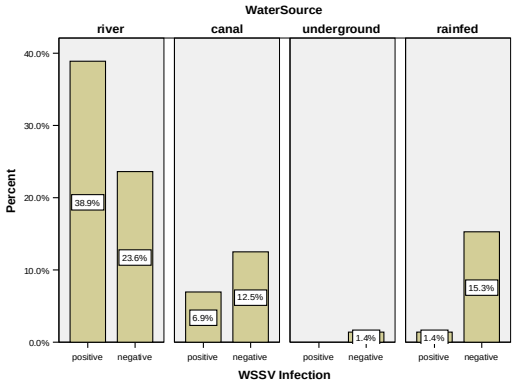

Figure 4. Percentages of WSSV infection and source of water

Fig. 5. A typical shrimp gher

Fig. 6. Sampling of shrimp from the gher

Fig. 7. WSSV infected shrimp

Fig. 8. WSSV test using PCR

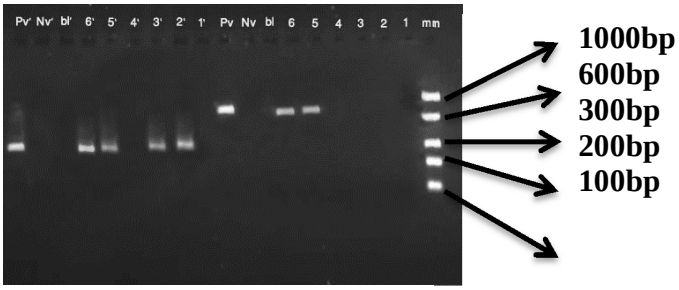

Fig. 9. DNA band attained with UV illumination