Korean J. Malacol. 26(3): 179-183, 2010

The Effect of Yellow Soil on Mortality of Korean Scallops, *Patinopecten yessoensis* at Indoor Tank

Bong Se Oh[1], Choon Koo Jung[1], Mun-Gyeong Kwon[2] and Jung Sick Lee[3]

[1]*South East Sea Fisheries Research Institute, Yeosu 556-823, Korea*
[2]*National Fisheries Research and Development Institute, Busan 610-900, Korea*
[3]*Department of Aqualife Medicine, Chonnam National University, Yeosu 550-749, Korea*

ABSTRACT

In other to understand the effect of yellow soil to mortality of Korean scallops, *P. yessoensis*, We investigated its mortality at indoor tanks. The environmental conditions such as water temperature, Salinity, Do and pH were continued constantly during the experimental periods. The 100% of survival rate showed in two experiments groups such as 0.1% and 0.4% of concentration of yellow soil and the other groups as 0.05% and 0.2% of concentration of yellow soil was appeared one dead scallop at each group for 8 days of the experiment periods. the gills of scallop in high concentration of yellow soil (0.2% and 0.4% groups) were covered by yellow soil particles so that this group's scallop should be got a high stress from yellow soil. I think this situation will be more continued for long time the scallop will become to dead. The results of bacteriological analysis did not isolated from haemolymph of scallops and no *Perkinsus* infectious disease in scallops and the scallops showed necrosis and degeneration on digestive grand and gills of scallop.

Key Words: Korean scallop, *Patinopecten yessoensis*, Yellow soil, Mortality

INTRODUCTION

The Korean scallops, *Patinopecten yessoensis* belongs to the family pectinidae, this family have 24 species of scallop which live in the sea water of Korea (Lee and Min, 2002). But some taxonomist classified this family pectinidae as 12 species (Kwon *et al*., 1993). Korean scallops inhabited in cold water and depth from 10 to 50 m so this scallop contains a kind of cold water species and they lived from 10℃ to 25℃ (Yoo, 1979).

On the other hand, we have been cultured several kinds of scallops for commercial production in Korea such as Korean scallop (Park, 1998), Jicon scallop, *Chlamys farreri* (Na *et al*., 1995) and Bay scallop, *Argopecten irradians* (Oh *et al*., 2002) which Bay scallop transplanted from China in 2002 and the China was also imported bay scallop from the Gulf bay of the America.

The Korean scallop maximum grows up 10 to 12 Cm of shell length and their weight is reached 130 to 200 g. It takes 20 to 28 months from seed (Park, 1998).

The aquaculture of Korean scallop was started in 1994 and the maximum production was recorded in 1996 but the next year there was sharply decreased of production due to mass mortality. The production was suddenly recovered in 2000. But the next year, mass mortality happened again and then the minimum production hit 23 mt in 2003 (Fishery statistics system, 2009).

In Korean scallop culture, the main problem is mass mortality. So, we would like to understand that how much effect to mortality of Korean scallop by the yellow soil. But there are nothing as a paper about relation between yellow soil and mortality of *Patinopecten Yessoensis* without a report of Sung *et*

Received June 20, 2010; Revised July 5, 2010; Accepted August 20, 2010
Corresponding author: Bong Se Oh
Tel: +82 (61) 690-8970 e-mail: obsksy@nfrdi.go.kr
1225-3480/24353

al. (2007). On the other hand, only a little paper was showed by foreign researcher such as Wildish and Power (1985) and Ying *et al*. (2009). So we have done mortality test during the indoor tank culture with several concentrations of the yellow soils.

MATERIALS AND METHODS

The experiment groups of yellow soil was consisted of triple groups at every concentrations of the yellow soils (0.05%, 0.1%, 0.2%, 0.4%) and the scallops was reared at the running water system with 15℃ (used Automatic Controlled water temperature) during the experimental periods. Experimental yellow soil was made through several levels of sieve. First, the 106 ㎛ m standard sieve to used and then water added it and that was re-filtered with 63 ㎛m standard sieve and after, the yellow soil was sink to the bottom in the water and then the water removed and wet yellow soil was dried by sun light and after that grind it for use.

We had been keeping the constant of concentrations of yellow soil at indoor tanks during the experiment periods (Fig. 1).

The experiment environmental condition, such as water temperature, Do, Salinity, pH, were checked by YSI (US/556 MPS) at every day and shell height, Shell length and Shell width which were measured by vernier caliper with 0.01 mm and weight was measured by an electronic scale with 0.1 g at initial and final time.

Mantle, gill and digestive gland tissues for light microscope observation fixed in 10% formalin for 24h and rinsed in running water for 24h and then dehydrated through a graded ethanol series (70-100%). the preparations were embedded in paraplast after being dehydrated through graded concentrations of ethanol. Embedded tissues were sectioned at 4-6 ㎛m thickness using a microtome. Samples were stained with Mayer's hematoxylin-0.5% eosin (H-E), periodic acid-Schiff solution and alcian blue (AB-PAS, pH 2.5) and observation yellow soil deposited to inner tissue.

Fig. 1. Experimental tanks for keep the constant of concentrations of yellow soil.

Scallop disease by groups, we investigated *Perkinsus* and bacteriology from samples its digestive grand and gonad and these detective methods was used PCR as examine methods. *Perkinsus* prevalence or infection was determined from histological method (H-E stain) and fluid thioglycollate medium (FTM) culture preparation of scallop tissue. For bacteriological analysis, total and vibrio cell count, 100 ㎕ of haemolymph was collected from the pericardium of scallops and cultured on TCBS and TSA.

Table 1. Environmental conditions of soil experiment groups

Divisions \ Con. of soil	0.05%	0.1%	0.2%	0.4%
Water temperature (℃)	14.56 ± 0.59	14.35 ± 0.87	14.27 ± 0.72	12.99 ± 0.37
Salinity	36.39 ± 0.07	36.29 ± 0.17	36.32 ± 0.05	36.22 ± 0.07
DO(mg/l)	5.82 ± 0.66	5.61 ± 0.49	5.84 ± 0.60	6.30 ± 0.60
pH	7.62 ± 0.34	7.80 ± 0.31	7.82 ± 0.26	7.70 ± 0.43

* Con: concentration

Table 2. A survival rate of Patinopecten yessoensis at concentrations of soil (June 16-23)

Divisions	Con. of soil	0.05%	0.1%	0.2%	0.4%
6. 16	SL (mm)	45.49 ± 1.62	43.37 ± 3.13	44.37 ± 1.66	42.56 ± 2.05
	TW (g)	11.30 ± 1.28	10.65 ± 2.27	10.97 ± 1.34	9.57 ± 1.53
	Number	30	30	30	30
6. 23	TW (g)	11.13	10.73	10.79	9.62
	Number	29	30	29	30

* Con: concentration, SH: shell length, TW: total weight

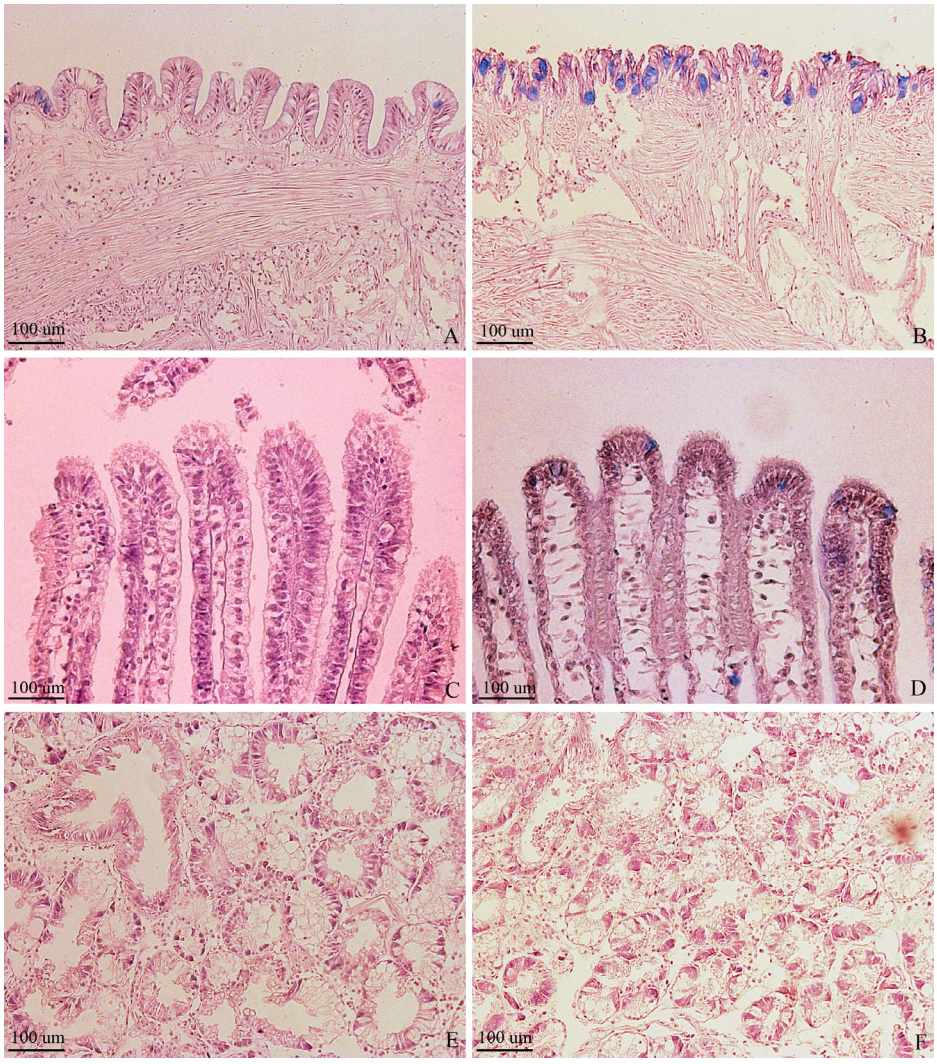

Fig. 2. Histology of organ system of the *Patinopecten yessoensis* exposed to yellow soil. **A**: Mantle of control, AB-PAS reaction. **B**: Mantle exposed to 4% concentration of yellow soil. Note the increased mucous cell, AB-PAS reaction. **C**: Gill of control, HE stain. **D**: Gill exposed to 2% concentration of yellow soil, AB-PAS reaction. **E**: Digestive gland of control, HE stain. **F**: Digestive gland exposed to 2% concentration of yellow soil, HE stain.

RESULT AND DISCUSSION

The environmental conditons of experiment was checked periodically and the results showed as table 1, the water temperature had been continued from 12.99-14.56℃ which was controlled by Automatic Water Temperature Control System (below call it as Aquatron that means brand name), Salinity was kept from 36.22-36.39 psu, Do was also controlled from 5.61-6.30 mg/l by supplied air and pH kept from 7.62-7.82. The experimental groups was kept their concentration of yellow soil by added some water of constant concentration of yellow soil during the experiment periods.

The temperatures of experimentals periods was not effect to the results of this experiment and another environmental items such as Do, pH, salinity were also not effect to the results of experiments.

The mortality of yellow soil by concentrations to Korean scallop showed as table 2. the 100% of survival rate showed in two experiments groups such as 0.1% and 0.4% of concentration of yellow soil and the other groups as 0.05% and 0.2% of concentration of yellow soil was appeared one dead scallop at each group for 8 days of the experiment periods. The gills of scallop in high concentration of yellow soil (0.2% and 0.4% groups) were covered by yellow soil particles so that this group's scallop should be got a high stress from yellow soil. I think this situation will be more continued for long time the scallop will be more to died.

The results of bacteriological analysis did not isolated from haemolymph of scallops and no *Perkinsus* infectious disease in scallops.

Accumulation of yellow soil in mental tissue no showed but increased mucous cells (Fig. 2. A and B). Gill was observed numerous particles on surface but not observed inner, in the 0.2% exposure group (Fig. 2. C and D). And observed particle in the digestive gland exposed to 0.2% yellow soil (Fig. 2. E and F). However, in order to gets the conclusion which is more detailed, the electron microscope observation considering the yellow soil particle size and food groove is necessary (Veniot *et al*., 2003; Cannuel *et al*., 2009).

As the result, although the concentration of yellow soil were over 0.2%, the scallop was not dead in short rearing time, but if the rearing time was longer the scallops was affected from yellow soil, so scallop was got a high stress due to increase amount of yellow soil particles attached to tissue that the scallop happened physiological and that will be caused to dead of scallop.

ACKNOWLEDGEMENTS

This study was supported by national fisheries research & development institute's fund (NFRDI, RP-2010-AQ-055).

REFERENCES

Cannuel, R., Beninger, P.G., McCombie, H. and Boudry, P. (2009) Gill development and its functional and evolutionary implications in the blue mussel, *Mytilus edulis* (Bivalvia: Mytilidae). *Biolical Bullitin*, **217**: 173-188.

Kwon, O.K., Park, K.M. and Lee, J.S. (1993) Coloured shells of Korea. *Academy Publishing, Seoul, Korea*.

Lee, J.S. and Min, D.J. (2002) A catalogue of molluscan fauna in Korea. *Korean Journal of Malacology*, **18**: 93-217.

Na, G.H., Jeong, W.G. and Cho, C.H. (1995) A study on seedling production of jicon scallop, *Chlamys farreri*. 1. Spawning, development and rearing of larvae. *Journal of Aquaculture*, **8**(4): 307-316.

Oh, B.S., Jung, C.G. and Kim, S.Y. (2002) Study of growth on bay scallop, *Argopecten irradians* in differential cultured depths. *Korean Journal of Aquaculture*, **15**: 61-68.

Park, Y.J. (1998) Biological studies on aquaculture of the scallop, *Patinopecten yessoensis* (Jay). *Philosophy Doctor Dissertation, Cheju National University*, 185pp.

Sung, C.G., Lee, C.H., Moon, S.D., Kim, J.H. and Lee, K.T. (2007) Acute and chronic effects of suspended particles on eel, *Astroconger myriaster*, shrimp, *Litopenaeus vannamei* and flounder, *Paralichthys olivaceus*. *Korean Society of Water and Wastewater, Korean Society on Water Quality Abstract book*, pp. 621-624.

Veniot, A., Bricelj, V.M. and Beninger, P.G. (2003) Ontogenetic changes in gill morphology and potential significance for food acquisition in the scallop, *Placopecten magellanicus*. *Marine Biology*, **142**: 123-131.

Ventilla, R.F. (1982) The scallop industry in Japan. Marine Biology, *Academic Press, London*, **20**: 309-350.

Wildish, D.J. and Power, J. (1985) Avoidance of suspended sediments by smelt as determined by a

new "single fish" behavioral bioassay. *Bulletin of Environmental Contamination Toxicology*, **34**: 770-774.

Ying, L., Shuanglin, D., Xiangli, T. Fang, W. and Qinfeng, G. (2009) Effect of dietary sea mud and yellow soil on growth and energy budget of the sea cucumber *Apostichopus japonicus* (Selenka). *Aqualture*, **286**: 266-270.

Yoo, S.K. (1979) 淺海養殖. *Sero Publishing Company*, 639pp.