

Wilailuk Khruanet 2014: Biochemical Evaluation of Dietary Quality in Relation to Growth Rate, Muscle Quality and Sexual Maturation of Freshwater Mussel *Chamberlainia hainesiana* (Lea, 1856). Doctor of Philosophy (Zoology), Major Field: Zoology, Department of Zoology.
Thesis Advisor: Associate Professor Uthaiwan Kovitvadh, Ph.D. 99 pages.

The activities of enzymes from digestive gland including stomach from freshwater mussel *Chamberlainia hainesiana* revealed the suitable optimal conditions at pH 6 40°C for amylase activity, pH 5 50°C for protease activity, and pH 8 50°C for lipase activity. No alkaline protease activities were detected. These conditions are suitable for future study on *in vitro* digestibility of feeds and feedstuffs. *In vitro* digestibility of 5 commercial diets and 21 feedstuffs from algae, plants and animals revealed that broken rice and soybean meal had the highest carbohydrate and protein digestibilities, respectively. The activity of trypsin-like enzyme has been found in oocytes of females, with optimal condition at pH 6 40°C.

Artificial diets were formulated based on *in vitro* digestibility screening of feedstuffs, prepared at 35%, 40% and 45% protein levels, and algae. There were no differences in the *in vitro* digestibility values between them. Changes in specific activities of amylase and lipase were dependent on time of treatment ($P < 0.01$), while that of protease specific activity was dependent on the interaction between time of treatment and feed quality ($P < 0.01$). The muscle qualities of freshwater mussels were similar between treatments at the end of experiment with 3 months period ($P > 0.05$). Growth was found to decrease due to maturation.

There were three stages of eggs observed; immature oocyte I, immature oocyte II and maturing oocyte I from the female gonad of mussels fed freely with natural plankton in the pond. After that, maturing oocyte I was moved to outer demibranch for the mature oocyte development. Trypsin-like specific activity was correlated with the number of maturing oocyte I ($r = 0.812, P < 0.01$). RNA levels were inversely correlated with the number of maturing oocyte I ($r = -0.326, P < 0.05$) and immature oocyte I ($r = -0.519, P < 0.01$). Protein levels were inversely correlated with the number of immature oocyte I ($r = -0.533, P < 0.01$) and immature oocyte II ($r = -0.517, P < 0.01$). RNA/protein ratio was inversely correlated with specific activity of trypsin-like enzyme ($r = -0.339, P < 0.01$) indicating a positive relationship between trypsin-like specific activity and protein level.

Water temperature had relationships with productions of immature oocyte I and maturing oocyte I. The pH ($r = -0.766, P < 0.01$) was generally inversely correlated with the production of immature oocyte I. Alkalinity ($r = 0.683, P < 0.05$), nitrate ($r = -0.676, P < 0.01$) and free CO₂ ($r = -0.736, P < 0.01$) were correlated with the production of immature oocyte II. Conductivity ($r = -0.799, P < 0.01$), and dissolved oxygen ($r = -0.867, P < 0.01$) were inversely correlated with the production of maturing oocyte I.

Student's signature

Thesis Advisor's signature