

Figure 9. Electron micrograph of early vitellogenic oocyte (Oc3) showing the secretory granules (Sg) undergoes aggregation, fusion and incorporation forming large endogenous yolk granules (**A**). The mitochondria (M), rough endoplasmic reticulum (RER) and granular mass (Gm) are frequently seen among the secretory granules (**E, F**). Meanwhile, The oocyte membrane become folding and forming digitations (*) for transport the exogenous yolk granules (Eg) (**A, B, C**). Some exogenous yolk granules transport via hemolymph, which could be seen on hemolymph sinus (Hs) wall of figure **A**. The nucleus (Nu) exhibited generalize decondense. The transporting of nuclear materials through nuclear space (Ns) and nucleopores (Np) to cytoplasm (Cy) could be observed along nuclear membrane (Nm) (**F**). Follicular cells cytoplasmic volume is increased and their organells developed. Its nucleus mostly occupied by euchromatin (**B**). Fm, follicular cell membrane; M, mitochondria; Om, oocyte membrane.

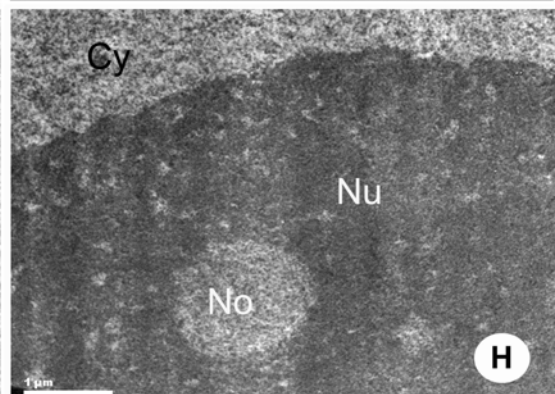
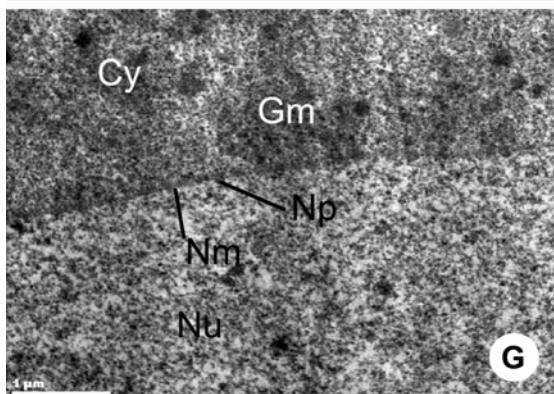
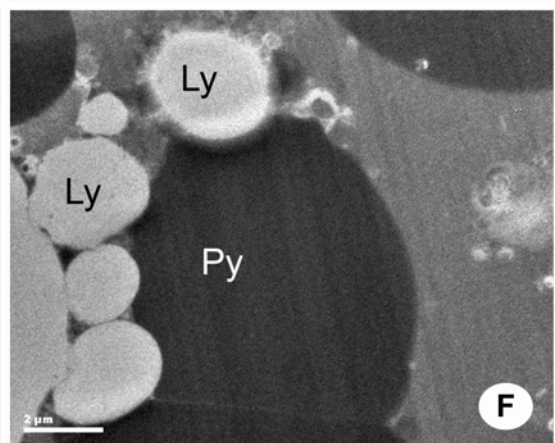
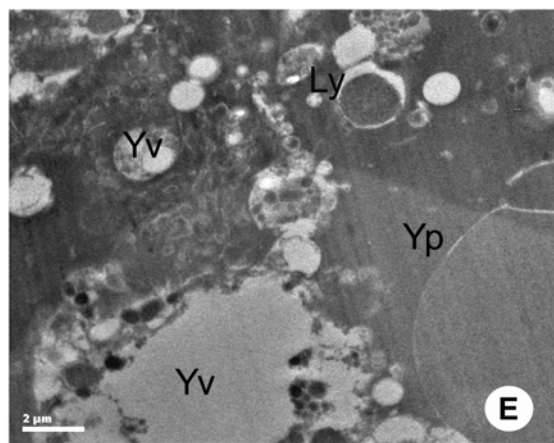
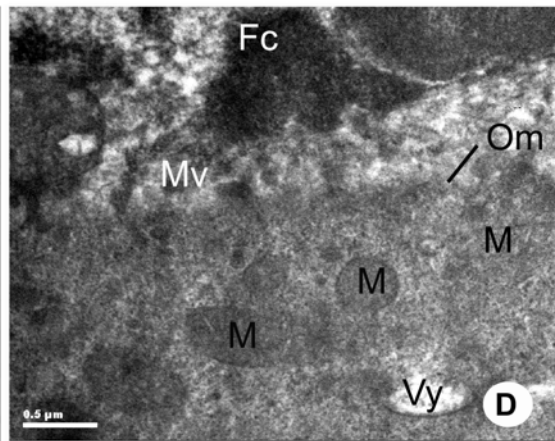
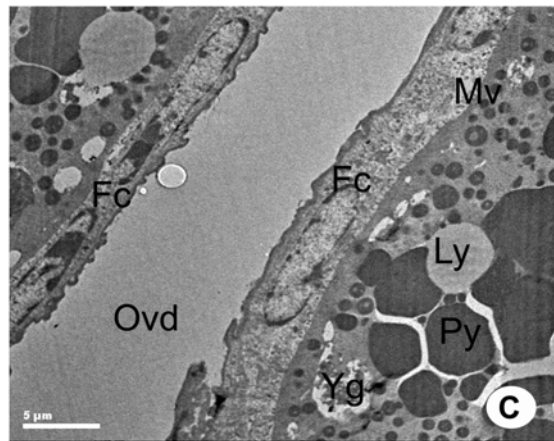
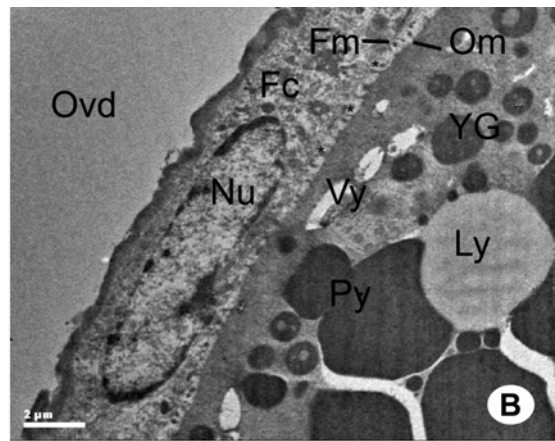
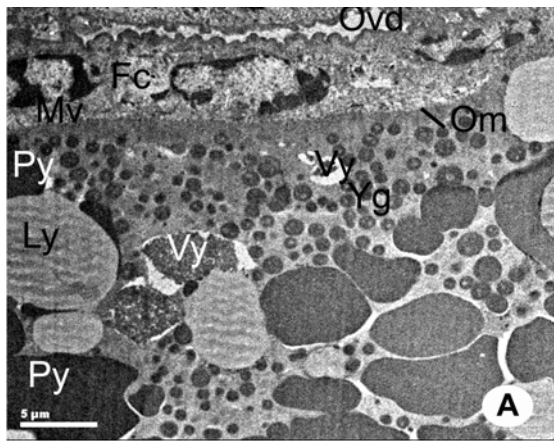


Figure 10. Electron micrograph of late vitellogenic oocyte (Oc4) exhibiting large amount of small and medium size proteinaceous yolk granules (Py) accumulation along the peripheral area of cytoplasm (Cy) (**A, B, C**). Incorporation of proteinaceous yolk granules, lipid yolk granules (Ly) and vesicular yolk granules (Vy) forming large yolk granule (Yg), which could be seen on inner area of cytoplasm (**E, F**). The mitochondria (M) are predominant underneath the oocyte membrane (Om) (**D**). The cytoplasm surrounding the nucleus remain cloudy with small granules and granular mass (Gm) (**G, H**). The nuclei (Nu) are similar the previous stage and some oocyte undergo more condense. The nucleolus (No) shows less condense and excentric in position (**H**). Moving of electron dense materials across nucleo pores (Np) is seen in figure G. The outer surface developed numerous multidirectional microvilli (Mv) along oocyte membrane (A-D). The follicular cells (Fc) are more flatten and elongation. Their nuclei contain mostly euchromatin (A-D). Ovd, oviduct.

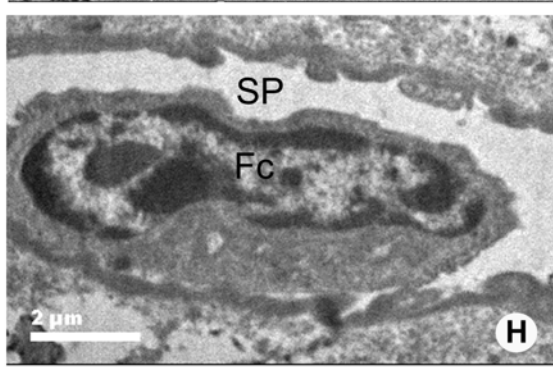
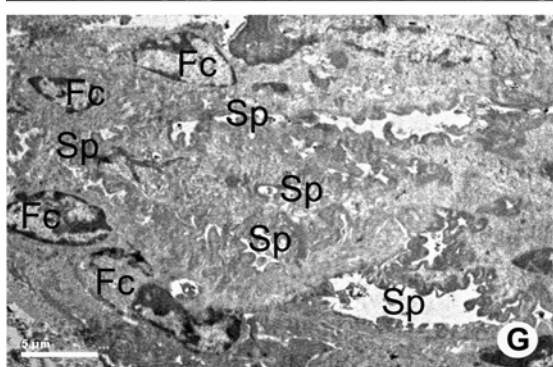
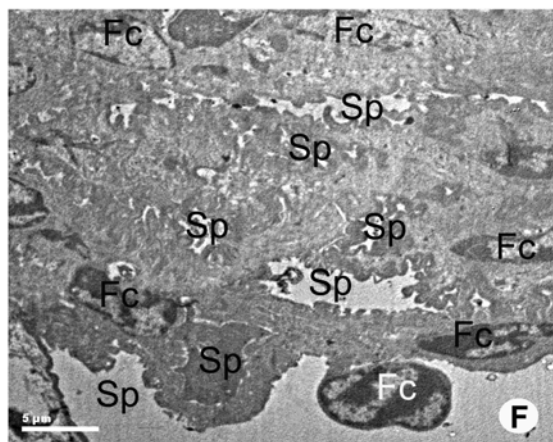
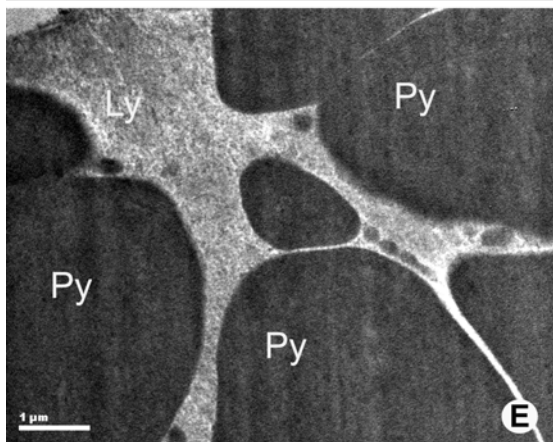
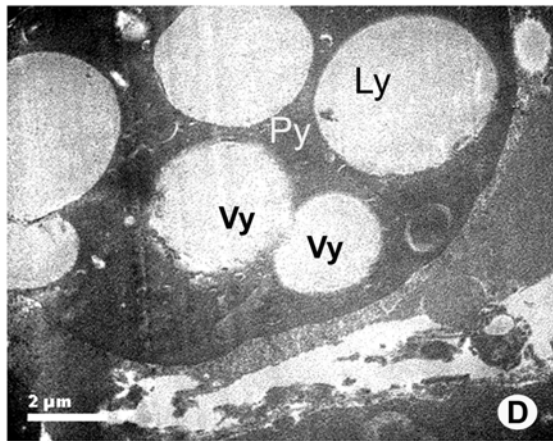
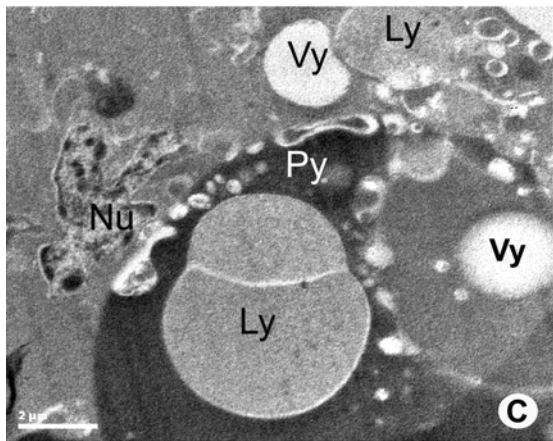
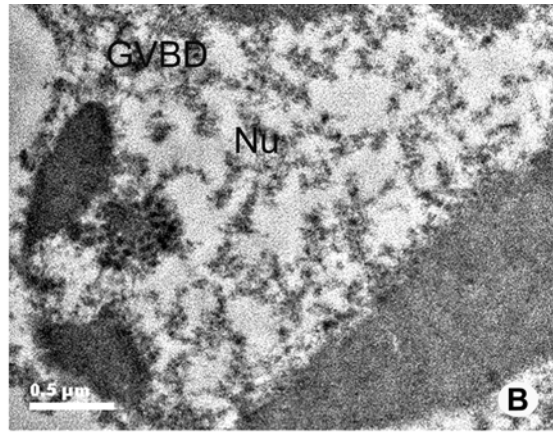
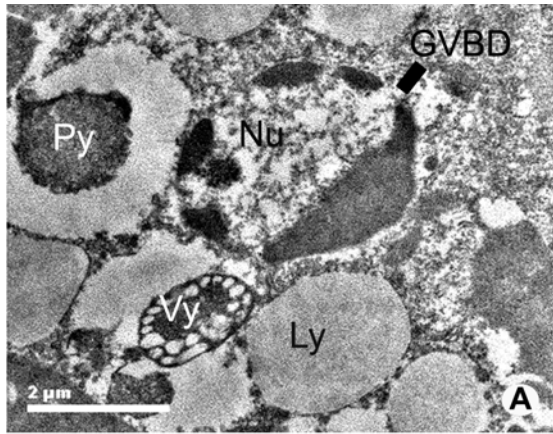


Figure 11. Electron micrograph of mature oocyte showing pronucleus (pN) on periphery of ooplasm surrounding with lipid yolk granules (Ly), protenatious yolk granules (Py) and vesicular yolk granules (Vy) (A, B). Disappear of nuclear membrane, which enter germinal vesicle break down; GVBD is seen. Large amount of yolk platelets forming by incorporate of lipid yolk granules, vesicular yolk granules and protenatious yolk granules (C, D, E). The chromosome of 1st meiosis metaphase following germinal vesicle breakdown could be seen in some mature oocyte (C). The developing oocytes in some oogenic pouch may become artresia and absorbed leaving spent oogenic pouch (Sp) and recoil follicular cells (Fc) (F, G, H).

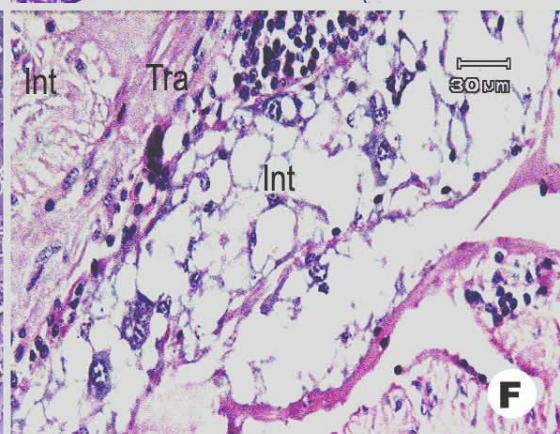
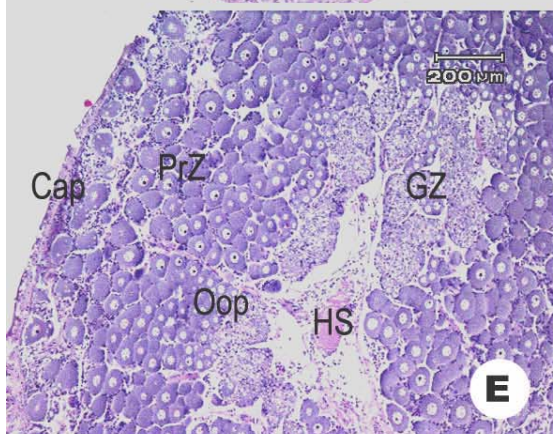
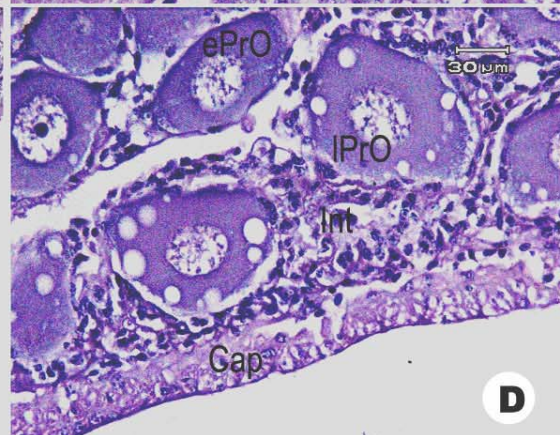
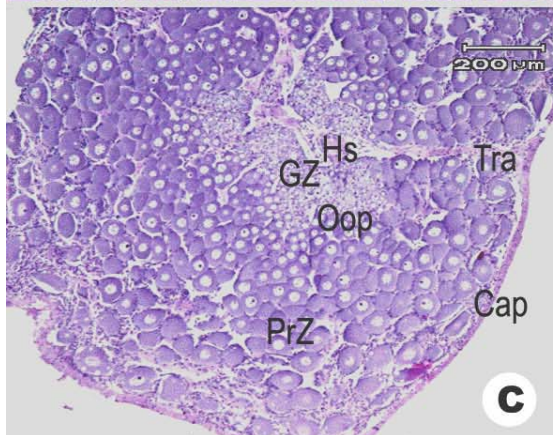
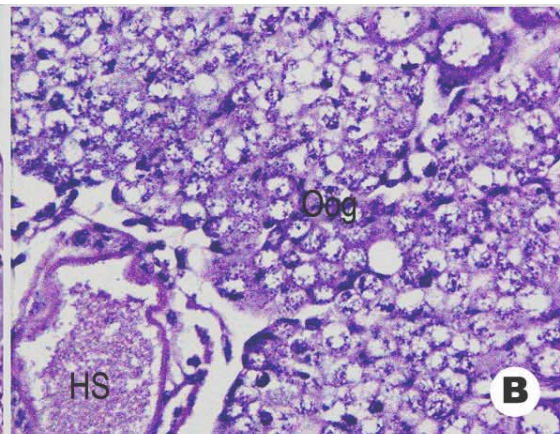
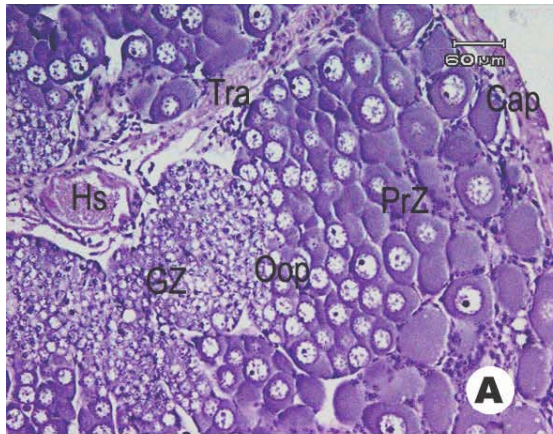


Figure 12. Micrograph of developing ovary of *Macrobrachium rosenbergii* broodstock during ovarian stage I. Clone of developing oocytes bounded by trabeculae (Tra), which extending from ovarian capsule forming conical profile called oogenic pouches (Oop). The ovary could be divided into 4 zones of oogenic (OZ), previtellogenic (PZ), vitellogenic and maturation zones (**A**). the later 2 zones did not observed during this stage. The oogonia (Oog) accumulated in oogenic zone (**B**), previtellogenic oocytes (Pro) in previtellogenic zone. The early previtellogenic oocyte(ePrO) located periphery to the oogonia (Oog). The main hemolymph vessel (Hv) located on central ovaria core (Cc) and radially branching into hemolymph sinus (Hs) accompanying the trabeculae. (**C** and **E**). Thickening of ovarian capsule (Cap) is prominent during this stage (**D**). Loosen of onnective tissue surrounding trabeculae is frequently seen during ovarian stage I (**F**).

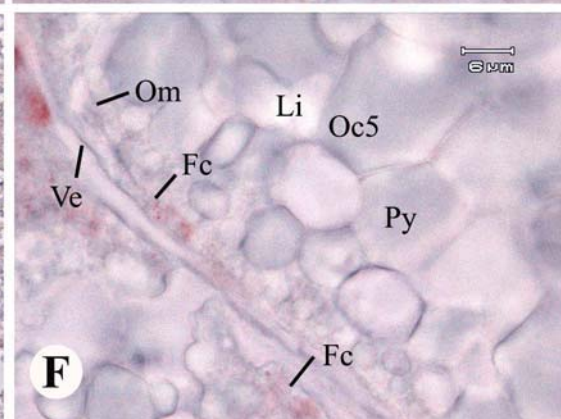
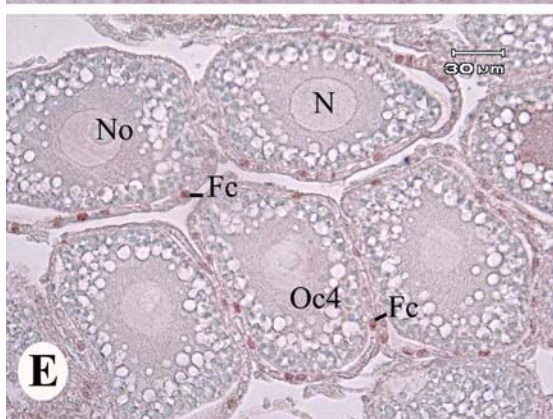
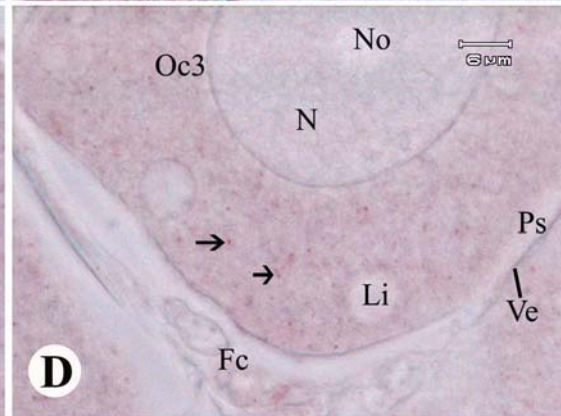
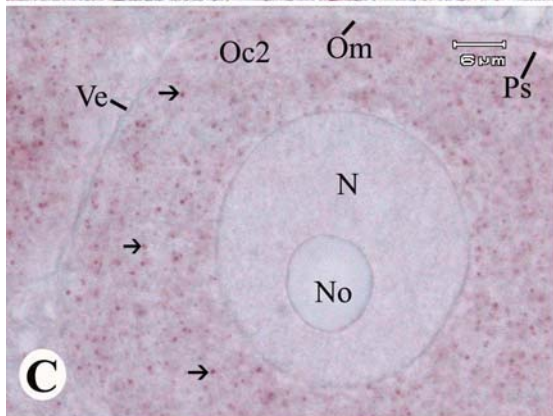
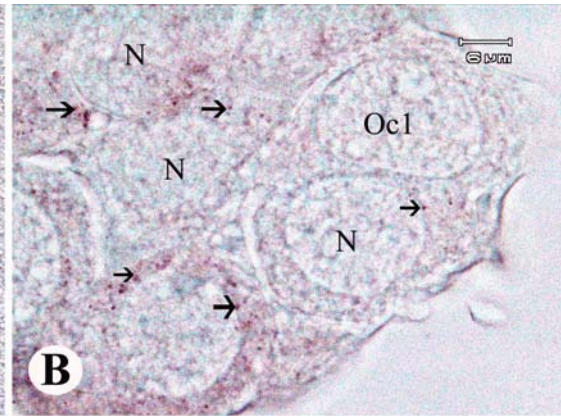
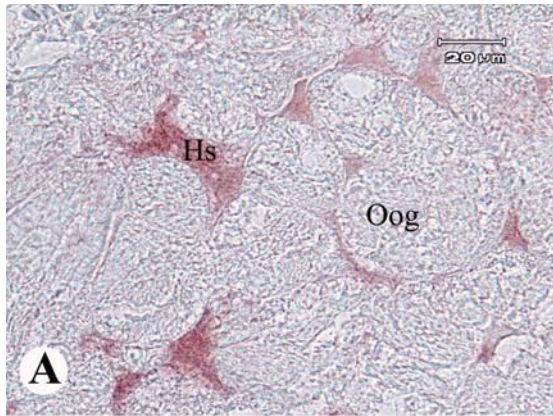


Figure 13. Micrograph of the 5HT-immunolocalization using AEC as chromogen in developing oocytes of *Macrobrachium rosenbergii* broodstock during ovarian cycle. Clone of oogonia (Oog) in oogenic pouch of stage I ovary exhibit negative stained, while a strong positive reaction is seen in hemolymph sinus (Hs) (A). The distinction of reactive 5HT immuno-stain occurred as dense core granules (arrow) during Oc1 (B) and Oc2 (C) of ovarian stage II and III respectively. The oocytes at Oc3 and Oc4 are gradually decreased in number and intensity of positive 5HT immuno-stain (D), while faintly homogeneous positive stained in nuclei (N), nucleoli (No) and lipid droplets (Li) are demonstrated. The positive 5HT immuno-stained is disappeared at Oc5 when lipid droplets and protenatious yolk are accumulated in ooplasm. However, transition of reddish-brown positive staining of 5HT to follicular cells (E) and hemolymph sinus (F) are demonstrated during ovarian maturation.

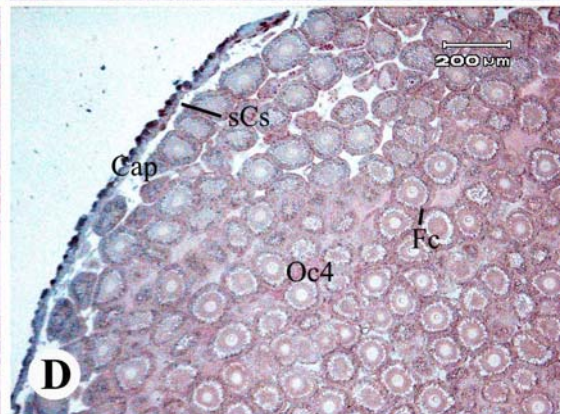
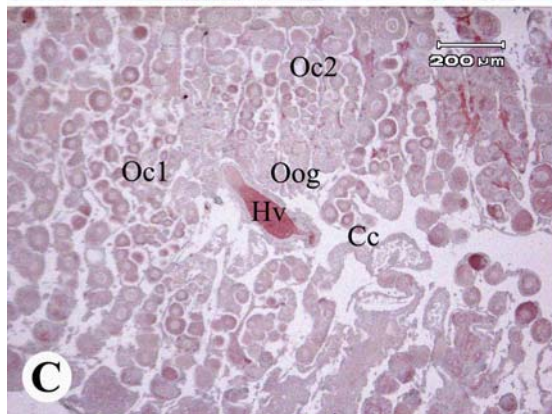
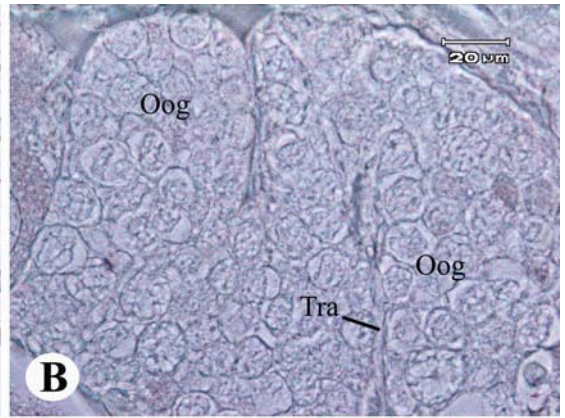
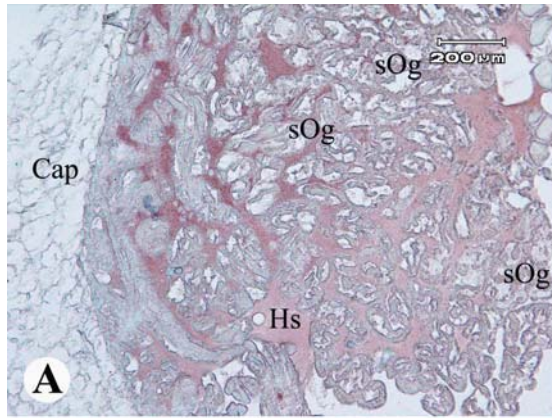


Figure 14 Micrograph of the 5HT-immunolocalization using AEC as chromogen in developing ovaries of *Macrobrachium rosenbergii* broodstock during ovarian cycle. During ovarian stage 0 (**A**), 5HT-immunoreactivity occurred only in hemolymph sinuses (Hs) among spent oogenic pouches (sOg). The positive reaction in stromal tissue is not seen, even in ovarian capsule (Cap). The 5HT-immunoreaction in hemolymph is disappeared when the ovary progress into stage I (**B**). The faint positive reactivity is observed among oogonia (Oog) and tra beculae (Tra). Generalize of 5HT-immunoreactivity is seen in the ovary at stage II (**C**). The most intense reactive is seen in hemolymph vessels (Hv), while the Oc1 and Oc2 oocytes are predominantly positive among the oocytes. The ovarian stage III (**D**) occupied mostly by Oc4. The intensity of 5HT-immunoreaction is decrease in oC4, but it shift to follicular cells (Fc). Less stained is seen in ovarian capsule and dilated subcapsular space (sCs) is observed .

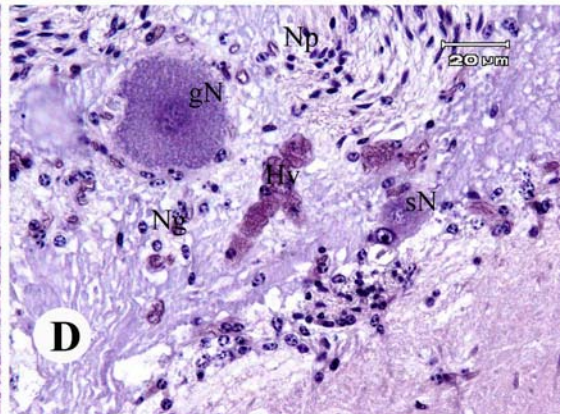
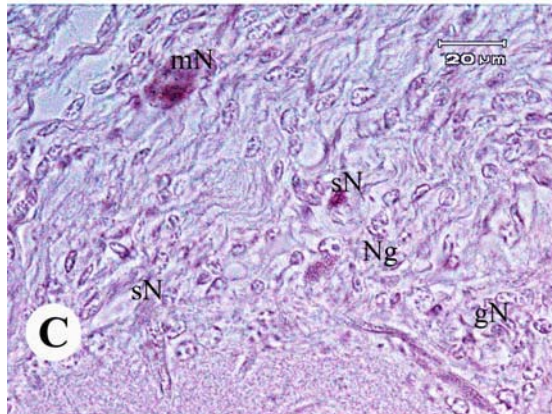
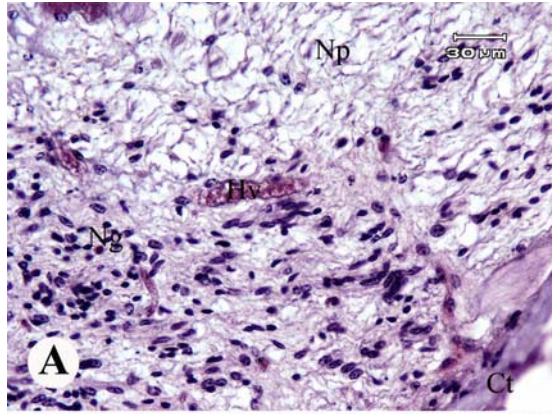


Figure 15 Micrograph of the 5HT-immunolocalization using AEC as chromogen in ventral nerve cord of *Macrobrachium rosenbergii* broodstock during ovarian cycle. During ovarian stage IV, the intense 5HT-immunoreactivity is seen in hemolymph vessels (Hv) traverse brain neuropiles (Np) (**A**) and ventromedial ganglion of brain (**B**). The faint 5HT-immunoreactivity is also found in area surrounding neuroglia (Ng), but absent in stroma and connective tissue (Ct). The faint reaction also seen surrounding small (sN), medium (mN) and giant neurons (gN). The similar 5HT immunoreactivity in thoracic ganglia neuropiles (**C**) and neural ganglia (**D**) are observed.