CHAPTER FOUR

D I S C U S S I O N

DISCUSSION ON HISTOLOGY AND HISTOCHEMISTRY OF MUCOSUBSTANCES IN BUCCAL MASS, ESOPHAGUS, STOMACH AND INTESTINE OF *O. Verraculatum*

Discussion :

The present investigation on mucosubstances in the mucosa (columnar epithelial cells and goblet cess), connective tissue, muscular layers and serosa of the alimentary tract of O. verraculatum was under-taken with a view to augment the mucosubstances in alimentary tract. The present chapter deals with the discussion on the results obtained in present investigation and the existing literature on mucosubstances in the molluscan alimentary tract. The present thesis deals with the mucosubstances present in various layers from mucosa to serosa in buccal mass, esophagus, stomach (including gizzard) and intestine in O. verraculatum . As it is brought to the notice that the paucity of literature on mucosubstances of the gastropod alimentary tract. It is hoped that such study will provide the knowledge of mucosubstance in alimentary tract of gastropod investigated, and to findout species species differences if any, in the alimentary tract mucosubstances as well as similarities and/or dissimilarities. The purpose of the present discussion is to view critically the results obtained in the present investigation and the information available through the existing literature.

1. Buccal mass

Buccal cavity is an oblique passage, which is slightly

eversible. Its wall thrown in to the conspicuous folds. The buccal region is continued into a large swollen bulb like muscular pharynx. The wall of the pharynx exhibits prominent folds, which formed the cavity in which the radula, the rasping organs is situated. The structure of the redula and radular apparatus has been extensively studied (Hoffman, 1932; Brown, 1934; Marcus, 1955; Lamche, 1956; Starmuhlmer, 1956; Cate, 1967) in several grastropods. The main function of the radula is to rasp off food attached to submerged objects. To achieve this function the radular apparatus has to perform a backward and forward movements, within the pharyngeal cavity. This movement is effected by means of muscle bands streching between pharyngeal bulb and the body wall. The radula is a chitinous plate bearing teeth on its surface; they are arranged symmetrically in transverse rows. Awati and Karandikar (1948) reported that the radula of Onchidium consisted of numerous transverse rows with about sixty minute teeth in each row. Radwin and Wells (1968) carried out a comparative study of radulae of 11 species of muricid gastropods. They concluded that there exists a relationship between the feeding habit and the radular structure.

The buccal mass in O. verraculatum consisted of mucosa, connective tissue, muscular layers and serosa. A similar histology was also described of the buccal mass of gastropod,

Bulinus truncatus by Luffy et al. (1974) and Theba pisama by Rolden and Diaz-Cosin (1975).

The distribution of mucosubstances in the various tissues and cell types in the buccal mass of this species was investigated. The histochemical results revealed the presence of hyaluronidase resistant sulfomucins in the epithelial cells; glycogen, neutral mucins and sulfomucins in the radula; neutral mucins in the connective tissue; glycogen in the muscular layer and neutral mucins as well as weak sulfomucins in the serosa. Reports on the buccal mucosubstances from other gastropods are not available, hence at this juncture it becomes difficult to deduce any information.

The mucosubstances observed in the epithelial cells, radula, connective tissue, muscular layer and serosa of the buccal mass in O. verraculatum show mostly the same tinctorial affinities with other organs of the alimentary tract. In their PAS reactivities, modifications by phenylhydrazine and diastase, alcianophilic reactivities, metachromasia sequential staining techniques, modifications in alcianophilia by methylation, saponification, acid hydrolysis and enzyme digestion tests they resembled to similar mucosubstances in other organs. (No special type of mucosubstances such as sulfated sialomucins, KOH-labile mucosubstances, high pH alcianophilic mucosubstances,

azurophilic but non-alcianophilic and alcianophilic but nonazurophilic mucosubstances were found in the various sites of this species).

The presence of glycogen in the muscular layer is well established. The present histochemical results also revealed the presence of the glycogen in the radula and muscular layer of this species. The importance of glycogen as an energy source for muscle contraction is well known.

2. Esophagus

The esophagus is a thin wall mascular tube, the function of which is to conduct food material from buccal mass to the gizzard-stomach. The wall of the esophagus consisted of chitinous lining, secreted by mucosal cells i.e. columnar epithelial cells and goblet cells. The connective tissue and muscular layers are comparatively thin and no glands were observed in these layers. The serosa is also very thin.

The distribution of the mucosubstances in the various tissues and cell types of the esophagus is studied in the species. The histochemical results revealed the presence of neutral mucosubstances, trace of glycogen and weak sulfomucins in the chitinous lining and in the columnar epithelial cells. The goblet cells show the presence of hyaluronidase resistant

sulfomucins, whereas, neutral mucosubstances in the connective tissue and serosa. The muscular layer contains glycogen only.

In similar studies Demian and Michelson (1971) have studied the epithelial mucins in the alimentary tract of a snail, Marisa cornuarietis employing histochemical techniques. They demonstrated four types of mucosubstances in six different types of cells viz. neutral mucosubstances with moderate to weak reactivity in the fusiform and club-shaped cells; strongly PAS reactive neutral mucosubstances in the ovate cells; PAS unreactive but strongly acidic sulfomucins in the goblet cells and saccular cells, whereas, PAS reactive but weakly acidic sulfomucins in the elongated conical cells. The observations in the present studies are in good agreement with above results.

The next interesting aspects is to view comparatively, the mucosubstances in the esophagus of the species under present investigation and the mucosubstances reported in the esophagus of other gastropods, to find out similarities or differences if any, and to draw a common plan of distribution of the mucosubstances in gastropod in general. Due to the scanty information of the mucosubstances in the esophageal tissues of other gastropods, it is not possible to draw a common plan of the mucosubstances distribution in the gastropod in general.

The present study reveals that, the columnar epithelial cell mucosubstances are identical with the mucosubstances found in the chitinous lining. This is an additional evidence to support the earlier view, that the chitinous lining was secreted by the columnar epithelial cells. The epithelial mucosubstances might protect the esophageal mucosa against rough surface of the food material and it act as a lubricant. This is only a suggestion and it should be confirmed further by experimental studies.

3. Stomach

The stomach is a thin wall chamber, which communicates with gizzard on one side and intestine on other side. The main function of the gizzard is to crush the food material, while the major activity of the stomach is to mix the food material throughly with digestive enzymes. The wall of the stomach consisted of mucosa, a thin connective tissue, well organized muscular layers and a typical serosa. The mucosal lining of the stomach, give rise to, two different sizes of villi, one is small and other is large (histochemically they are similar in nature). The villi exhibited numerous ciliated columnar epithelial cells and few goblet cells scattered in between them. The glands are not observed.

With regard to the distribution of the mucosubstances in the present investigation, revealed the presence of neutral mucosubstances in the columnar epithelial cells, connective tissue and serosa of the stomach. The muscular layers consist only glycogen, whereas, the goblet cells contain a mixture of sulfomucins and sialomucins.

The mucosubstances in different cellular sites from the mucosa to the serosa exhibited staining reactivities identical to the neutral mucosubstances, sulfomucins, sialomucins, glycogen and hyaluronic acid. So in the stomach of this species, there is no indication of the presence of any atypical type of the mucosubstances.

Another interesting point of discussion is to compare the mucosubstances in the stomach of this species and the mucosubstances present in the stomach of other gastropods, to find out the similarities or dissimilarities or species specificity if any, and to draw a distribution plan of gastric mucosubstances in gastropod in general. Due to the lack of information of the mucosubstances in the stomach of other gastropods, it is difficult to formulate any conclusion about distribution of the mucosubstances in the stomach of the gastropods in general. The mucins secreted by the epithelial cells might be protecting a delicate surface

epithelium of the mucosa against the proteolytic enzymes and luminal contents. This is only a possible conclusion, which required further research work for confirmation.

4. Intestine

The intestine of O.verraculatum is thin wall muscular tube and circular in cross section. The mucosa give rise to numerous micro villi, which are more in number and larger in size as compared the villi present in the esophagus. The mucosa contained non-ciliated columnar epithelial cells and few goblet cells, secretary in nature. The glands were found to be absent in the intestine of this species. The connective tissue is not well developed but muscular layers and serosa are prominent.

The present histochemical studies showed the heterogeneous distribution of the mucosubstances in various cell types and layers in the intestine of this animal. The histochemical results obtained, indicate the presence of neutral mucosubstances and weak sulfomucins in the columnar epithelial cells; a mixture of neutral mucosubstances (less amount) and sulfomucins (predominent) in the goblet cells; neutral mucosubstances in the connective tissue and serosa, and glycogen in the mascular layer.

In similar studies Demian and Michelson (1971) reported four types of mucosubstances in six different types of cells in the alimentary tract of a snail, M. cornuarietis. The neutral mucosubstances with moderate to weak reactivity in the fusiform and club-shaped cells; strongly PAS reactive neutral mucosubstances in the ovate cells; PAS unreactive but predominent acidic sulfomucins in goblet cells and saccular cells; and PAS reactive but weak acidic sulfomucins in elongated conical cells. The results obtained in the present investigation are in good agreement, with the mucosubstances reported earlier in the intestine of other gastropods. In the intestine of this species also there is no indication of the presence of any atypical mucosubstances. The intestinal epithelial mucins might be protect the delicate intestinal mucosa, from proteolytic enzymes. It acts as a antibacterial layer and might be function as a lubricant. At last this layer might be assisting in reabsorption of the digested food material. Of course, the above suggestions require further research for confirmation.

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