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RESEARCH ARTICLE

EFFECT OF PYGIDIAL SECRETION ON HISTOLOGICAL CHANGES IN THE SEMINAL VESICLE OF THE ADULT MALE *Sphaerodema rusticum* (HELEROPLERA: BELOSTOMATIDAL) IN RELATION TO REPRODUCTION

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ABSTRACT

The pesticides are used for the eradication of pest causes tremendous changes to the environment and also to other non – target organisms. To prevent such contamination of the environment and pests, uses of zoopesticides are in current use. The male reproductive system of *Sphanerodema rusticum* consists of a pair of testis, seminal vesicle vasdeferentia, a common ejaculatory duct and then into aedeagus. The seminal vesicle is bulged tubule shape structure. The seminal vesicle showed some marked changes in the insects treated with the (zoopesticide) pygidial secretion (25ppm median lethal concentration). Treated insects shows a highly disintegrated epithelial cells with weakly strained cyloplasum and nuclei with many cytoplasmic vacuoles. Hence, the recent study was undertaken to foldout the effect of phygidial secretion on *Sphanerodema rusticum*.

INTRODUCTION

The reproductive system of the insect is found to be a complicated one. General reviews of insect reproduction are given by Engelmann (1970) and Wigglesworth (1872). The structure of reproductive organ is described by Miall and Denny (1886) and Musgrave (1937).

The seminal vesicle of *Sphanerodema rusticum* appears to be short, stout, slender tube bearing the posterior region of the vas deferens (Osanai *et al,* 1986). The seminal vesicle has an outer connective tissue sheath and an inner circular muscle fibre (Joseph, 1965, Jayakumar, 1988 and Premarathi, 1993). Seminal vesicle is found to be composed of a single layer of simple columnar epithelial layer surrounding the narrow lumen (Numata and Hidaka, 1980). The secretion of these cells are found to be in the form of fine eosinophilic foamy secretory substances which are released into the lumen by the rupture of the apical regions of the cell membrane, and thus, if represents the apocrine mode of secretion Mernitt and Cummins (1978) similar studies have been carried out in relation to reproduction in *Odontopus varicornis* (Selvisabanayakam, 1995; Ravichandran, 1996). This consideration led to investigate the effect of zoopesticide, pygidial secretion on the seminal vesicle of *Sphaerodema rusticum*.

MATERIALS AND METHODS

The adult control and zoopesticide treated *Sphaerodema rusticum* were kept separately after 48 hours; they were dissected under binocular microscope by using Ringer solution (Emphrussi and Beadle, 1936). The ringers are subsequently removed and the tissue was fixed in Bocin's fluid for 24 hours. Later, the tissue was processed by adopting standard histological techniques (Gurr, 1958).

The nuclear volume and diameter of the seminal vesicle were calculated using a compound microscope fixed with a range of stage micrometer and an occular micrometer. Statistical calculations were done and student't' test were applied.

RESULTS AND DISCUSSION

The seminal vesicle of the control insects consists of an outer thin delicate membrane and it has folded epithelium internally with numerous nucleus. The cytoplasm contains a prominent spherical nucleus without any vacuoles. The nucleus is deeply stained with haemotoxylin. The lumen surrounded by the layer of folded columnar epithelium and contains rich secretory substances (Fig 1 and 2). The nuclear diameter and its volume are measured about 49.85 ± 1.2m and 1690-12 ± 1.4m^3 respectively.

The seminal vesicle of treated insect exhibits marled histological changes in its architecture such as highly disintegrated folded epithelium with feebly strained cytoplasm and nuclei. The size of the nucleus and its volume are reduced and measuring about 23.85±1.6m and 590.30±1.22m^3 respectively. The cytoplasm contains many vacuoles and appears to the less secretary in nature. The lumen contains a

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negligible quantity of secretory substance and wealthy stained with eosin (Figs. 3 and 4).

In the present study on seminal vesicle, it has been observed that the lumen of seminal vesicle was surrounded by columnar epithelium which rest on a basement membrane surrounded by a circular muscle layer. The secretory cells of columnar epithelium secrete nourishment for sperms. The seminal vesicle acts as store house for sperms (Indson, 1980). The lumen is filled with sperm bundles were reported in *Cylas formicarius* by Krishan (1933); Ctora Maheswari (2005) in *Sphaerodema rusticum*. Various kinds of secretions are produced by the epithelial cells along the reproductive tract and are mixed with spermatazoa to form semen (Gillot, 1988).

According to Vinicins Albano Araujo et al. (2005) the epithelium of the seminal vesicle was relatively thin and consisted of a monolayer of cuboidal cells adhering to a thick basement membrane. These epithelial cells were polarized and the luminal surface was differentiated into microvilli like projections that were frequently seen in contact with spermatozoa.

It has been reported earlier that the seminal vesicle of control insects showed the presence of an outer thin, delicate membrane and internally it has folded, epithelium with numerous nuclei. The columnar epithelial cells surrounding the lumen and their spherical nuclei were intensely stained with haematoxylin.

Table 1 Cytometric data of the seminal vesicle of the adult male insect *Sphanerodema rusticum*

Tissue	Group of insects			
	Aspects	Control	Treated	Inference
Seminal vesicle	Nuclear diameter (mm)	49.85 ± 1.2m	23.85 ± 1.6m	Changes in the nuclear diameter after treatment
	Nuclear volume (mm^3)	1690.12 ± 1.4m^3	590.30 ± 1.22m^3	Changes in the nuclear volume after treatment

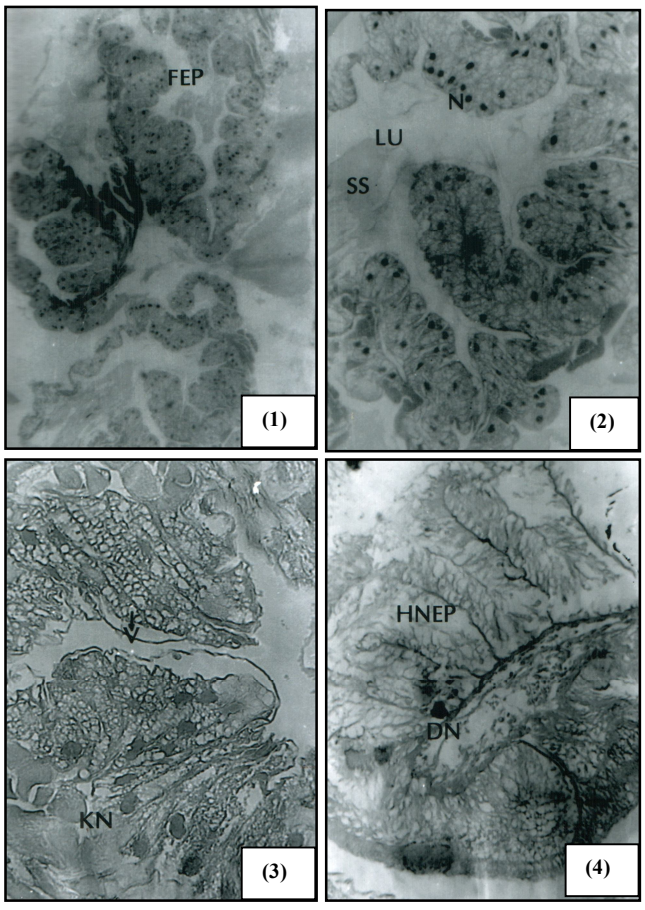

Fig. 1-2 Transverse section of seminal vesicle of control insect
Fig. 3-4 Transverse section of seminal vesicle of treated insect

FEP – Folded epithelium, LU – Lumen, N – Nucleus, SS – Secretory substances, V – Vacuole, KN – Karyotypic nucleus, HNEP – Highly necrotic epithelium, DN – Disintegrated nucleus

The cytoplasm contains prominent nucleus without any vacuoles. These findings appear to suggest that the secretory nature of seminal vesicle and its secretory substance may be used for the nourishment of stored sperms. On the other hand, the seminal vesicle of *Sphaerodema rusticum* treated with median lethal concentrations of zoopesticide showed on highly disintegrated epithelium with may vacuoles in the cytoplasm. These histopathological observations indicate that the secretory nature of the seminal vesicle has been affected, therefore, inadequate nourishment to the development to the developing and stored sperms.

Thus a similar changes have been reported in *Odontopus varicornis* when exposed to dimethoate that cause vacuolization in cytoplasm, enlargement of epithelial cells, disintegration of epithelial cell was and nuclear pycnosis in *Laccotrephes ruber* when exposed to mercuric chloride (Pazhanichamy, 1997), From the above findings it may be inferred that the zoopesticide produce severe histopathological changes in the seminal vesicle, so that the seminal vesicle has lost it secretory nature therefore no nourishment to the developing sperms in *Sphaerodema rusticum* when intoxicated with the zoopesticide, pygidial secretion.

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