



“BODY INDICES OF THE FRESH WATER SNAIL, *THIARA LINEATA*”.

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Abstract

The snail is economically important from ancient time and also harmful which serves as an intermediate host of various trematod parasites, which causes severe diseases to human being as well as domestic animals. The gastropod mollusc, Thiara lineata is a filter feeder at secondary level of fresh water ecosystem. The reproductive potential, resistance, survival abilities, feeding habits and most of the peculiarities are depending on the presence or absence of the body fluids, proportions of organs and organ index in the body of animal. Hence, it felt necessary to study alteration in the organ indices, reproductive index, shell index and water percentage throughout pre-reproductive, reproductive and post-reproductive period in the body of snail, T. lineata. The healthy, active and same sized mature adult animals were considered for an experiment. Whole body and different parts of the body, viz., brain, gonad, hepatopancreas, accessory gland, foot, reproductive tract, visceral organs (rest of the body) were estimated. The results were statistically analyzed and were found to be significant.

Keywords: *Thiara lineata, Reproductive tract Index, Water percentage, Shell and Organ indices.*

Introduction:

Mollusca is one of the great group of the animal kingdom, of which Gastropoda is a big class. In the whole world so far nearly 80,000 gastropod species have been described. The class Gastropoda comprises of three classes – Prosobranchia, Opisthobranchia and Pulmonata. The Prosobranchs are most important group of molluscs from the stand point of medical malacology, the studies on their physiological aspects and control measures are essential. For these purposes one of the prosobranch snail, *Thiara lineata* is selected as a model as these snails are abundantly available throughout India in freshwater bodies.

A number of studies have been carried out on the pesticide toxicity in aquatic gastropods. (Ramana Rao and Ramamurthi, 1978; Muley and Mane,1989; Magare, 1991; Chaudhari and Lomte, 1992, Jadhav *et. al.*,1995; Lomte and Waykar, 2000; Ahirrao *et al.*,2004; Ahirrao and Kulkarni, 2005; Ahirrao and Khedkar, 2012; Ahirrao and Borale, 2013 And Borale and Ahirrao, 2013. But different parameters like organ indices, reproductive index, shell index and water percentage in the body of snail is studied by very few workers. This prompted me to study the above factors. The present study was undertaken with the aim to extend our knowledge of body proportions in the body organs of aquatic snail, *T. lineata*. The principal objective were to investigate the Reproductive tract index, Water percentage, shell percentage and different organ indices viz. brain, gonad, Hepatopancreas, Foot, Accessory gland etc. in Pre-reproductive(Summer), Reproductive(monsoon) and Post-reproductive period(winter).

MATERIAL AND METHODS:

The geographical distribution being Northern hemisphere: latitude: 20⁰ 31' to 21⁰ 15' and longitude: 74⁰ 45' to 75⁰. Bori River's origin is at the Ravalgaon near Malegaon Dist-Nasik, MS India. The active and healthy snails, *T. lineata* were collected from 'Bori' river at Tamaswadi. The snails were brought to the laboratory and acclimated for four days. Each observation was confirmed by taking 25 animals in each set were confirmed at least for three replicates. All values were expressed as mg/gm wet weight and subjected to statistically analysis according to Bailey (1965). The physico-chemical parameters of the water were studied by method of APHA (1981).

For component indices study healthy and active snails of equal/ same sized adults were selected. The soft body of the animal (without shell and operculum) was taken out and the excess water was blotted out and it was then dissected in order to separate and weigh whole body and various body components particularly brain, gonad, hepatopancreas, foot, accessory gland.

Reproductive Tract (RT) Index: The Reproductive Tract index was calculated by the following formula:

$$\text{RT Index} = \frac{\text{Wet wt. of Reproductive Tract}}{\text{Wet wt. of the animal body}} \times 100$$

Water Percentage: The total body water content can be determined most accurately by the process of desiccation, Bischoff (1863).They were weighed (Whole body without shell and operculum) and kept in oven for 72 hours at 60⁰C for dehydration. The completely dried body of animal was weighed till a constant weight was obtained. The water present was calculated by the following formula Wells(1959):

$$\text{\% of Water} = \frac{\text{Wet wt. of Animal body} - \text{Dry weight of the Animal body}}{\text{Wet wt. of the animal body}}$$

Data from 25 animals was pulled together and the body component index for each component was determined for one year June 2011 to May 2012.

Sell Percentage: The shell percentage was calculated by the following formula:

$$\text{Shell Percentage} = \frac{\text{Wet wt. of Animal body with shell} - \text{Dry weight of the Animal body without Shell}}{\text{Wet wt. of the animal body with Shell}}$$

Organ Index: The organ index was calculated by the following formula:

$$\text{Organ Index} = \frac{\text{Wet weight of Organ}}{\text{Wet wt. of the animal body}} \times 100$$

Rain Fall: The rain fall reproduced here was recorded by Tamaswadi Metrological laboratory Tamaswadi, Tq. Parola Dist. Jalgaon from June 2011 to May 2012

Observations: The breeding habits of *T. lineata* were studied by Muley(1974). According to him, this snail is a continuous breeder showing the gravid condition throughout the year. Actually in monsoon the breeding activities are more and in the winter and summer the reproductive capacity has been reduced suddenly. Morphological observation of the snail showed that sexes cannot be identified externally. Careful observations of reproductive system after dissecting the snail have shown that the sexes are separate. The female bears the ovary embedded in the hepatopancreatic coil and an oviduct opening anteriorly near the brood pouch opening. The brood pouch like a large sinus and situated beneath the mantle roof in the antero-dorsal portion of the foot and extends backwards as far the apex of the mantle cavity. The males are rare in occurrence and can be distinguished from the females by the absence of the brood pouch.

RESULTS AND DISCUSSION

The physico-chemical parameters of water used for holding the animal had temperature between 26-28 °C, pH 7.1 to 7.3, total hardness 140 to 150 ppm and DO of 5.6 to 7 ml/lit.

The water percentage in the whole body of animal was determined since June 2011 to May 2012. The Maximum water content in the whole body of animal was recorded during the months of August to October (88.22 to 89.33%) Afterwards it starts declining slowly, and the minimum water content was recorded in the months of Feb, March, April and May (75.22 to 78.22). Though the animal is aquatic, still the variation in water percentage is due to different reproductive phase. Water is the most vital and at the same time the most abundant component of the animal body. It constitutes about 65-70% in terrestrial animals Mitchell *et. al.*,(1945) and 80-90 % of the total body weight in aquatic animals Widdowson *et. al.*,(1951). Without water there would be no form of life and it forms the intracellular medium within which metabolic reactions characteristic of living substances take place. Bischoff (1863) determined the water content of an executed criminal by the method of desiccation. Mitchell and his associates (1945), Widdowson and his co-worker (1951) have also determined the water content of the human beings by direct method. The average water content in different tissues of the human body is about 65 %.

The reproductive tract index was correlated with a function of seasonal breeding activity. It was observed that it showed changes according to the environment. The index was at its peak level in August and September. It is up to 32.00 and its minimum was recorded in March (25.92). The study of the functional morphology of the reproductive tracts and organs has been attempted by several workers in Pulmonates.(Hymen, 1967; Vijaym Sriramulu, 1993; Muley, (1974). An extensive literature is available on the relationship between neurosecretion and reproduction in molluscs. Gabe(1984) was the first to report cyclic neurosecretory activity, which was correlated with the reproductive cycle and ultimately affects on the reproductive tract index and other somatic organs also. The reproductive peak occurs in the monsoon season particularly in the month of August and September. Neurosecretory materials in small cells of visceral ganglia and lateral cells of cerebral ganglia were found to be accumulated significantly. While notable decrease was observed during post reproductive period. Parallel results were reported by Kulkarni and Hzari(1983), but they were reported through reproductive tract index and number of eggs in the ovotestis of *Cerastus*. Ekoue(1997) studied on growth and reproduction of the gaint African snail, *Achatina fulica* by determining the weight of the snails, number of eggs, weight of eggs, average weight of the eggs.etc. in the present study synthesis and secretions of the sex cells, materials and liberation of young ones responsible for decrease in the RT index in the post reproductive

phase. But in the reproductive phase it is increased up to the significant level. The total shell weight in relation with whole body (Wet weight) is calculated throughout the year. The maximum shell percentage was found in the month of October, November and February (81.68) and minimum shell percentage was recorded in the month of June July and August (82.46 to 88.22).

The organ indices was noted for the organs like brain, gonads, hepatopancreas , foot and accessory gland. The brain index was slightly increased in the months of November, December, April and May (0.6666). It shows slight variation throughout the whole year. In Molluscs nervous system has several advantages, such as gaint size of neurons, simplicity of structure, complexity of function and easy availability as compared to the rest of animals. (Muley 1974), the map of the organ and organ system as well as neurosecretory system was demonstrated in *Thiara lineata*. Neurohormone are secreted in the reproductive period(Magare, 2000). The reproductive system of molluscs are highly complicated It is a well known fact that the neurosecretory cells control the physiological processes like reproduction and exposure of animals to pesticides interfere with the normal functional process and ultimately create an imbalance in the normal system (Utkar, 1982). As the Brain is the master organ of the body hence slight variations are due to the some neurohormones are loaded or secreted during the pre-reproductive, reproductive and post-reproductive periods. The gonad index was found maximum in the month of November and December (1.4). After January it decreased gradually up to the month of April (1.2). This change is due to the synthesis and secretions of the sex cells and materials. Hence in the post reproductive period the gonad index has been declined significantly. The hepatopancreas and foot indices were found to it's maximum in the months of November, December and January (12.25). And Minimum indices were noted in the months of summer viz. March to June (7.777). The accessory gland index was greatly increased in the month of May to August and maximum in the month of July (0.9729). After September it was gradually decreased up to the month of February (0.6250). All these prominent organs indices were expressed here for a period from June 2011 to May 2012. Magare(2000) studies Histological and histochemical revealed that the neurosecretory material from medium cells of the visceral ganglion was found to be accumulated more as compared to the order neurosecretory cells during the breeding season. But during summer and late autumn the cell again loose their secretory material and become emptied, which fluctuated the organ indices as well as reproductive tract index. During the

tenure of study, it has been found that the reproductive potential is maximum is the monsoon. While it is suddenly decreased in winter(post-reproductive period) and it is slowly increased(Pre-reproductive period) in the summer it reached its maximum just before onset on rainy season. Water percentage is also changes in the different reproductive phases, As the reproductive organs are stimulated and shows active growth, cell division and secretion during the reproductive phase.

ACKNOWLEDGEMENT

Author is grateful to Shri B. V. Patil, Principal, Rani Laxmibai college, Parola, Dist-Jalgaon, for providing facilities and to vice-principal Shri V. N. Koli for constant co-operation and encouragement .

TABLES

Table: 1: Annual variations of RT Index, water and Shell percentage in the body of *T. lineata*

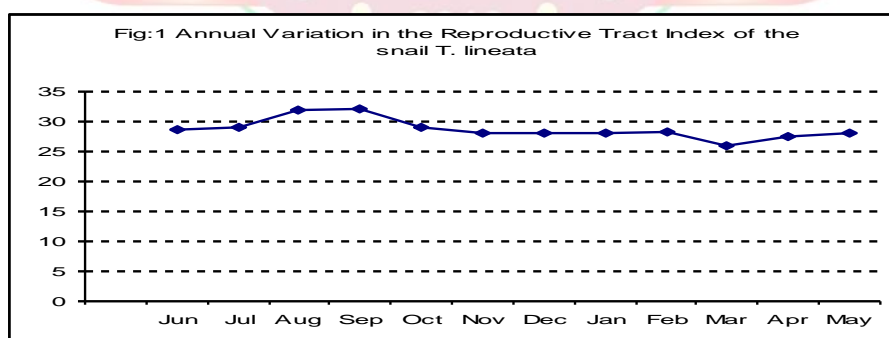
Year	Month	RT Index	Water percentage in soft body (Without shell and operculum)	Shell Percentage	Rainfall recorded in mm
2011	June	28.72 ± 0.02	82.46 ± 0.04	75.94 ± 0.06	77
	July	29.00 ± 0.02	85.12 ± 0.05	76.96 ± 0.09	60
	August	32.00 ± 0.05	88.22 ± 0.07	76.19 ± 0.08	143
	September	32.00 ± 0.06	89.23 ± 0.06	76.96 ± 0.05	40
	October	29.00 ± 0.04	89.23 ± 0.08	81.69 ± 0.08	64
	November	28.00 ± 0.02	87.03 ± 0.08	80.00 ± 0.04	-
	December	28.00 ± 0.02	79.42 ± 0.02	79.80 ± 0.02	-
2012	January	28.00 ± 0.02	78.12 ± 0.02	78.02 ± 0.02	-
	February	28.25 ± 0.03	77.85 ± 0.02	81.68 ± 0.02	-
	March	25.92 ± 0.01	78.22 ± 0.03	76.61 ± 0.02	-
	April	27.50 ± 0.02	75.22 ± 0.02	78.10 ± 0.02	02

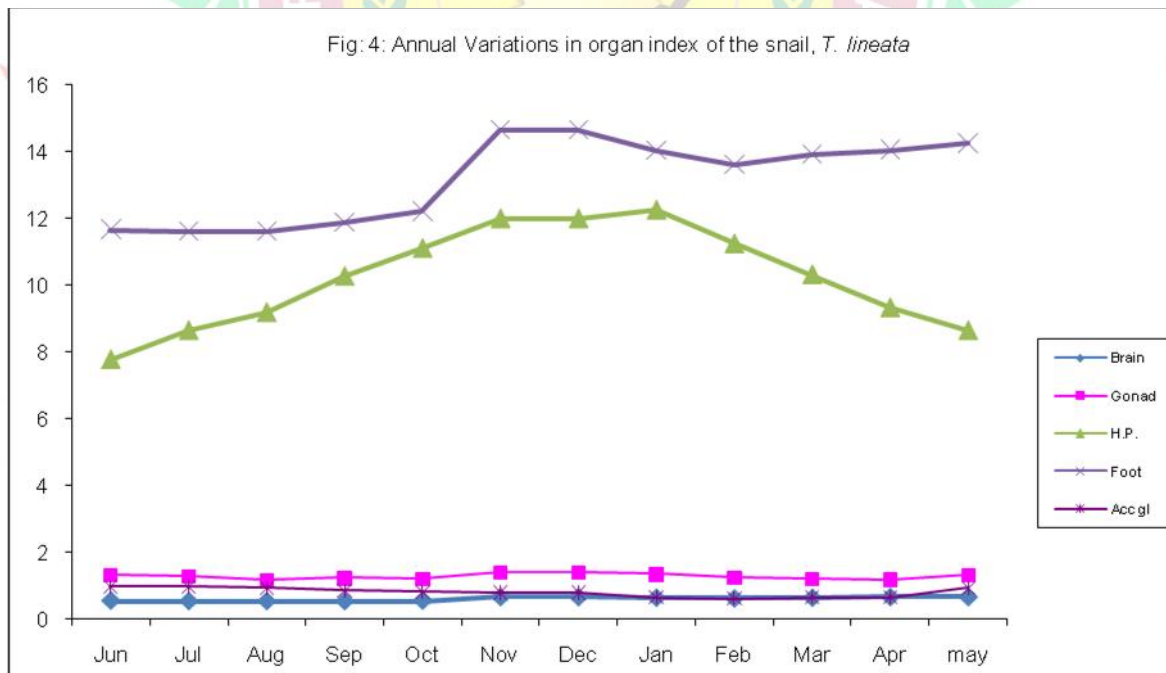
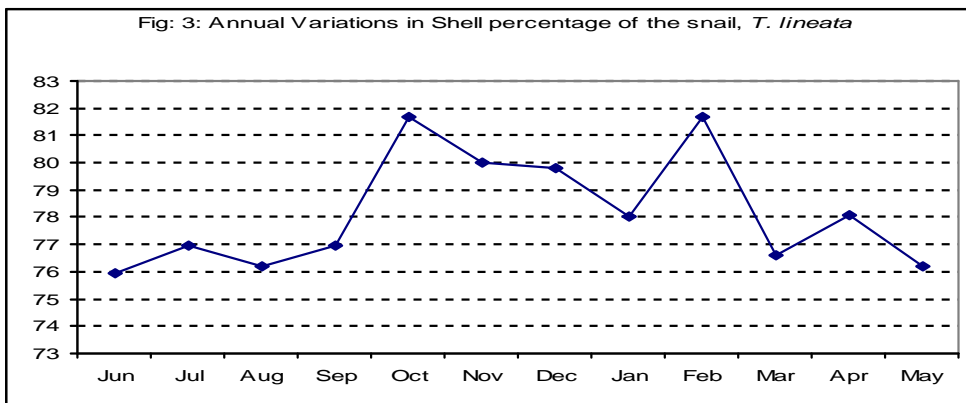
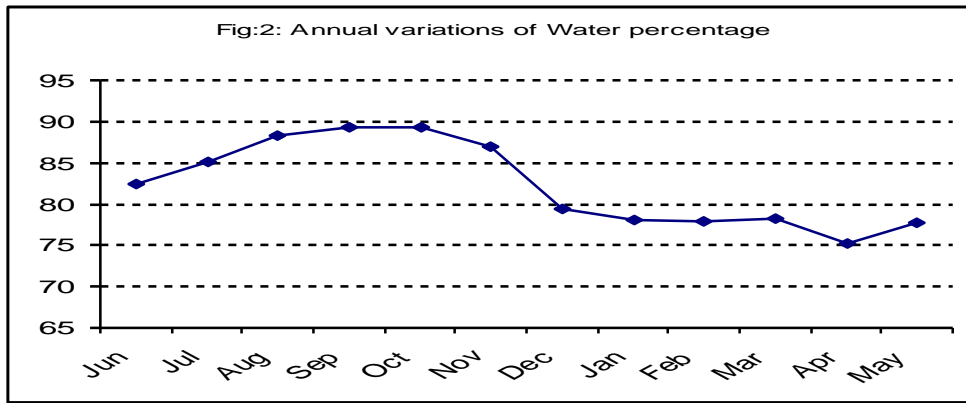
	May	28.00 ± 0.02	77.82 ± 0.02	76.19 ± 0.00	-
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Table :2: Annual variations of somatic index in *T. lineata*

Year	Month	Organ Index				
		Brain	Gonad	Hepatopancreas	Foot	Accessory gland
2011	June	0.5555	1.333	7.7777	11.6666	0.9722
	July	0.5405	1.2927	8.6486	11.6216	0.9729
	August	0.5405	1.1891	9.1891	11.6216	0.9459
	September	0.5405	1.2432	10.2702	11.8918	0.8648
	October	0.5555	1.2222	11.1111	12.2222	0.8333
	November	0.6666	1.4000	12.0000	14.6666	0.8000
	December	0.6666	1.4000	12.0000	14.6666	0.8000
2012	January	0.6451	1.3548	12.2580	14.0645	0.6451
	February	0.6250	1.2500	11.2500	13.625	0.6250
	March	0.6451	1.2258	10.3225	13.9354	0.6451
	April	0.6666	1.2000	9.3333	14.0666	0.6666
	May	0.6666	1.3333	8.6486	14.2666	0.9333

GRAPHS:





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