International Journal of
Life Sciences
International Peer Reviewed Open Access Refereed Journal

Int. J. of Life Sciences, 2019; 7 (1):120-122
ISSN:2320-7817(p) | 2320-964X(o)

Original Article Open Access

Changes in the glycogen content of the foot and hepatopancreas : Thermal relation of the slug *Semperula maculata*

Bidwai PA

Assistant Professor, Department of Zoology, Narayanrao Kale Smruti Model College (Arts, Commerce and Science), Karanja (Gh.) , Maharashtra, India
Email: pushpanjalib@gmail.com

Manuscript details:

Received : 17.01.2019
Accepted : 02.02.2019
Published : 31.03.2019

Editor: Dr. Arvind Chavhan

Cite this article as:
Bidwai PA (2019) Changes in the glycogen content of the foot and hepatopancreas : Thermal relation of the slug *Semperula maculata* , *Int. J. of. Life Sciences*, Volume 7(1): 120-122.

Available online on
http://www.ijlsci.in
ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

ABSTRACT

The study in respect to glycogen content in hepatopancreas and foot of the slug, *Semperula maculata* to acclimatize in changing natural environment at laboratory condition. Carbohydrates are the source of ready energy for organism to overcome stress. On warm acclimation (32^0 C and 36^0 C) glycogen content in the hepatopancreas and foot lowered down where as on cold acclimation (10^0 C and 15^0 C) these content raised, which shows that the slug, *Semperula maculata* is capable of adapting changes in the environmental temperature by modifying content.

Keywords: Slug, Glycogen, Thermal, Changes

INTRODUCTION

The terrestrial slugs and snails are in constant confrontation against exogenous factors for its survival. Because of the restraining influence of the ambient factor, the organisms are not uniformly distributed over the earth, (Edward et al., 1987, Gates., 1993). The animals in diverse environments are confronted with different problems, conversely in the same environment, different animals react to stress in different ways. Biochemical contents, enzymatic reaction rates alter as temperature oxygen and foodstuff changes. In mollusk biochemical correlation occurs with acclimated temperature, (Das, 1967). In mollusca, hepatopancreas is an important digestive gland and storage depot which plays a very important role in physiological process. Certain metabolic reactions are also found in the foot. Hence, these organs were taken for biochemical study. Slug, *Semperula maculata* is most commonly found in Vidarbha region and it is abundantly available in the field and garden. Now a day scenario is gradually changing. This fact provided an incentive to undertake the present investigation.

MATERIAL AND METHODS

Adult fully matured slugs, *Semperula maculata* were collected from city garden Paratwada and around Paratwada city, Maharashtra, India from July to September. The temperature of the soil at the time of collection varied generally from 26^0 C to 28^0 C. Slugs were brought to the laboratory and were maintained in the glass tough containing sufficient moist soil. They were fed once in a day with plant vegetation. Slugs were acclimated at room temperature (26^0 C to 28^0 C) for 3 to 4 days. For acclimation slugs were kept inside the BOD incubator at temperature 32 ^{0} C$\pm$ 0.5^0 C and 36^0 C $\pm$ 0.5^0 C for worm acclimation and at temperature 15^0 C$\pm$ 0.5^0 C and 10 ^{0} C $\pm$0.5^0 C for cold acclimation for 10 days. The slugs were gradually warmed or cooled until the desired acclimatized temperature was reached. Every after 2 days the soil in jar were replaced with moist soil already brought upto appropriate acclimation temperature. Concomitantly control slug were maintained similarly by keeping animals at a temperature (26^0 C to 28^0 C). Hepatopancreas and foot were dissected out from the slug and glycogen content of control and experimental tissue were estimated by Montgomery (1957).

RESULTS AND DISCUSSION

The glycogen level in hepatopancreas and foot on cold and warm acclimation of the slug, *Semperula maculata* are given in the following table and figure.

On cold acclimation in slug, *Semperula maculata*, the level of glycogen in hepatopancreas and foot was found to be increased and on warm acclimation, the level of glycogen in hepatopancreas and foot was found to be decreased.

Table 1: Changes in the glycogen content of hepatopancreas and foot of the slug, *Semperula maculata* on cold and warm acclimation (mg/gm wet wt.tissue)

Tissue		Cold acclimation		Warm acclimation	
		15^0 C	10^0 C	32^0 C	36^0 C
Hepatopancreas	C	41.80±2.50	40.40±1.50	41.80±2.50	40.40±1.50
	E	42.82±0.9**	45.12±2.0**	35.50±1.7*	32.03±1.5*
	% change	(2.44)	(11.68)	(-15.07)	(-20.71)
Foot	C	26.0±2.0	26.28±1.70	26.0±2.0	26.28±1.70
	E	27.25±1.35**	31.2±1.1**	14.0±2.8*	13.04±1.5*
	% change	(4.80)	(18.72)	(-46.15)	(-50.38)

C=Control,E=Experimental,*p<0.05,**p<0.01,Values in parenthesis are percent change over control.Values are means ± SE of 5 individual observations.

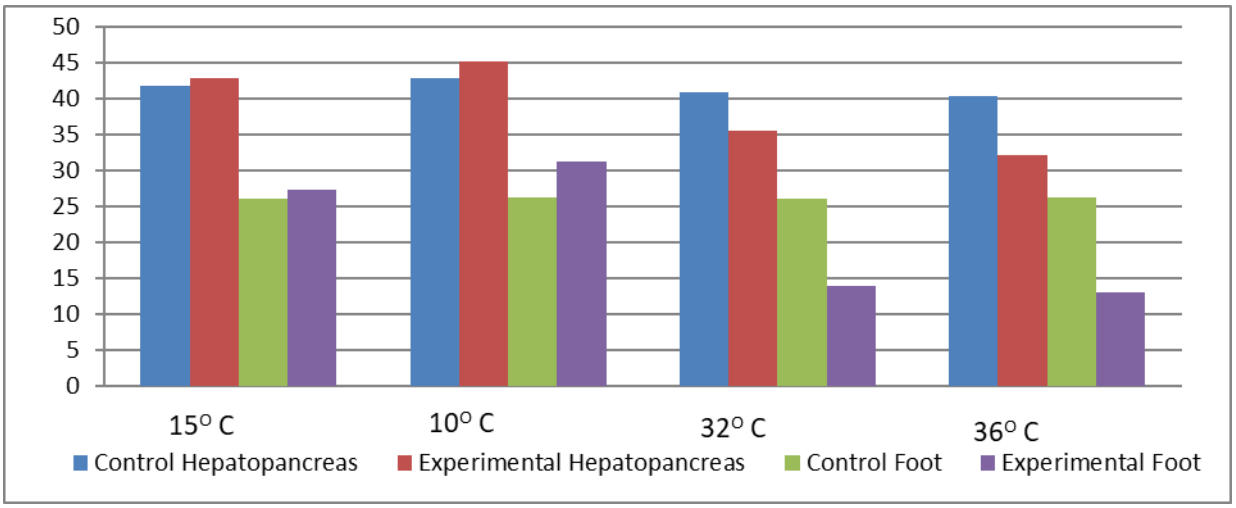

Fig 1 : Changes in the glycogen content of hepatopancreas and foot of the slug, *Semperula maculata* on cold and warm acclimation (mg/gm wet wt.tissue)

DISCUSSION

Glycogen is the major foodstuff of the animal. This food gets oxidized to meet most of the energy requirement of the body. During present study, glycogen content was found to be lower in warm acclimated animals in both the tissues that are hepatopancreas and foot. This result was similar to that of Das and Prosser (1967); Das (1967). While glycogen content in cold acclimated animals increased in both the tissues. In case of cold acclimation, as there is no activity of the animal, the constituents are not used, so there is an anabolic activity. Thus there is increase in the constituents. When the animals were acclimated for high temperature the much of the energy must have been used to compensate the stress. So there is depletion in the organic constituents. Excess glycogen is stored in different tissues, any stress of temperature, these stores are utilized to obtained energy for counteracting this stress. Such effect of temperature on the alteration in the biochemical substance of the body has been studied by Martin, (1966). Glycogen content of cryptozona acclimated to different temperature indicated that the glycogen content in foot and digestive diverticula was lowered at high temperature Mantale(1970); Kulkarni and Baramatiwala(1987) in *Bellamya bengalensis*. Davies (1966) worked on *Patella aspersa and P. vulgata* likewise Micallef and Banmister (1967) on *Monodonta turbinata* also noted abnormally irregular respiratory rates between 25^0 C and 35^0 C. In warm acclimation, the glycogen level in hepatopancreas and foot was decreased where as in cold acclimation glycogen content was increased. The glycogen is considered to be major source of energy in animal tissue and maintenance of glycogen reserves is an essential feature of normal metabolism of organism, a decrease in glycogen content of the slug after exposing to warm temperature was probably due to temperature stress and is accompanied by rapid depletion of glycogen reserves.

CONCLUSION

The findings of increase or decrease in glycogen content of hepatopancreas and foot at 10^0 C,15^0 C, 32^0 C and 36^0 C suggests that the slug,*Semperula maculata* is capable of adapting changes in environmental temperature by modifying contents.

Acknowledgement

I express my heart full indebtness and a deep sense of gratitude to my teacher Dr.K.M. kulkarni and my Ph.D guide Dr. B.D. Deshmukh. I am extremely thankful to Dr. S. P. Dhanwate Principal of Narayanrao Kale Smruti Model College, Karanja (Gh) and my colleague for their kind guidance and encouragement.

REFERENCES

Das (1967) Biochemical changes in tissues of gold fish acclimated to high and low temperature. II. Synthesis of protein RNA of subcellular fractions and tissue. composition. *Comp.Biochem.Physiol*.21:469-485.

Das and Prosser (1967) Biochemical changes in tissues of gold fish acclimated to high and low temperature". I. Protein synthesis. *Comp.Biochem.Physiol*.21:449-467.

Davies (1966) Physiological ecology of Patella.1.the effect of body size and temperature on metabolic rate. *J. Mar. Biol. Ass*. U.K., Vol.46, PP, 647-658.

Edward and Gillman (1987) Herbivores and plant succession. In : Colonization, Succession and Stability (eds A. J. Gray, M.J. Crawley and P. J. Edward) PP.295-314.Smposium of the British Ecological Society,26.Black-well Scientific Publications, Oxford.

Gates (1993) Climate change and its ecological consequences. Sunderland. Sinauer. Massachusetts.

Kulkarni and Baramatiwala (1987) Metabolic adaptations to temperature stress and temperature acclimation in Bellamya bengalensis (Lamark). *Comp. Physiol. Ecol*. 12,37-40.

Mantale (1970) Studies on the temperature tolerance in snail, Cryptozona semirugata. Part of the Ph.D thesis submitted to Marathwada university. Aurangabad. India.

Martin (1961) The carbohydrate metabolism of the molllusca: Comparative physiology of carbohydrate metabolism in heterothermic animals" university of Washington. Press, Washington.

Micallef and Bannister (1967) Aerial and aquatic oxygen consumption of Monodonta turbinate (Mollusca: Gastropoda). *J.Zool. Lond*. Vol.151 PP, 479-482.

Montgomery (1957) Detection of glycogen. *Arch Biochem Biophys*. 67(2):378-86.