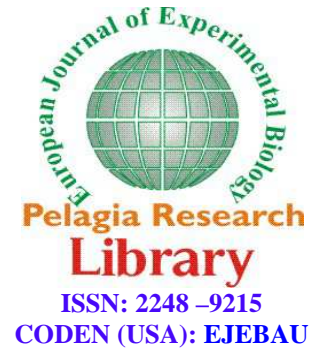




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## Analysis of the contraction kinetics of three fresh water Gastropod Molluscan Muscles of India

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**Keywords:** Grass- S4 Stimulator(USA), P. Globosa (Swainson) Fresh water species of India, L. Pseudosuccinea fresh water species of India, V. Bengalensis fresh water species of India

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### INTRODUCTION

Contraction Kinetics is the tension output under twitch and Tetanic phase. In order to get a correlated picture, the contractile properties under a given tension were studied with the pedal muscles of P. Globosa, V. Bengalensis and L. Pseudosuccinea. Stimulation was given through Grass S4 Stimulator (USA) with supramaximal voltage (20 volts in cases of P. Globosa and V. Bengalensis and 15 volts in case of L. Pseudosuccinea, 4msec.duration and either single shock for twitch and 10/sec for tetanus).

Stimulus patterns were those which caused maximal tension responses when applied directly to the muscles through Bipolar Electrodes. Tension was ensured by an isotonic myograph of the torsion type, with initial tension of 2-5 gm 25 degree C.

The isotonic Contraction evoked by direct electrical stimulation was recorded on a smoked Drum. Tension was measured from the Kymographic record. A baseline was drawn in each case and a line coinciding the maximum slope of rising and of the falling phase of the twitch was extended to the baseline in each case. The contraction time and the relaxation time was nicely recorded. The optimal frequency of stimulation needed for the development of maximal isotonic tetanic tension 25degree C was determined initially and finally 10/sec shocks was used in each case and a summary of the result has been prepared, which show weight relationship, tension output and various kinetics. The data clearly show that for each property there is some differences amongst the three species and the muscles of the mollusk are totally different from other invertebrates and vertebrates.

Twitch and tetanic responses of the muscles of the three species-The twitch tension of the muscle of individual species varied widely but it was much smaller than tetanic tension in all the muscles. Gloriously enough the ratio twitch tension by tetanus tension was smaller in all the three types of muscles in contrast to the other vertebrate striated muscles. Similarly the Tetanic tension varied widely in the three types of muscles but the ratio, though much smaller remained more or less to the same extent in all the muscles. Typical twitch and tetanic contraction of the three varieties of muscles are illustrated in fig. Which indicate that the contraction time did not vary widely from each other, though it was highest in P.globosa and lowest in V. bengalensis whereas the relaxation time was greatest in L. Pseudosuccinea lutela and shortest in P.globosa. The values presented in the table were obtained by averaging the mean results of atleast three twitches of each of the muscles that were used. Both the contraction time and relaxation time of the muscles of the muscles of individual species were much longer in contrast to other vertebrate striated muscles, but when their relative values compared with themselves, it became clear that the

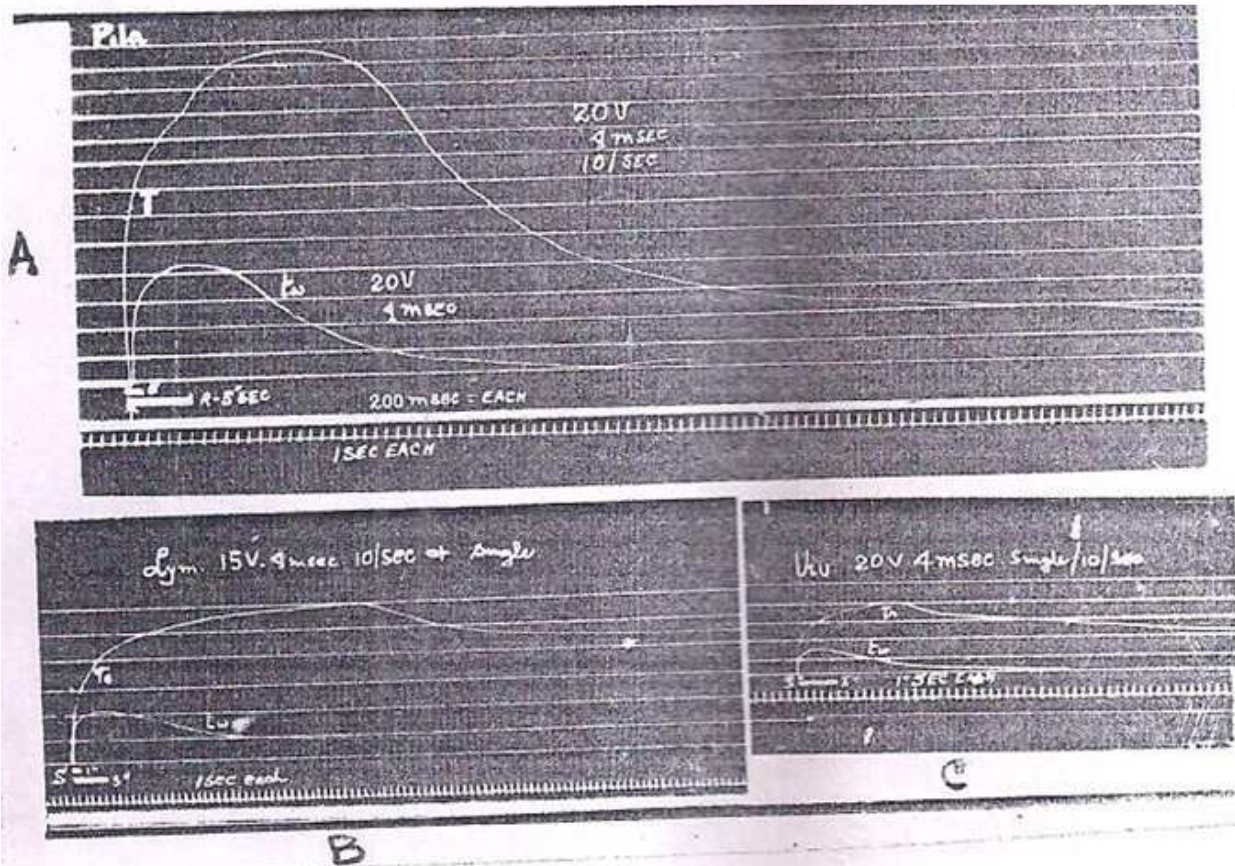
relative ratio of contraction time/relaxation time was highest in cases P. globosa (0.12) and lowest in cases of L. Pseudosuccinea(0.078).

Table - (I)

Contraction kinetics of the pedal muscles of Viviparus bengalensis, Pila globosa and Lymnaea (pseudosuccinea) luteola.

Properties	V. bengalensis	P. globosa	L. (pseudosuccinea) luteola
Muscle weight - ratio body weight	$\frac{262 \text{ mg}}{3750 \text{ mg}} = 0.07$	$\frac{2.8 \text{ gm}}{38 \text{ gm}} = 0.673$	$\frac{38 \text{ mg}}{480 \text{ mg}} = 0.08$
Isotonic twitch tension (in gm.)	16.7	45.5	22
Isotonic tetanus tension (in gm)	41.2	126.7	59.2
Relative Isotonic twitch tension/tetanus tension - ratio.	0.40	0.35	0.36
Contraction time of a single shock in msec.	380	310	250
Half relaxation time of a single shock.	1 - 4 sec.	640-850 msec.	1 - 3 sec.
Fusion frequency.	every 2 sec.	10/sec.	1/sec.

Each value is the mean of ten muscles.



Myographic record demonstrating the twitch and tetanus tension relationship as well as the contraction time and relaxation time of the single twitch contraction of the pedal muscles of the three species of gastropod mollusc.

A. – P.globosa – parameters of the stimulation 20 volts , 4 msec and 10/sec tetanic stimuli tension of the liver-10gm.

B. –Lymnaea -15 volts, 4 msec, 19/sec (parameters of stimulation – 20 volts , 4msec, 10/sec. Tension 5gm.

Tn – represents the contractile tension developed during the tetanic contraction as produced by repeated stimulation.

tv- represents the single twitch in rapidly moving drum.

Time signal at the bottom of each figure are of two kinds –one for tetanic contraction and is at 1sec.interval the other for twitch contraction which is 100msec.apart.

#### **Acknowledgement**

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