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# Effect of eye-stalk ablation on reproduction in female prawn *Macrobrachium* dayanum

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**ABSTRACT**

The effect of eyestalk ablation (uni-lateral and bi-lateral) on ovarian histology of *Macrobrachium dayanum* has been evaluated. Morphological variables like weight and size were recorded & ovaries were histologically evaluated according to oocyte diameter and percental occurrence of oocytes.In the ovarian tissue of unablated female's basophilic oocytes (BO) were dominant. Larger oocyte with yolky granules in the cytoplasm could be detected only in the ovaries of ablated females. Another distinguished feature of the ovaries of ablated females was the presence of advanced and atretic oocytes.The presence of advanced oocytes in ablated females probably indicates the effect of uni-lateral/bi-lateral eye-stalk ablation (UEA/BEA)in the reproductive cycles of *Macrobrachium dayanum* under laboratory conditions.

**Key words:** Eye-stalk abltation, *Macrobrachium* dayanum.

## INTRODUCTION

Fresh water prawns belong to order Decapoda and family Palaemonidae of class Crustacea.On the basis of information made available by several workers (Bhimacchar,1962, 1965; Chopra, 1939, 1943; Pannikar & Menon, 1956; Rajaylakshmii, 1960, 1961 & 1964; Randhir & Rajyalakshmi 1969;Jhingran 1982) has enlisted nine culturable species of freshwater prawns of the genus *Macrobrachium*.The two species of *Macrobrachium* viz. *M. dayanum* & *M. kistensis* that have been recorded from Jammu region of J&K state obey the laid criteria of Jhingran (1982) and hence are culturable and therefore warrant an extensive investigation for their commercial exploitation.

A comparative analysis with various species of fin fishes and shell fishes reveal that the two native species of Jammu water bodies stand at par with other commercially important species like Indian major carps and *M. rosenbergii* in terms of nutritional status especially the protein contents( *Catla catla*; 14.060% ; *M. rosenbergii*:21.17%;*M. dayanum*: 17.5%; *M. kistensis:* 11.42%). The only limitation which seems to restrict its commercial exploitation at large scale is its its size which is comparatively small size (Max. size:5cm)Present work therefore presents a beginning step in this direction where authors have tried eye-stalk ablation as a tool to enhance its growth and reproductive potential.

Eye-stalk ablation is the commonest technique and the most effective way to induce the ovarian maturation and spawning of many species of prawns in captivity(Browdy,1992) with this technique , the endocrine system is directly effected by reducing the inhibitory control over reproduction (Dall.et.al, 1990).Although faster maturation and a decrease in the latency period between spawning are commonly observed, conflicting results have been reported about the effect of eye-stalk ablation

on spawning quality (Beard & Wickins 1980; Emmerson, 1980; Browdy & Samacha, 1985; Tan-Fermin, 1991).

## MATERIAL AND METHODS

### Collection area

Prawns were collected from their natural habitat from a stream at Ghomanhasan located at a distance of 20km north west of Jammu city (32° 67'Lat N; 70° 79'Long E).

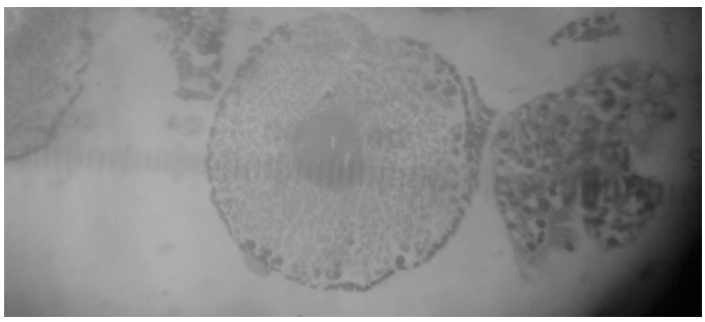
Prawns were collected from Ghomanhasan stream and these were acclimatized in plastic troughs at room temperature. They were feed on live fed and formulated feed, every alternate day dead prawns were removed. After acclimatization 60 prawns were isolated for experimental purpose, 10 each to be used as control, for uni-lateral bi-lateral ablation. Trials were kept in replicate. Ablation was performed by using a pair of scissors. The wound was cauterized by placing a hot blunt needle over it. The physiochemical parameters of water were maintained in the optimum range by replenishing 50% water every alternate day.

### Ovarian histology and data analysis

Fragments of each ovary were fixed in Bovine fixative. After dehydration in ethanol, these were embedded in paraffin and 5-7µm section were stained using Mallory's trichrome and Harris hematoxylin and eosine.

## RESULTS AND DISCUSSION

The studies regarding the effect of eyestalk ablation on reproduction is presented in Table 1 & 2. The perusal of Table I reveals highest oocyte diameter in bilaterally ablated prawns (0.263) followed by uni-laterally ablated (0.244) and the least in unablated prawns(0.233) . Results of UEA & BEA prawns were significantly different from unablated ($P<0.05$).There was however no significant difference between UEA & BEA prawns ($P>0.05$). Similar to oocyte diameter, the maximum percental occurrence of stage IV oocytes too was recorded in BEA followed by UEA and least in unablated prawns (Table 2). Mature oocytes make their appearance in UEA prawns after 45 days (10.33%) with mean oocyte diameter(0.214). In BEA, however quite encouraging results are evident, where as after 30 days period ,15.33% oocyte with maximum diameter of 0.238 have been observed.



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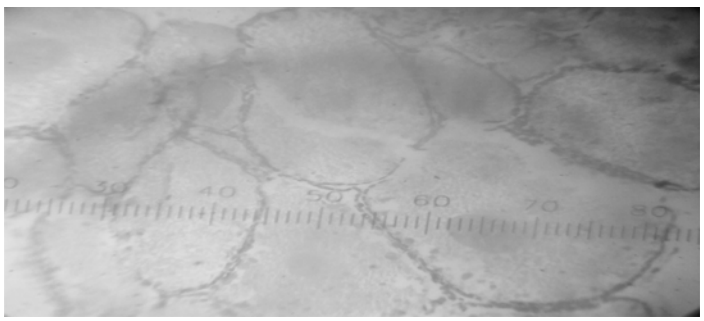

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**Fig. 1: A1-A2. Enlarged view of ovary of an ablated female showing Basophilic oocytes (BO)**

**Table 1: Oocyte diameter of unablated (control) and ablated (UEA & BEA) prawns *Macrobrachium dayanum***

| Prawn | S1 (Immature oocytes) | | | S2 (Maturing oocytes) | | | S3 (Early mature oocytes) | | | S4 Mature oocytes) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| days | Control | UEA | BEA | Control | UEA | BEA | Control | UEA | BEA | Control | UEA | BEA |
| 0 | .140±0.014 | .140±.014 | .140±.014 | .149±.008 | .149±.008 | .149±.008 | .177±.016 | .182±.014 | .182±.014 | 0.0±0.0 | 0.0±0.0 | 0.0±0.0 |
| 15 | .149±0.008 | .158±.008 | .163±.008 | .154±.014 | .163±.008 | .168±.014 | .182±.014 | .186±.008 | .192±.008 | 0.0±0.0 | 0.0±0.0 | 0.0±0.0 |
| 30 | .158±0.008 | .168±.014 | .186±.008 | .158±.008 | .170±.008 | .178±.008 | .186±.008 | .200±.008 | .210±..008 | 0.0±0.0 | 0.0±0.0 | 0.0±0.0 |
| 45 | .158±0.008 | .182±.014 | .196±.014 | .163±.008 | .182±.014 | .196±.014 | .186±.008 | .205±.008 | .214±.014 | 0.0±0.0 | .214±.008 | .238±.015 |
| 60 | .177±0.008 | .196±.014 | .205±.008 | .170±.014 | .186±.008 | .205±.008 | .196±.014 | .205±.008 | .219±.008 | .214±.008 | .228±.008 | .248±.009 |
| 75 | 0.182±0.024 | .196±.014 | .219±.008 | .186±.008 | .200±.008 | .224±.014 | .200±.008 | .214±.008 | .228±.008 | .219±.008 | .238±.008 | .263±.008 |
| 90 | 0.186±0.021 | .205±.008 | 0.0±0.0 | .196±.014 | .224±.014 | 0.0±0.0 | .205±.008 | .224±.014 | 0.0±0.0 | .233±.008 | .244±.017 | 0.0±.0.0 |

**Table 2: Percental occurrence of oocytes in unablated (control) and ablated prawn *Macrobrachium dayanum***

| Prawn | S1 (Immature oocytes) | | | S2 (Maturing oocytes) | | | S3 (Early mature oocytes) | | | S4 Mature oocytes) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| days | Control | UEA | BEA | Control | UEA | BEA | Control | UEA | BEA | Control | UEA | BEA |
| 0 | 50.00±1.00 | 51.66±1.52 | 50.00±2.00 | 35.00±1.00 | 30.00±1.00 | 34.00±1.00 | 15.00±1.00 | 18.00±1.00 | 16.00±1.00 | 0.0±0.0 | 0.0±0.0 | 0.0±0.0 |
| 15 | 1.00 | 40.00±2.00 | 40.33±1.52 | 35.33±1.52 | 41.00±1.00 | 41.00±2.00 | 20.00±2.00 | 19.00±1.00 | 18.33±1.52 | 0.0±0.0 | 0.0±0.0 | 0.0±0.0 |
| 30 | 37.66±1.52 | 30.00±1.00 | 27.66±1.52 | 41.66±1.52 | 45.33±1.52 | 22.33±1.52 | 20.00±2.00 | 39.66±1.52 | 40.33±1.52 | 0.0±0.0 | 0.0±0.0 | 15.33±1.52 |
| 45 | 30.00±1.00 | 19.66±2.51 | 18.33±2.51 | 50.00±2.00 | 30.66±1.15 | 21.33±1.52 | 20.66±3.05 | 40.33±0.57 | 42.33±2.00 | 0.0±0.0 | 10.33±1.52 | 20.00±2.00 |
| 60 | 24.66±1.52 | 14.66±1.52 | 11.66±1.52 | 40.00±2.00 | 21.00±1.00 | 14.00±1.00 | 25.33±1.52 | 43.66±2.51 | 23.66±2.51 | 10.33±2.51 | 19.00±1.52 | 49.66±1.52 |
| 75 | 25.33±1.52 | 10.33±1.52 | 4.00±1.00 | 24.00±2.64 | 15.00±1.00 | 6.33±1.52 | 34.00±3.60 | 30.00±1.00 | 26.33±1.52 | 15.33±1.52 | 44.00±1.00 | 69.66±2.51 |
| 90 | 19.66±1.52 | 5.00±1.00 | 0.0±0.0 | 19.66±2.51 | 11.00±1.00 | 0.0±0.0 | 34.33±2.08 | 20.00±2.00 | 0.0±0.0 | 24.66±2.51 | 65.00±1.00 | 0.0±0.0 |

After 75 days of experiment duration the ovaries of BEA prawns contained approximately more than 70% mature oocytes with GSI as high as 0.950 compared to 0.140 at the start of experiment. These mature oocytes exhibit spawning as induced by (a) reduction in the number of mature oocytes.(b) fall in GSI and (c) appearance of atretic oocytes in ovaries. UEA prawns on the other hand demonstrate the presence of maximum of 65% of mature oocytes with GSI…at the end of 90 days. At no point of time however did these UEA prawns exhibit either sign of fall in GSI or presence of atretic oocytes.In this context present findings on UEA are similar to Akta & Eroldogan (2004) who also have witnessed induction of maturation. In addition to maturation , spawning has also been recorded which however could never be achieved during 90 days of experiment duration in the present study. Such variation present authors feel may possibly be because of variables like sensitivity of prawns species at different ecological situations. Comparison of results on effect of UEA & BEA with controls simply highlights the effect of ablation as the later (control) during the experimental duration

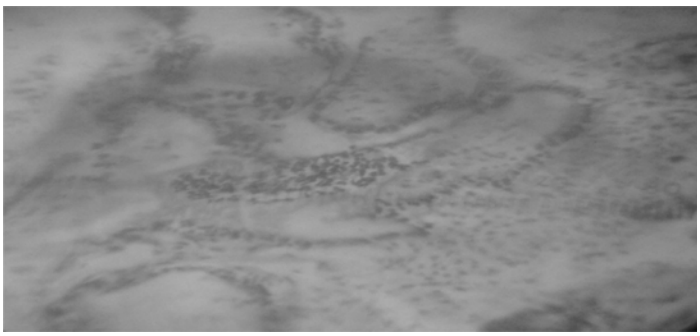

**Fig. 2: Atretic oocytes seen in the ovarian tissue of ablated females**

could record up to just 10% appearance of stage IV oocytes after 60 days which observed numerical increase only up to just 24% at the end of 90 days experimental duration when ovaries of UEA prawns have 67% stage IV oocytes & BEA showed spawning.

Explaining the effect of ablation endocrinologically, Peixoto et.al. 2002 stated that eye-stalk ablation accelerates the process of gonad maturation by reducing synthesis and release of gonad inhibiting hormone(GIH) from neurosecretory complex of eye-stalk.That such a mechanism operates,also been reported by Kulkarni and Nagabhushanam(1981) wherein they found unablated *Parapenaeopsis hardwickii* to have comparatively higher GIH level as compared to ablated ones .This hypothesis also seems to hold true and explain well the histological features of unablated could not exhibit the presence of mature oocytes up to 45 days of experiment duration where UEA had 10.33% and BEA had 20.00% of mature oocytes which signify the effect of GIH on inhibition of maturation in unablated prawns. From the ongoing discussion it is therefore apparent that only bilateral ablation in *M. dayanum* resulted in induction of maturation as well as spawning after 90 days.

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