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***Research Article***

# Seasonal variations of ascorbic acid and lipid composition of freshwater edible crab, *Barytelphusa guerini*

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**Abstract**

Biochemical contents like ascorbic acid and lipid of different tissue like muscle, gills, hepatopancreas, gonads, and whole body of crab, *Barytelphusa guerini* were studied. It was found that freshwater crab, *B. guerini* show fluctuations in their organic reserve according to the need and utilization. In present investigation it was found that the value of lipid in hepatopancreas was high and in gills it was low. The high value of lipid content of hepatopancreas is expected in view of its role as storage organ. Increase in lipid content of gonads during breeding periods related to its simultaneous decrease in hepatopancreas in crab, *Barytelphusa guerini.* The lipid increased in the gonads of crab, during the peak period of gonadal activity i.e. in summer. Ascorbic acid is strong reducing agent and acts as a co-factor in several metabolic reactions. The value of ascorbic acid in crab is low because of incapability of synthesis. Results of the analysis of ascorbic acid concentration in *Barytelphusa guerini* showed seasonal variation in different body components. The above clear indicate that need of dissection crab for understanding the biochemical change in different body parts of crab. So I recommended that research level dissection was required.

## INTRODUCTION

Crustaceans are widely distributed in freshwater and marine water. *Barytelphusa guerini* is most popular because of its size, meat quality. The crab is fast growing and adapts itself to various aquatic conditions. This crab is consumed largely as a protein source. Proximate biochemical analysis provides information on the nutritional value of a particular organism used as a source of food. There is considerable interest gained in determining the different biochemical parameters, as the different tissue and organs in an animal are structurally and functionally designed to carry out different physiological process. It is possible that they have different biochemical set up and may respond differently to seasonal changes. Crustaceans are the most important freshwater and marine water biota (Mali and Kalyankar, 2006).

The invertebrates show fluctuations in their organic reserves according to the need and utilization. From biochemical point of view class crustacean has been extensively studied by many workers. The biochemical composition of several marine organisms has been studied and comprehensive details are available on this subject. The knowledge of biochemical composition of any edible organisms is extremely important since the nutritive value is reflected in its biochemical contents (Biesiot *et al.*, 1995 and Sivachchandrabose, 2002).

There are several publications on the change in lipid composition of brood tissues, eggs

and nauplii during ovarian maturation in terms of total lipid, lipid classes and fatty acid profile. Studying these biochemical parameters allow better understanding of lipid requirements in maturing and reproducing shrimp. Such studies have been reported for *Penaeus monodon* (Dy-Penaflorida *et al*, 1990). (Calado *et al.*, 1995) reported the amino acid and fatty acid dynamics of *Lysmata seticaudata* (Decapoda: Hippolytidae) embryos during early and late reproductive season.

Ascorbic acid (vitamin C) is essential for the normal development and in most species it is produced endogenously thus resembling a hormone. Glucose and other hexoses, which are convertible to glucose, serve as the starting material for biosynthesis of ascorbic acid. Ascorbic acid plays a major role in tissue synthesis and growth processes and obviously mediates rapid tissue repair in disease conditions. A major function of ascorbic acid is the formation of tissue collagen also it takes part in the maturation of red blood corpuscles Ascorbic acid (vitamin C) has been widely used in the treatment and prevention of cancer; nevertheless, the clinical results are still inconclusive (Chatterjee 1995, Du J, 2012 and Guerriero et al, 2014).

In view of above, detailed investigation of the influence of season on biochemical contents of the reproductive tissues in crustaceans was felt highly desirable. Hence in the present investigation an attempt is made to gather information from the biochemical analysis of testis, ovary, hepatopancreas, gills, muscle and whole body of crab *Barytelphusa cuncularis.*

## MATERIALS AND METHODS

Healthy uniform size adult crabs, *Barytelphusa guerini* were collected from the Godavari River near Aurangabad. The crabs were collected every month for a period of one year from February-2005 to January-2006.The crabs were brought to the laboratory and placed in fresh river water for few hours to remove mud. Hepatopancreas, Gills, Gonads and Muscle were dissected out from these crabs. The tissues separated from crabs were taken into petridishes and kept in a hot air oven maintained at $60^0$C for a period of 48 –72 hours. Ascorbic acid was estimated from these tissues and whole body.The total ascorbic acid content of the tissue was estimated by 2, 4-dinitrophenyl hydrazine-spectrophotometer method described by (Roe J H., 1967) using spectrophotometer. The total lipid content of the tissue was estimated by Chloroform: Methanol method of (Barnes and Brad Stock, 1973) using spectrophotometer. The results are expressed in % of dry weight tissues.

## RESULTS AND DISCUSSION

The ascorbic acid and lipid content in different body components of *Barytelphusa guerini* was determined in three seasons (summer, monsoon and winter) and results are depicted in Table 1 and 2 and illustrated in figure 1 and 2. The ascorbic acid and lipid content in different body components of *Barytelphusa guerini* was determined in three seasons (summer, monsoon and winter) and results of the analysis showed seasonal variation in different tissues. Ascorbic acid (% dry wt.) in muscle varied from 0.163 ± 0.013 in summer to 0.105 ± 0.395 in winter. In gills it varied from 0.280 ± 0.180 in winter to 0.160 ± 0.036 in monsoon. Ascorbic acid in hepatopancreas varied from 0.365 ± 0.026 in summer to 0.258 ± 0.017 in winter. In whole body it varied from 0.363 ± 0.070 in summer to 0.170 ± 0.018 in winter. In testis it varied from 0.285 ± 0.013 in summer to 0.228 ± 0.31 in monsoon and in ovaries it varied from 0.450 ± 0.026 in monsoon to 0.195 ± 0.013 in summer. In general, value of ascorbic acid in crab tissue is low.

The lipids content (% dry wt.) in muscle fluctuated from 3.854 ± 0.680 in summer to 3.250 ± 0.534 in monsoon. In gills it varied from 5.325 ± 1.065 in monsoon to 2.846 ± 0.085 in summer. Lipid in hepatopancreas varied from 23.500 ± 2.380 in winter to 16.050 ± 0.100 in summer. In whole body it varied from 22.250 ± 1.707 in monsoon to 10.700 ± 0.476 in summer. In testis it varied 8.625 ± 1.690 in summer to 6.975 ± 0.974 in monsoon and in ovaries it varied from 9.625 ± 1.075 in summer to 6.362 ± 0.576 in monsoon.

The ascorbic acid and lipid of a tissue also depends upon the status of the metabolism. The gonadal cycle of *Barytelphusa guerini* an be divided into four phases during one-year period as preparatory phase during January to March, Pre-spawning phase during April to May, spawning phase during August and September and post-spawning phase during November and December. The developing gonad was in the preparatory phase, developed gonad is during Pre-spawning phase, ripe was during spawning phase and regressed gonad is during Post-spawning phase. This had been based on changes in the gonad somatic index.

**Table 1: Seasonal change in ascorbic ascorbic acid percentage (%) in different tissues of *Barytelphusa guerini***

| Seasons | Muscles (% dry wt.) ± S.D | Gills (% dry wt.) ± S.D | HP (% dry wt.) ± S.D | Whole body (% dry wt) ± S.D | Testis (% dry wt.) ± S.D | Ovaries (% dry wt.) ± S.D |
|---|---|---|---|---|---|---|
| Summer | 0.163± 0.013 | 0.228± 0.013 | 0.365± 0.026 | 0.363± 0.017 | 0.285± 0.013 | 0.163± 0.013 |
| Monsoon | 0.130± 0.014 | 0.160± 0.036 | 0.290± 0.048 | 02163± 0.021 | 0.228± 0.031 | 0.450± 0.026 |
| Winter | 0.105± 0.0395 | 0.280± 0.180 | 0.258± 0.017 | 0.170± 0.018 | 0.235± 0.017 | 0.265± 0.013 |

**Table 2: Seasonal change in lipid percentage (%) in different tissues of *Barytelphusa guerini***

| Seasons | Muscles (% dry wt.) ± S.D | Gills (% dry wt.) ± S.D | HP (% dry wt.) ± S.D | Whole body (% dry wt) ± S.D | Testis (% dry wt.) ± S.D | Ovaries (% dry wt.) ± S.D |
|---|---|---|---|---|---|---|
| Summer | 3.854± 0.680 | 2.846± 0.085 | 16.050± 0.100 | 10.70± 0.476 | 8.625± 1.690 | 9.625± 1.075 |
| Monsoon | 3.250± 0.534 | 5.325± 1.065 | 19.250± 2.500 | 22.25± 1.707 | 6.975± 0.974 | 6.362± 0.576 |
| Winter | 3.750± 0.168 | 2.975± 0.087 | 23.500± 2.380 | 12.43± 2.447 | 8.350± 0.129 | 8.210± 0.235 |

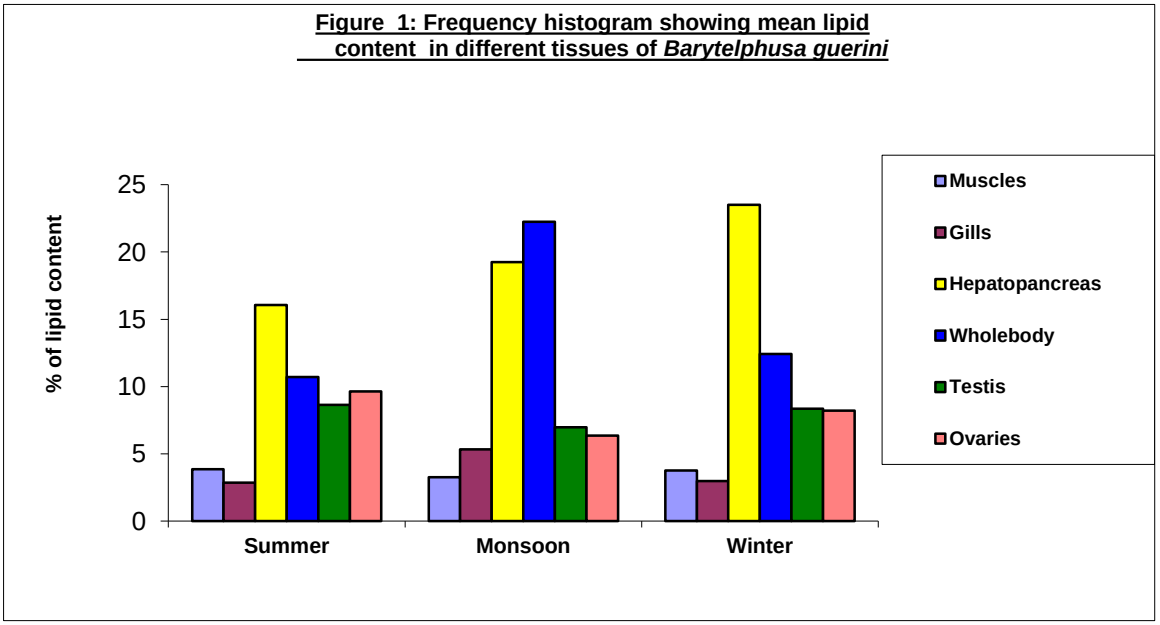
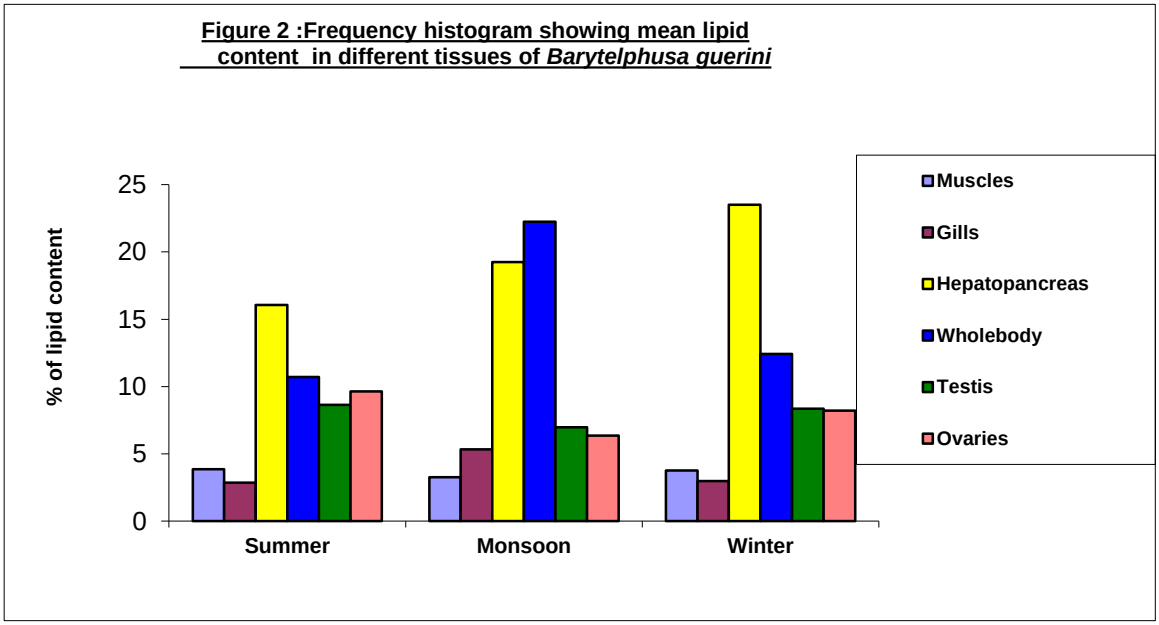


**Figure 2 :Frequency histogram showing mean lipid content in different tissues of *Barytelphusa guerini***




Lipid and ascorbic acid analysis of the important organs like muscle, gills, hepatopancreas, whole body, testis and ovary of crustaceans yielded interesting information on the exchange and movement of chemical substances between the various organs throughout the course of an annual reproductive cycle. The environmental factors influence and modify the pattern of accumulation of biochemical reserves. Tropical areas like India show distinct seasonal variations in environmental parameters. These different seasons also govern the distinct pattern of breeding and reproductive cycle (Oliveira *et al*., 2003 and Parate, 2013).

Ascorbic acid is a strong reducing agent and acts as a co-factor in several metabolic reactions. It is an important promoter of faster growth. In general, value of ascorbic acid in crustaceans is low because of incapability of synthesis. (Chatterjee, 1995) reported that invertebrates including crustaceans and fishes are incapable of synthesizing ascorbic acid. However, it is surprising how little work has been carried out on the synthesis, dietary requirements and even tissue concentrations of vitamin C in crustaceans. Natural diets, algae are usually rich in ascorbic acid. A dietary requirement for vitamin C has been reported for number of species of crustaceans (Fox *et al*., 1994).

Results of the analysis of ascorbic acid concentration in *Barytelphusa guerini* showed seasonal variation in different tissue. It was also indicated by (Ahmed, *et al*., 1987) that the concentration of ascorbic acid in the muscle and hepatopancreas of the crab, *Sesarma boulengeri* increases significantly after the removal of eye stalk, since ascorbic acid is involved in oxidation reduction reactions, its higher level may be due to increased demand of the tissues for the oxidation reduction processes to meet the increased rate of oxygen uptake. Some studies reported that vitamin C could be used to increase resistant ability to bacterial infection in crustaceans. Vitamin C was excellent reducing agent and plays the role in prevention of cancer and acts as antitumor agent (Du J, 2012 and Guerriero *et al*., 2014).

Lipid forms an important part of the protoplasm. Lipid content in various tissues of crab is obviously the cumulative effect of lipogenesis. These characteristics make fat storage a suitable means for providing energy when it is needed. Increase in lipid content of the gonads during breeding period is related to its simultaneous decrease in hepatopancreas in *Barytelphusa cunicularis.* It was found that increase of lipid content in testis during breeding season is related to its simultaneous decrease in hepatopancreas and muscle in *Barytelphusa guerini.* In gametogenesis mobilization of lipid reserves occurs in hepatopancreas. In present investigation it is found that the value of lipid in hepatopancreas is high and in gills it is low. Several workers suggested that the hepatopancreas is a labile organ for lipid storage. Just as in the other crustaceans studied lipid appears to be the major energy reserve during reproductive cycle (Mohammed *et al.*, 2004 and Bhavan *et al*., 2008).

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