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Nutrient and Chemical Composition of Sea Hare, *Dolabella auricularia* in Pujada Bay, Davao Oriental

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ABSTRACT

Proximate analyses, macro-, and micro-nutrient contents of the mature sea hare, *Dolabella auricularia*, and its egg strings were determined following the standard chemical analyses of the Association of Official Analytical Chemists (AOAC). Gravimetric method was used for moisture and ash content, Soxhlet for the crude fat, Macro Kjeldahl for the crude protein, UV-VIS for phosphorous and Atomic Absorption Spectrophotometer for Na, Ca, Mg Fe md Zn. The study showed that egg strings had higher concentration for moisture (93.32%), crude fat (2.01%), phosphorus (0.2266%), potassium (0.000869%), sodium (8.69%),

magnesium (1.01%), iron (0.175%) and zinc (0.0282%). On the other hand, the mother sea hare showed higher concentration for ash content (39.78%), crude protein (33.25%) and calcium (8.77%). Based on the Recommended Energy and Nutrient Intakes (RENI), the egg strings are better alternative source of nutrients needed by our body.

Keywords: Proximate analyses, macronutrients, micronutrients, sea hare resources

INTRODUCTION

The Sea hare, *Dolabella auricularia*, locally known as *donsol*, is a small marine gastropod. Like many other gastropods, it exhibits torsion, a phenomenon that moves the mantle cavity from posterior to the front of the body twisting the visceral organs through a 180-degree rotation. Sea hares are slow moving marine invertebrates that usually lack morphological defense structures such as spines or a protective shell[1]. When threatened or placed in an unfavorable condition, they may often start laying eggstrings[2]. There are no records of predators eating sea hare's eggs strings which may be due to distasteful chemicals that they obtain from their algal diet[3], a kind of chemical defense to fight off potential predators or to force back neighbors competing for space. Sea hare digestive gland extracts contain wide variety of secondary metabolites like prepacifinol epoxide and its skin extracts contained (-)-7dehydrocholester014. The species *D. Auricu*laria is also known to contain hemocyanin. Moreover, sea hares are good source of pharmacologically active compound, dolastatin 10, an anti-cancer agent which is now currently in phase II clinical trials[r'6]. Dolastatin peptides have been found to be the source of 20 potent anticancer agents[7]. Dolabellanin B2, a new isolate with antimicrobial factor, was also found to contain 33 amino acid residues. This peptide was cytoxically effective against some pathogenic microorganisms at 2.5-100 pg. mL 18. Further, sea hare is also a good source of primary metabolites[1].

In coastal areas of Davao Oriental, this gastropod is economically important as a source of food and income. Interviews with local coastal residents revealed that fisher folks sometimes harvest not only the egg strings but its mother sea hare as well for food consumption. At some point, these baseline nutrient profile for further studies and evaluation.

MATERIALS AND METHODS

Sampling Site

The study site was conducted in Guang-guang Cove, Pujada Bay, City of Mati, Davao Oriental (Figure 1). The area is a fishing ground and has a stretch of reforested mangrove. The sea bed is sandy-muddy with abundant sea grasses making it a preferable habitat by the burrowing sea hares. The absence of an

extreme low tide in the area aids the continuous productivity of the ecosystem, making Guang-guang Cove a rich marine resource.

Sea hare Samples

Three sea hare individuals (Figure 2A) approximately weighing 1 kg each were randomly collected. These were placed in a plastic container with sea water maintained at 4^0C to retain the freshness of the samples and to prevent moisture loss during resources have been commercially exploited leading to depletion of the natural stocks. This scenario prompted Davao Oriental State

College of Science and Technology (DOSCST) together with some agencies to study and introduce mariculture of the sea hare. This led to the conduct of studies concentrating on the abundance and resource assessment of this species. However, there are no available data on its nutrient profiling. Hence, this study aims to determine the proximate analysis of the mother sea hare and its egg strings in terms of their moisture and ash contents, crude fat and crude protein; concentration of macronutrients such as: phosphorous, potassium, sodium, calcium and magnesium; and micronutrients in terms of iron and zinc that will serve as transportation to DOSCST laboratory. These samples were then eviscerated and cleaned by removing the internal parts and washed. These were cut into pieces about half an inch and drained for 10 minutes in a strainer. Approximately 2.0 g of prepared samples with replicates (RSI, RS2, RS3) were used for determining the moisture content at DOSCST laboratory. The rest of the samples were air dried for five days. Dried samples in three replicates (RSI, RS2, RS3) were placed in a properly labeled zip locked container and submitted to University of Immaculate Conception - Science Resource Center laboratory for the chemical analysis.

Egg strings Samples

About a kilogram of egg strings samples (Figure 2B) were randomly collected. This is a mixture of freshly laid greenish and matured brownish egg strings samples. Samples were placed in a plastic container with seawater and prepared as described above. Approximately 2.0 g of the fresh samples with three (3) replicates were used for the analysis of moisture content which was done at DOSCST laboratory. The rest of the samples were air dried. Dried samples were divided in three replicates (REI, RE2, RES), placed in a properly labeled zip lock container and submitted to University of Immaculate Conception.

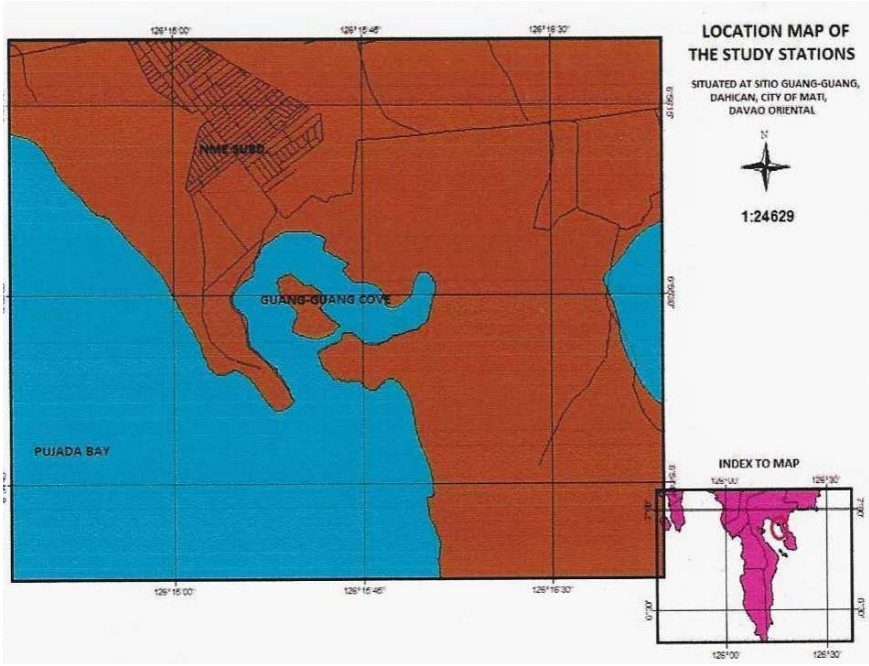

Figure 1. The study site at Guang-guang Cove,
Pujada Bay, City of Mati, Davao Oriental.

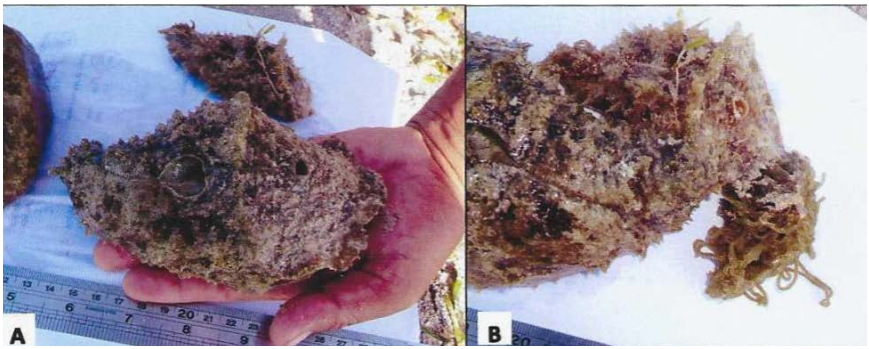

Figure 2. Sea hare collected from Guang-guang Cove (A) with and egg strings still attached to the mother sea hare (B).

Nutrient and Chemical Analyses

The different nutrients and chemical composition of the sea hare and its egg strings were determined following the standard analysis suggested by the standard method of Association of Official Analytical Chemists (AOAC, 1984)9

such as: Gravimetric method for moisture and ash content, Soxhlet for die crude fit, Macro Kjeldahl for the crude protein, UV-VIS for phosphorous and Atomic Absorption Spectrophotometer for Na, Ca, Mg Fe and Zn. The concentration of each analysis was reported as the mean of the three replicate samples.

RESULTS AND DISCUSSION

A. Proximate Analyses

The egg strings showed higher average moisture content (93.32%) than its mother sea hare (82.78%) as shown in Figure 3. Water is often excluded in the list of nutrients but it is an essential dietary component and must be obtained either from drinking water or from the products of the body's metabolism. For adults, the recommended water requirement is 1mL/ kcal of energy expenditure or depending on the activity level of the results showed that egg strings were rich in moisture and can contribute to the human's body water requirement.

The ash is a good index of mineral content in food. The results showed that ash content of sea hare (39.78%) was higher than its egg strings (28.96%). This difference cm be attributed to their structural component. The egg masses were elongated geenish spaghetti-like strings of gelatinous filaments while sea hare had a large flattened, quick heavily calcified shell[11].

The crude fat content of egg strings (2.01%) was also higher compared to its mother sea hare (0.74%). These values were almost the same with the fat content from commercially important mollusks of Bangladesh which ranged from 0.507 to 0.9720/012. In any case, sea hare or egg strings, these marine species is a negligible source of fat. Hence, this can be recommended for those who are in low fat diet.

The protein component of sea hare (33.25%) was higher compared to its egg strings (23.87%). According to the Recommended Energy Nutrient Intakes, human body's protein requirements vary according to age and gender. Women ages 19 years old and above have lower nutrient daily requirement than men. Women need 58 grams while men require 67 grams per day. This required amount can be provided by both sea hare md egg strings as component of one's diet.

B. Macronutrients Content

The result of this shows that both sea hare and egg strings rich in minerals such as phosphorous (P), potassium (K), sodium (Na), calcium (Ca), magnesium (Mg), iron (Fe) and zinc (Zn). These are needed by the body for normal growth and development. The average phosphorus concentration in egg strings (226.6 grams per 100 yams) was higher Tran the P in sea hare (28.84 grams per 100 grams) (Figure 4). The Recommended Energy and Nutrient Intakes (REM) of phosphorus for women 19 years old and above is 700 mg. In addition to other food supplement one is taking, the amount of P needed daily by the body can be

supplied by consuming egg strings in ample amount.

The acid-balance and osmotic pressure in the body is maintained by electrolytes such as potassium and sodium. Although these are also excluded among the list of nutrients, K and Na are essential component of human diet. The old recommended daily allowance (RDA) for K was set at a range of 1875-5625 mg. Egg strings K's of 600 mg can supplement the needed amount as compared to sea hare with only 380 mg per 100-gram sample. The same pattern was observed for sodium. Egg strings had higher Na content of 8960 mg compared to sea hare with 790 mg per 100 gam sample. However, it has to be noted that the recommended human daily intake of Na should be less than 3,000 mg[13]. For calcium, sea hare had higher concentration of 8770 mg as compared to egg strings with 1560 mg per 100gram sample. The High Ca content of sea hare may be attributed to its large flattened heavily calcified shell in the tissue of the "back shield". The daily human Ca intake also varies with age and gender. For men and women, ages 19 years old and above, 750 mg of Ca is needed daily10. Magnesium (Mg) content was in egg strings (1010 mg) compared to sea hare with 480 mg per 100-gram sample. On the average, Mg's RENI requirement is 205 mg. This amount of Mg needed by our body can be supplied by both sea hare and egg strings.

C. Micronutrients Content

The recommended iron (Fe) intake for women that is 27 mg is much higher than the 12 mg requirement for men. This is based on the needed amount to cover the Fe losses during menstrual and reproductive age of women[10]. This needed amount can be provided by egg strings which had higher Fe content of 17.5 mg compared to sea hare with only 0.548 mg (Figure 5). It has to be noted that Fe deficiency is a problem worldwide. However, too much Fe is also toxic14 Zinc content of 28.2 mg in egg strings was higher than in sea hare, 10.326 mg per 100-gram samples. The recommended amount of Zn for adult men is 1/3 higher i.e., 6.4 mg for men compared to 4.5 mg for women12. This amount of zinc requirement of the body can be supplied by egg strings.

CONCLUSION

The sea hare is a valuable source of food to coastal residents, especially in Guang Guang, City of Mati. The result of this study provided basic information on sea hare's nutritive value. It also showed that egg strings of sea hare were a better source of the basic nutrients that a human body need. Moreover, this study serves as the baseline for further chemical studies that may somehow lead to the discovery of pharmaceutical substances.

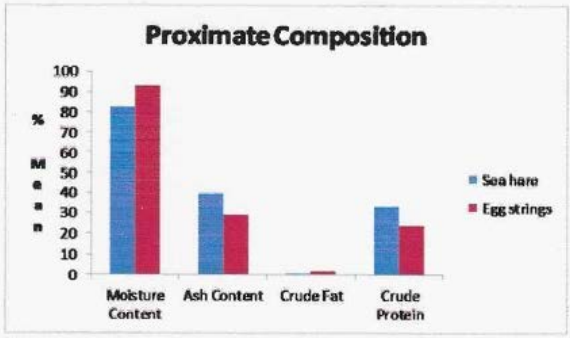

Figure 3. Proximate % mean (g/ 100 g) composition of sea hare and egg strings. Ash, fat and protein values were in % dry basis while moisture in % wet basis.

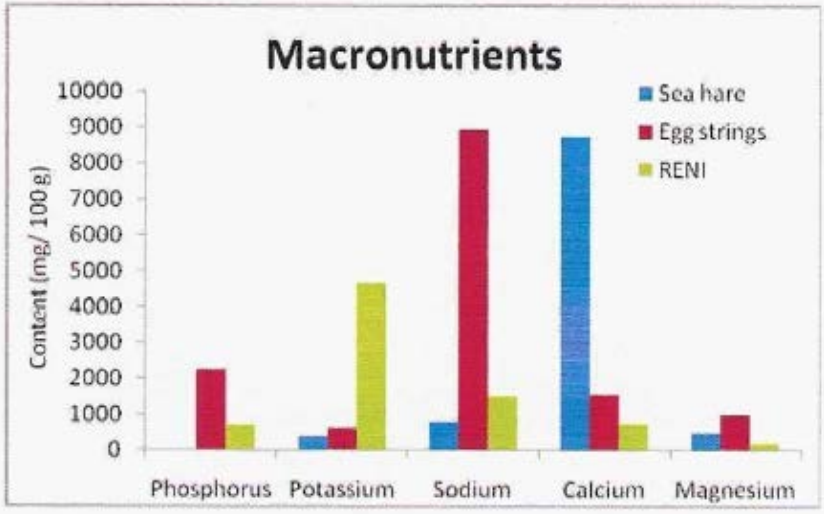

Figure 4. Macronutrients content (mg/ 100 gram) of sea hare and egg strings.

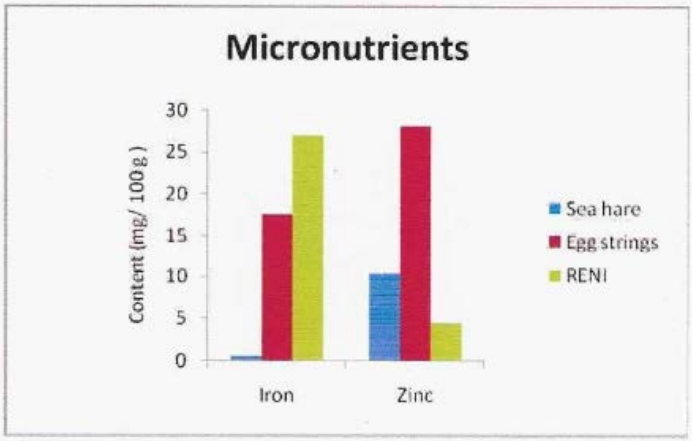

Figure 5. Micronutrients content (mg/ 100 gram) of sea hare and egg strings.

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