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Comparison of Antioxidant Activity in Gracilaria Edulis and Hypnea Valentiae

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Abstract – The present study investigates about the antioxidant activity of red algae *Gracilaria edulis* and *Hypnea valentiae* by radical scavenging method, DPPH assay. The ethyl acetate and ethanolic extracts of the two red algae were prepared keeping BHT as a standard. *Hypnea Valentiae* showed the highest antioxidant activity compared to *Gracilaria edulis*. The absorbance was recorded at 517 nm.

Keywords : DPPH Assay, Ethyl Acetate, Ethanol, *Gracilaria Edulis* and *Hypnea valentiae*.

I. INTRODUCTION

Seaweeds belong to the group of marine plants known as algae. The estimated range of seaweeds is probably 45,000 species [1]. Seaweeds are an extensive source of secondary metabolites. More than 600 secondary metabolites have been isolated from marine algae [3]. The importance of seaweeds for human consumption is well known since 300 B.C. in China and Japan. These two countries are the major seaweed cultivators, producers and consumers in the world [6]. It has been reported that seaweeds contain high levels of minerals, vitamins, essential amino acids, indigestible carbohydrates and dietary fiber [1]. Seaweeds with their diverse bioactive compounds [8] have opened up potential opportunities in pharmaceutical and agri-food processing industries. The consumption of seaweeds as a part of diet has been shown to be one of the prime reasons for low incidence of breast and prostate cancer in Japan and China compared to North America and Europe [8].

A free radical is a molecule with one or more unpaired electrons in the outer orbital. Many of these free radicals are in the form of reactive oxygen and nitrogen species, these can occur, due to oxidative stress brought about by the imbalance of the bodily antioxidant defense system and free radical formulation [9]. Oxidative stress has been linked to cancer, aging, ischemic injury, inflammation and neurodegenerative diseases (Parkinson's and Alzheimer's). Reactive oxygen species (ROS) such as superoxide radical, hydroxyl radical, peroxy radical, and nitric oxide radical, attack biological molecules such as lipids, enzymes, DNA and RNA, leading to cell or tissue injury associated with aging, atherosclerosis, carcinogenesis [9] and may lead to the development of chronic diseases related to the cardiac and cerebrovascular systems [9]. Antioxidants are micronutrients that have gained importance in recent years due to their ability to neutralize free radicals or their action [11].

A study shows that antioxidant substances which scavenge free radicals play an important role in the prevention of free radical-induced diseases [1]. This helps in protecting the body from degenerative diseases. *Gracilaria Edulis* and *Hypnea valentiae* contain phytochemicals and possess the capacity to destroy free radicals. The principle agents responsible for the protective effects could be the presence of antioxidant substances that exhibit their effects as free radical scavengers, hydrogen donating compounds, singlet oxygen quenchers and metal ion chelators [1]. The two red algae belong to the family Rhodophyta which is considered as an important species for industrial and biotechnological uses [5]. *Gracilaria Edulis* and *Hypnea valentiae* are the major Indian agarophytes. The members of Gelidiales and Hypnea are among the most economically important agarophytes, and are cultivated and harvested as sources of agar and agarose [7]. Compounds with antioxidant, antiviral, antifungal and antimicrobial activities have been detected in brown red and green algae [4]. The aim of the study is to compare the antioxidant activity of both the species.

II. MATERIALS AND METHODS

A. Seaweeds collection

Healthy, disease seaweeds of *Hypnea valentiae* and *Gracilaria Edulis* were collected from marine area the collected seaweeds was authenticated by Krishnamurthy Institute of Algology (KIA/2012/DZAB-0001) and (KIA/2012/DZAB-0002). Seaweeds were washed and shade dried they were then powdered and processed for antioxidant assay.

B. DPPH free radical scavenging activity

Reagents required

- DPPH
- Leaf extracts (1mg/ml)
- BHT
- Methanol

C. Procedure

The ability of the extracts to annihilate the DPPH radical (1,1-diphenyl-2-picrylhydrazyl) was investigated by the method described by Harbone, J.B (Harbone, J.B and Baxter, H 1995). Stock solution of leaf extracts was prepared to the concentration of 1mg/ml. 100µg of each extract were added, at an equal volume, to methanolic solution of DPPH (0.1%). The reaction mixture is incubated for 30min at room temperature; the absorbance was recorded at 517 nm. The experiment was repeated for three times. BHT was used as standard controls. The annihilation activity of free radicals was calculated in % inhibition according to the following formula $\% \text{ of Inhibition} = (A \text{ of control} - A \text{ of Test}) / A \text{ of control} * 100$

II. RESULT AND DISCUSSION

Seaweeds have received the special attention as a source of natural antioxidants [9]. Several studies were subsequently performed to verify the antioxidant properties of algae [9]. The environment in which seaweeds grow is harsh as they are exposed to a combination of light and high oxygen concentration. These factors can lead to the formation of the free radicals and other strong oxidizing agents but seaweeds seldom suffer any serious photodynamic damage during metabolism. This fact implies the seaweed cells have some protective mechanisms and compounds [4]. The results of DPPH assay shows the presence of antioxidant activity in both *Gracilaria Edulis* and *Hypnea valentiae* which is represented in table 1. Plant phenolics are a major group of compounds that act as primary antioxidants of free radical scavengers [9]. Ethyl acetate and ethanolic extract of *Hypnea valentiae* showed 74.8% and 73.8% of inhibition while ethyl acetate and ethanolic extract of *Gracilaria Edulis* showed 50% and 46.8% of inhibition. The comparative study reveals the fact that *Hypnea valentiae* recorded the highest antioxidant activity than *Gracilaria edulis*. The phenolic compounds are commonly found in edible brown, green and red seaweeds in which the antioxidative property has been correlated to their phenolic content [9]. Polyphenols are electron-rich compounds, which can intervene with efficient electron donation reactions and in turn produce phenoxyl radical species as intermediates in the presence of oxidizing agents [10].

Table.1: Free radical scavenging activity of *Hypnea valentiae*(HV) and *Gracilaria edulis*(GE) by DPPH assay

S. No.	Extract	Absorbance of control	Absorbance of sample	% of inhibition
1	Ethyl acetate – GE	0.3658	0.092	74.84
2	Ethanol – GE	0.3399	0.089	73.81
3	Ethyl acetate – HV	0.018	0.009	50
4	Ethanol - HV	0.016	0.0085	46.87

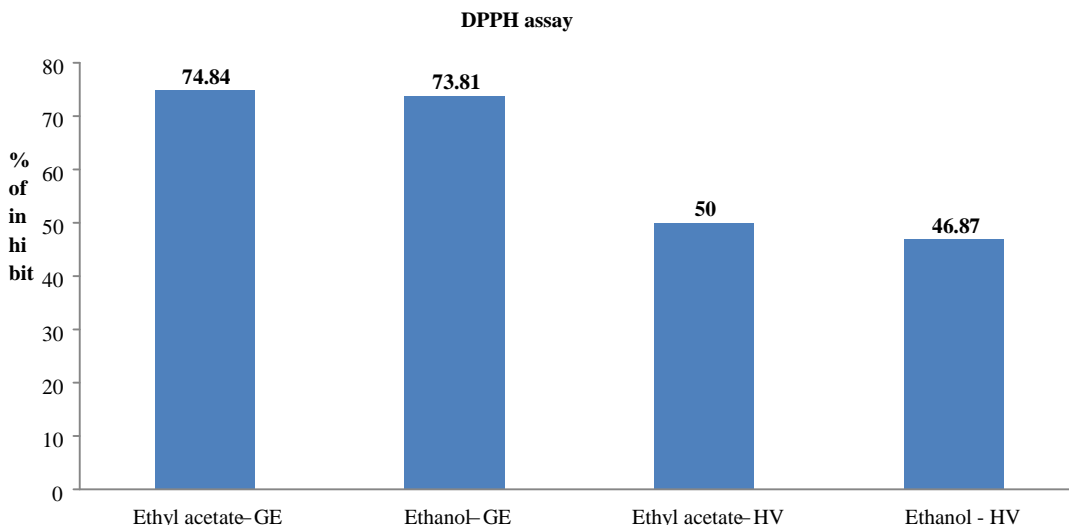


Figure.1: Free radical scavenging activity of *Hypnea valentiae* (HV) and *Gracilaria edulis* (GE) by DPPH Assay.

CONCLUSIONS

The ethyl acetate and ethanolic extracts of the two red algae were prepared keeping BHT as a standard. *Hypnea valentiae* showed the highest antioxidant activity compared to *Gracilaria edulis*. The absorbance was recorded at 517 nm. The proposed result of antioxidant activity of these seaweeds shows a good peak. The percentage of inhibition varies depending on the choice and the concentration of the solvent used. We have very little information on the antioxidant potentials of marine algae [11]. The result of a proposed work could be an accurate finding and hence this may support future exploration. Further studies are required to identify the active principles responsible for the significant antioxidant effect [11].

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