COMPOSITION OF PIGMENT, TOTAL PHENOLIC CONTENT AND ANTIOXIDANT ACTIVITY OF BROWN SEAWEED *Sargassum olygocystum*

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1. INTRODUCTION

Identified

6.000 species of seaweeds

Classified

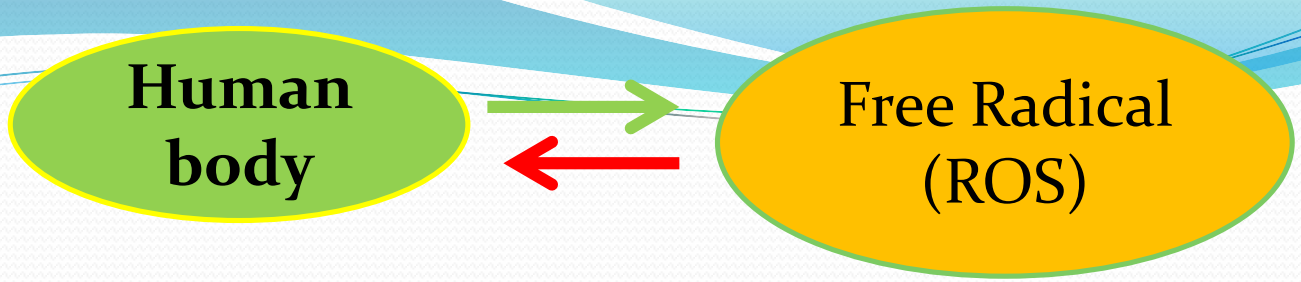
green algae (Chlorophyceae) ,

brown algae (Phaeophyceae)

red (Rhodophyceae)

Bioactive compound

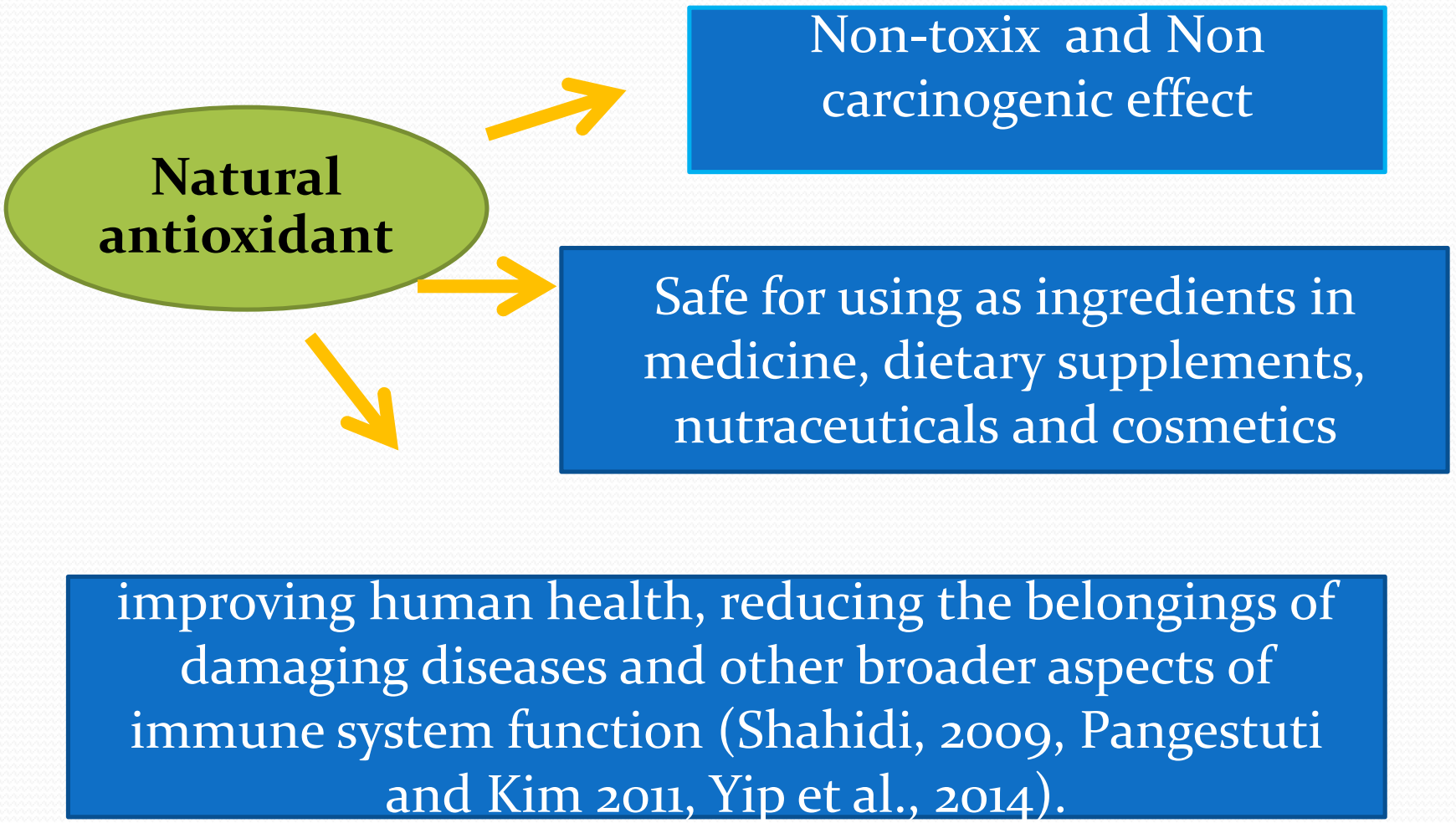
Carotenoids, pigments, polyphenols, enzymes, diverses functional polysaccharides. Seaweeds are excellent source of vitamin A, B1, B12, C, D and E [Domettila *et al*., 2013].



Superoxide (O_2^-), hydroxyl ($HO^\bullet$), hydrogen peroxide (H_2O_2) and nitric oxide (NO).

Extreme amount of ROS → Injury the essential biological molecules → various diseases disorders such as cancer, diabetes, stroke, cataract, myocardial infarction, atherosclerotic and Parkinsons diseases.

In order to diminish or avoid this damage of the human body by ROS antioxidants are believed to be protective all cell from injury (Wu et al., 1998, Halliwell et al., 1995).


Natural antioxidant
Non-toxix and Non carcinogenic effect
Safe for using as ingredients in medicine, dietary supplements, nutraceuticals and cosmetics
improving human health, reducing the belongings of damaging diseases and other broader aspects of immune system function (Shahidi, 2009, Pangestuti and Kim 2011, Yip et al., 2014).

`seaweeds have potential defensive properties to against oxidative stress in target tissues and lipid oxidation in foods.

Biological activity of Seaweed

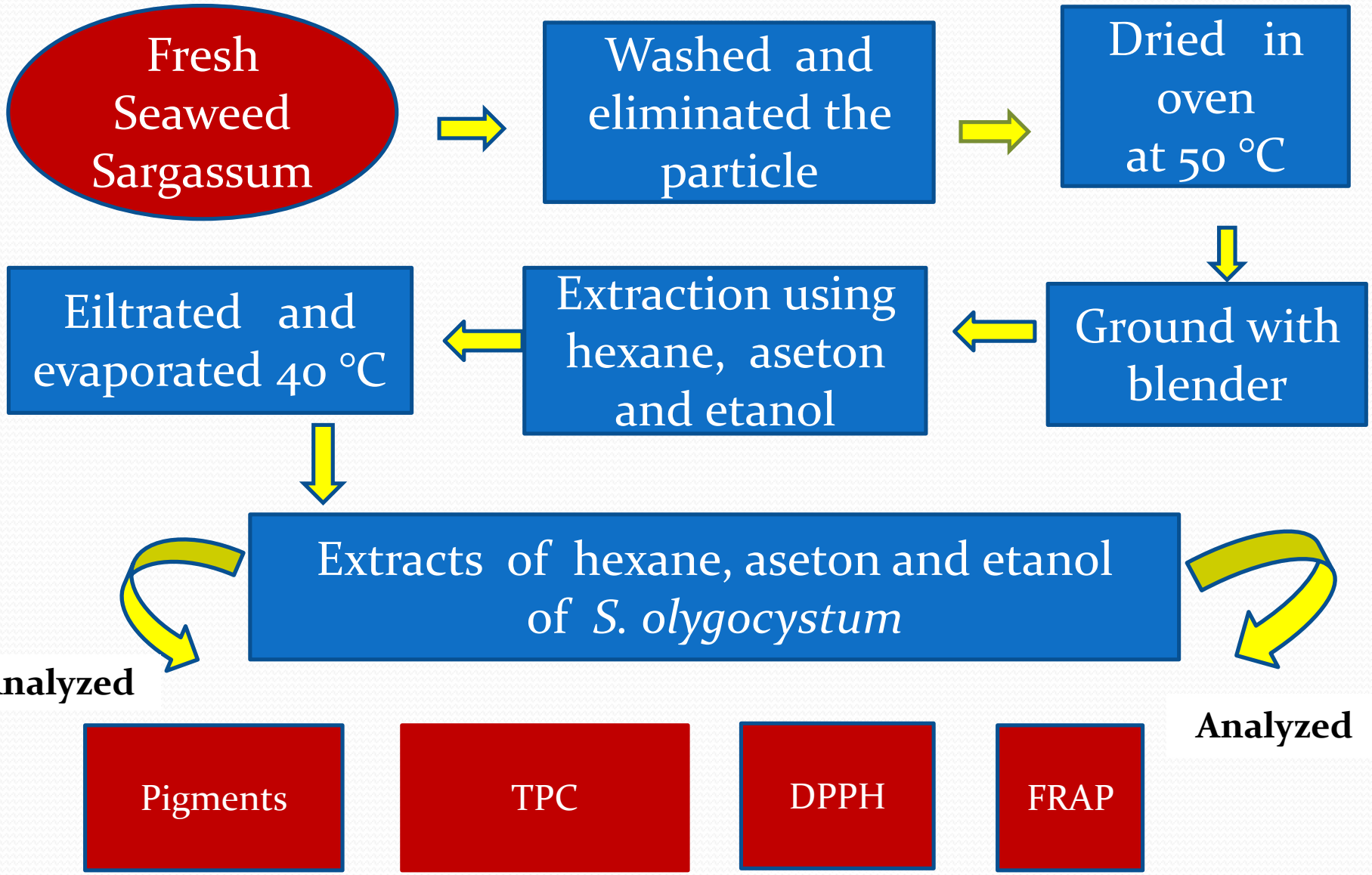
antioxidant, anti-bactery, anti-cholesterol anticancer, anti-anti-inflammatory, anti-obesity, anti-angiogenic and neuroprotective activities. (Pangestuti and Kim, 2011).

Potential defensive properties of seaweeds against oxidative stress in target tissues and lipid oxidation in foods.Consequently consumption of antioxidant and addition of antioxidant in food materials protect the body as well as against oxidative stress.

Although seaweeds possess extensive applications in food and pharmaceutical industries, the pigments and antioxidant activities of many types of seaweeds in Indonesian area are still unexplored.Hence, the present study was proposed to explore thepigments and antioxidant properties of S. olygocystum which grows plentifully in NorthSulawesi.

2. MATERIAL AND METHOD

2.1. sample preparation



Method of analyzis:

1. Composition of pigment

The pigments were quantified using UV-Visible spectrophotometer by reading the absorbance at their respective wave lengths, The pigments consisted of:

-Chlorophyll Chl a (mg g-1) (Arnon,1949).

-Total Chlorophyll (mg g-1) (Jeffrey et al, 1961). -Chlorophyll C1+C2 (mg g-1) Yentsh, 1956). -Carotenoids (Seely et al, 1972).

-Fucoxanthin (mg g-1) (Sudhakaret al., 2013)

-Phycoerythrin (µg g-1) (Beer and Eshel,1985) -Phycocyanin(µg g-1) (Beer and Eshel,1985);

2. The TPC of the extracts was measured using Follin Ciocalteu method as described by Ganesan et al., (2008).

3. Scavenging ability of stable 1,1-diphenyl-2-picrylhydrazyl (DPPH) radicals by the seaweeds antioxidant using the method describe by Chew. et al., (2008).

4.Ferric Reducing Antioxidant Power (FRAP) of seaweed extract was determined by the method prescribed by Chewet al., (2008).

3. RESULT AND DISCUSSION

1. Chemical Composition

Table 1. Chemical composition of S. olygocystum	
Parameter	Composition (%)
Water	16.66
Protein	3.66
Carbohidrate	56.06
Fat	0.33
Ash	23.29

. Seaweeds are low in fat but have vitamins and bioactive compounds such asterpenoids, sulfated polysaccharides and polyphenol compounds, the later being a potential natural antioxidant not found in land plants (Chew et al., 2008).Algae polysaccharides participate essential function as free radical-scavengers in-vitro and antioxidant for the avoidance of oxidative damage in living organism. Seaweeds could eliminate free radicals by acting as free radical scavengers (Molyneux 2004) or by donating a hydrogen atom to the free radical (Re et al 1999).

2. Composition of Pigmen

Table 2. Composition of Pigmen of S. plygocystum

Parameter	Pigment Content of Seaweeds extract	
	Hexane	Acetone
Chlorophyl a (mg/g)	0.046787	0.039748
Chlorofil b (mg/g)	0.043884	0.03399
Chlorophyl C1+C2 (mg/ml)	1.01925	0.62507
Carotenoid (µg/g)	19.546	24.911
Fucosantin (mg/g)	0.037044	0.006454
Phycoerythrin (µg/g)	0.62000	0.611

- The result of analysis showed the highest content of pigment was chlorophyll C1+C2 (1.01925 (mg/g) and the lowest content of pigment was fucosantin (0.006454 mg/g). Naziret al., (2013), the concentration of carotenoids, phycoerythrin and phycocyaninin red seaweeds were found higher than green seaweeds, Pereira et al, 2012 reported that red seaweeds possesses more phycocyanin than green strain. Red seaweeds observed are insignificant variation in chlorophyll a and phycocyanin (Plastino et al., 2004).Pereira et al, 2012, seaweeds contain three main photosynthetic pigments i.e. chlorophylls, carotenoids and phycobilins. These pigments provide protection against high light intensity and also support in light absorption and energy transfer to the reaction centre.

3. Total Fenolic content (TPC), DPPH and FRAP.

Parameter	Acetone	Ethanol	BHT
TPC (µg GAE/g)	45.282	44.885	-
DPPH (mg/mL	3.0101	2.6093	0.12167±0.012
Frap (µM Fe2+/mg)	14.05 ± 0.02	9.01 ±0.02	42.5±1.46

The antioxidant characteristics of these algae have been associated to their phenolic composition. Phenolic compounds or polyphenols have attained substantial attention due to their physiological purposes, counting antioxidant, antimutagenic, antitumor and anticancer activities (Souza et al 2017; Ahmad et al 2014; Sanger et al 2017).

Table. 4. Antioxidant activity (DPPH Method) extract ethanol of S. olygocystum

Konsentrasi (ppm)	Nilai absorbansi		Nilai penghambatan	
	Ke-1	Ke-2	Ke-1	Ke-2
0	1,141	1,090		
100	1,134	1,049	0,61	3,76
200	1,091	1,046	4,38	4,03
300	1,089	1,016	4,55	6,78
400	1,068	1,015	6,39	6,88

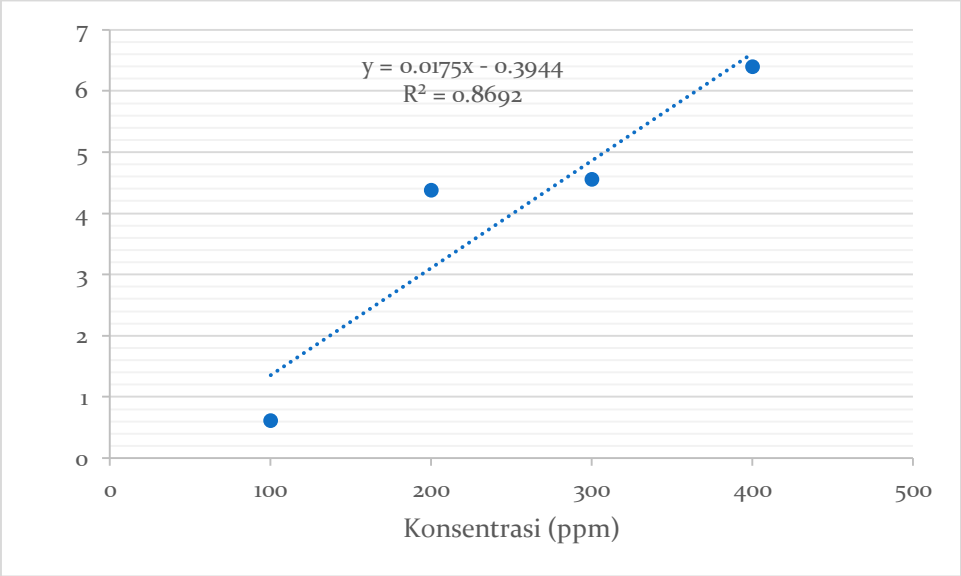
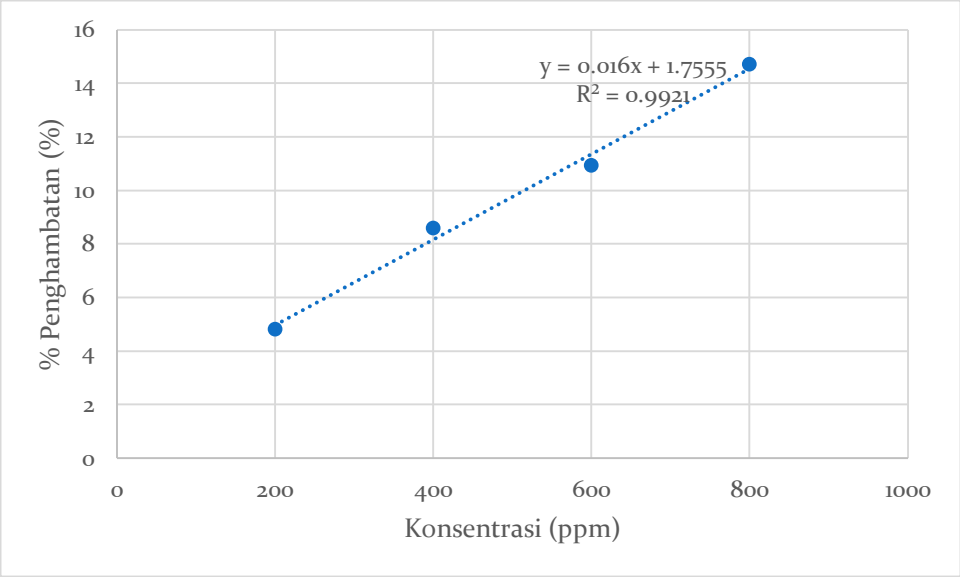


Table. 4. Antioxidant activity (DPPH method) extract acetone of S. olygocystum

Konsentrasi (ppm)	Nilai absorbansi		Nilai penghambatan	
	Ke-1	Ke-2	Ke-1	Ke-2
0	0,769	0,764		
200	0,732	0,739	4,8	3,3
400	0,703	0,704	8,6	7,8
600	0,685	0,675	10,9	11,6
800	0,656	0,665	14,7	12,9



Radical DPPH scavenging activity in aceton and ethanol extract of S. olygocystum were IC50 3.0101± 0.242 and 3.4093± 0.54 mg/mL

All organisms have multifaceted regularities of antioxidant enzymes, for example thioredoxin enzyme. Some of these enzymes are preserved throughout growth and are need for a normal development. Antioxidants in biological systems have various purposes, are a counter for oxidative destruction and have a contribution in cell pathways. The most important action of antioxidants in cells is to inhibit the destruction caused by reactive oxygen groups (Haliwell et al 1992; Borek 1993).

- Humans are impacted by many free radicals especiallyreactive oxygen species (ROS). ROS constitutes superoxide (O_2 -), hydroxyl (HO•), hydrogen peroxide (H_2O_2) and nitric oxide (NO).These molecules are unsteady and highly reactive, and can harm cells by chain reactions, such as lipid peroxidation or configuration of DNA adducts .
- Pigment shows several capability to maintain immune system, to help prevent cancer and is being utilized in cancer therapy, to aid to invigorate and energize the bodydetoxification of the liver, to normalize blood pressure and to struggle bad odors, bad breath as well as body odor by reason of the magnesium salts that it contains(Ferruzzi and Blakeslee, 2007).

5. CONCLUTION

- In the present investigation the asetone and ethanol extracts of *S. olygocystum* exhibited content of chlorophyll carotenes, phycoerythrine and phycocyanin. The TPC, antioxidant activity by DPPH assay and reducing power are high.
- Thus *S. olygocystum* could be used as a sourse of natural pigment and source of antioxidant which is potential to be applied in food product as fungtional food, medicine and cosmetic.
- Future study is required for identification of the active compound of S.olygocystum and measure the biological activities.


Thank you