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***Research paper***

# Chemical composition and sensory properties of *Caulerpa racemosa* seaweed yellow noodle

**Aziani Ahmad [1] *, Zamzila Zainol [1], Zaibunnisa Abdul Haiyee [2], Norakma Mohd Nor [2], Nazatul Nazihah Mohamad Nizam [3]**

[1] *Marine Research and Excellent Centre, Faculty of Applied Sciences, Universiti Teknologi MARA,Cawangan Perlis, 02600 Arau, Perlis*
[2] *Department of Food Technology, Faculty Applied Science,Universiti Teknologi MARA,40450 Shah Alam, Selangor*
[3] *Faculty of Applied Sciences, Universiti Teknologi MARA,Cawangan Perlis, 02600 Arau, Perlis*
**Corresponding author E-mail: aziani@perlis.uitm.edu.my*

## Abstract

Chemical composition and sensory properties of the dried *Caulerpa racemosa* collected from Port Dickson were determined. Addition of *Caulerpa racemosa* as an ingredient will enhance the nutritional composition of yellow noodle. In this study, the wheat flour that was used for the preparation of the noodles was partially substituted with the 20 g, 40 g and 60 g dried *Caulerpa racemosa* powder. The addition of *Caulerpa racemosa* powder in noodle increase the lipid and ash contents significantly ($p<0.05$). The lipid content was range from 2.24% d.w. to 8.2% d.w. The ash content was from 0.14% d.w. to 1.7% d.w. However, there were no significant different between original noodle and *Caulerpa racemosa* noodles in terms of moisture and protein contents. Noodle with addition of 20 g *Caulerpa racemosa* has mild seaweed flavour, aromatic odor, have a soapy texture, attractive appearance and acceptable sensory. All the sensory parameters scored higher than 5, which mean the average acceptance of noodle with 20 g of *Caulerpa racemosa* is good. Therefore, the noodle with 20 g seaweed replacement is recommended to be applied for nutritional and taste enhancement.

***Keywords***: *Caulerpa Racemosa; Seaweed; Yellow Noodles; Proximate Analysis; Sensory.*

## 1. Introduction

In Malaysia, total manufacturing output for food industry was 10% which are conquered by small and medium size of business [1]. A good idea and development strategy are needed for a product to get higher demand in marketing industry [2]. Every food producer must consider the standard of the food such as safety and health [3]. The demand of the food is predicted to increase along with the world population which is estimated to achieve 9 billion by 2050 [4].

According to [5], current behavior of consumer food choice are focusing on healthy food, quality and longer-lasting together with interesting packaging which can be produced with recent technologies. This is because the consumers are aware about the food health and the importance of functional processed food and natural food flavors [1]. Therefore, seaweed based product is an ideal alternative for this needs.

Seaweeds have been used as food supplement for decads because they contain good source of fibre [6], lipids, proteins, polysaccarides, vitamins, minerals and enzymes [7]. In Malaysia, seaweed industry has contributed approximate US$ 5.5-6 billion annually [8]. Seaweeds have been used for salads, soups and as low calorie dietetic foods as well as a source of hydrocolloids like agar, carrageen and alginate [9].

Seaweeds are various in colour such as red, brown, green and blue-green seaweed. The colour components are generated by the pigments inside the alga or seaweed cell. Red seaweed such as *Gelidium* sp., *Gracilaria* sp. and *Euchema* sp. are high in red phycoblin pigments [8]. They are beneficial for weight-loss program, lowering cholestrol, anti-tumor, immune-enhancing activity and slowing the process of aging [10].

While, green seaweed (*Ulva* sp., *Enteromorpha* sp., *Caulerpa* sp. and *Codium* sp.) high in chlorophyll can be eaten [7] raw, dried or cooked like soup [11]. Green seaweed has antibacterial properties to treat goiter, gout, scrofula, burns and irritants [12]. Some of the green seaweed also can be used as an indicator for water quality such as *Caulepa serrulata* [13] and *Ulva* sp. [12].

Meanwhile, blue-green seaweed which is *Spirulina* sp. is often cultivated to make human dietary supplement and feed supplement in aquaculture, aquarium and poultry industries [14]. Blue-green seaweed are rich in amino acids, γ-linolenic acid (GLA), finer, vitamins, calcium, iron, phosphorus, pigments such as β-carotene, chlorophyll and xanthophylls [15]. Blue-gree seaweed contain antioxidant, antiviral, antitumor, anti-inflammatory, antidiabetic, antiallergic, antibacterial properties, lipid-lowering impact [16] and reduce hyperlimidemia and oxidative stress that can cause development of cardiovascular disease [17]. The present study was aims are to compare the texture and quality of original noodle with seaweed (*Caulerpa racemosa*) enhancement noodle through proximate and sensory analysis.

## 2. Materials and method

### 2.1. Study area

The seaweed *Caulerpa racemosa* was harvested from Teluk Kemang, Port Dickson. The seaweed collected was kept inside a box was processed by removing the attached specimens on its surface. Then, the samples were washed in tap water and drain. The sea-

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weeds was drained under the sun for 48 h, grained and stored inside airtight containers.

### 2.2. Protein estimation

Protein content determination was performed according to [18]. 1 g of dry seaweed powder was used for protein digestion.

### 2.3. Lipid estimation

Lipids were extracted using chloroform and methanol with ratio 2:1 [19]. The amount of lipid was calculated using [18] method.

### 2.4. Ash estimation

5 g of dried seaweed samples were heated at 525 $^{o}$C for 5 h in furnace. After 5 h, the samples were placed inside desiccators and reweight [18].

### 2.5. Seaweed noodle preparation

The ingredients used were 250 g wheat flour, 80 ml water, 2.25 g salt sodium carbonate ($Na_2CO_3$), and 0.25 g potassium carbonate ($K_2CO_3$). Seaweed powder with 20 g, 40 g and 60 g were replace and mix with wheat flour to form three different concentrations of seaweed noodle [20]. One mixture of wheat flour without seaweed addition was prepared for control. The flour, salt, water and salt were mix in a mixer. The crumble dough was rest for 30 min in a plastic bag and then placed in noodle maker. The noodles then boiled in 750 ml distil water. Cooking then continue for 5 min until the uncooked core was disappeared [21] before drained.

### 2.6. Sensory analysis

Cooked noodles were analyzed for its sensory evaluation. Four different types of noodles mixture (original, 20 g, 40 g and 60 g seaweed) were tested by 15 panels that were picked randomly. Hedonic ratings using 9 point scale was adapted to determined the sensory quality. Panelist evaluated the noodles based on the odor, taste, texture and appearance [22]. Rating which is higher than 5 indicate good quality attributes.

### 2.7. Statistical analysis

Analysis of one-way-ANOVA was carried out to test the differences of proximate analysis and sensory evaluation for each noodle.

## 3. Result and discussion

### 3.1. Proximate content of *Caulerpa racemosa* powder

The result of average biochemical content in percentage of dry weight (%DW) for *C. racemosa* is presented in Table 1.

**Table 1:** Proximate Analysis of Ash, Moisture, Protein and Lipid for *Caulerpa Racemosa*

| Parameter (%DW) | Ash | Moisture | Protein | Lipid |
|---|---|---|---|---|
| *C. racemosa* powder | 22.75 | 87.39 | 7.29 | 14.4 |

The ash content is 22.75%, followed by moisture 87.39%, protein 7.29% and lipid 14.4%. [23], have reported a similar range of values for ash 24.2%, moisture 91.53% and protein 12.88%. However, the lipid content was higher than the value reported for *Caulerpa racemosa* that ranges from 0.15% to 7.65% [23 - 25]. This could due to different method of lipid extraction or geographical factors [23] or seaweed growth conditions [24]. Meanwhile, protein content for this study was low could be due to variation in protein extraction method [26].

### 3.2. Proximate content of seaweed noodle

The result of proximate analysis of original and *Caulerpa racemosa* enhancement noodles is presented in Table 2.

**Table 2:** Proximate Analysis of Original and Seaweed Enhancement Noodles

| Parameter (%DW) | Ash | Moisture | Protein | Lipid |
|---|---|---|---|---|
| Control | 0.14 | 32.42 | 2.4 | 2.24 |
| Ndl+20g C.r | 0.19 | 34.29 | 2.46 | 4.64 |
| Ndl+40g C.r | 0.26 | 34.48 | 2.47 | 5.8 |
| Ndl+60g C.r | 1.7 | 32.8 | 2.65 | 8.2 |

Ndl = noodles, C.r = *Caulerpa racemosa*

In this result, the moisture and protein contents between 4 types of noodle were not significantly different ($p>0.05$). This is because the high moisture content in seaweed noodles was due to dough formation [27]. There was high water holding capacity from fibers and polysaccarides in seaweed, while lower protein contents in seaweed noodles were cause by the dilution of seaweed powder. Percentage of lipid and ash increased significantly ($p<0.05$) with the increase in amount of *Caulerpa racemosa* powder. The increment of ash contents was due to high mineral content in seaweed [28]. However, for higher lipid contents were contributed by natural lipid that present in starch of wheat flour [29].

### 3.3. Sensory evaluation of caulerpa racemosa noodle

Sensory evaluation of noodles based on Hedonic scale is presented in Figure 1. Sensory parameters that scored higher than 5 means the average acceptance of the *Caulerpa racemosa* noodle by panelists were good [26].

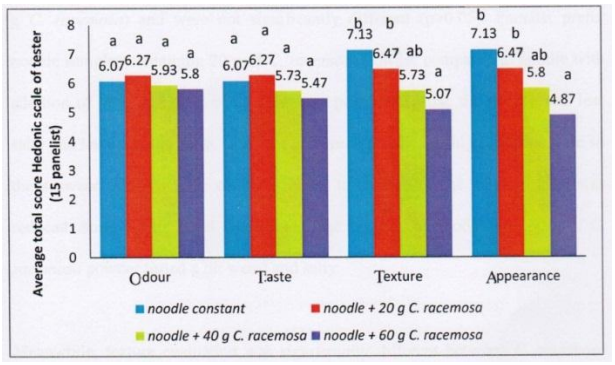



**Fig. 1:** Average Total Score of Hedonic Scale from 15 Finalist.

The yellow noodle with seaweed replacement gives more aromatic smell. However, there is no significant different between odour of different yellow noodles. Taste evaluation also shows no significant different and are acceptable with value score range from 5.4 to 6.07. Meanwhile, texture evaluation was significantly different between *Caulerpa racemosa* noodles but no different between original and 20g *Caulerpa racemosa* noodle. The average texture score was 7.13 (original), 6.47 (20g *Caulerpa racemosa*), 5.73 (40g *Caulerpa racemosa*) and 5.07 (60g *Caulerpa racemosa*). Original yellow noodle have soapy and firmer textural *than Caulerpa racemosa* noodle. As the seaweed replacement powder increase, the noodle becomes brittle and short in length. Appearance of *Caulerpa racemosa* noodle shows colours from green to dark green. The result of 60g seaweed addition noodle shows significant different in apperance as it give darker green colour noodle. As the colour become darker, the noodle become less attractive, dull and looks fragile.

## 4. Conclusion

The presence study indicates the biochemical contents of ash and moisture for *C. racemosa* powder is comparable with previous

study. However, there is some differences for lipid and protein contents due to variation in extraction method and geographical factors. The moisture content in seaweed noodles come from dough formation and ranges are slightly similar. Both moisture and protein were not influenced by addition of *C. racemosa*. On the other hand, the ash content increases with the additional amount of seaweeds powder as a result of high fiber content in raw seaweeds. Meanwhile, the presence of lipid was contributed by both wheat flour and seaweed powder. Based on sensory analysis, the 20g seaweed addition noodle is favourable compared to the others.

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