"BULUNG SANGU" (GRACILARIA VERRUCOSA) LOW COST BALINESE SEAWEED PRODUCT, NUTRITION, GENERAL AND ORODENTAL HEALTH (A REVIEW)

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ABSTRACT

In Bali, several types of seaweed are generally consumed as low-cost vegetables or salad by the local people and known by local names of *jukut* and *rujak bulung sangu*. *Jukut* and *rujak bulung sangu* is a very harmonious combination of food, a potential source of nutrients, and antioxidants. Therefore, this study was conducted to review nutrition, general and orodental health benefits of *bulung sangu. Bulung sangu* have potential nutrient and antioxidants content such as carotenoids, vitamins (A,C,E), fatty acids (omega 3 and 6), carbohydrates, minerals (I, Zn, Fe, Cu, Na, K, Mg, Ca, P and Cr), amino acid and chlorophyll. Carotenoids have an important biological function as an antioxidant and immunostimulatory which can prevent diseases, antiinflammatory, antistress, antiaging, and protect the skin from the harmful effects of ultraviolet radiation. The results of several research stated that total carotenoids and iodium is higher in *bulung sangu*, and that has significant potency as antistress, anticancer, antiinflammatory, antistroke and antipathogenic bacteria. They also have significant roles as normolipidemic, antidiabetic, antiatherosclerotic, antiosteoporotic, antiaging, and orodental health. The conclusion is that the *jukut* and *rujak bulung sangu* is high in nutrients and antioxidants, has the potential to maintain general health as well as orodental health.

Keywords *: Gracilaria verrucosa*, nutrition, antioxidants, health benefits

Introduction

Seaweed is a famous delicacy in some parts of Asia and also a well-known source of important food hydrocolloids, such as agar. Alginates, and carrageenan. In addition to the food value of seaweed, several health benefits have also been reported to be present in this valuable food source and low cost. It is presumed that the unique features of the marine environment, where the seaweeds are grown, are mainly responsible for most of its properties. Among the functional effects of the seaweed, nutritional and health-related benefits have been widely studied. Compared to the terrestrial plants and animal-based foods, seaweed is rich in some health-promoting molecules and materials such as dietary fiber, omega 3 fatty acids, essential amino acids, and vitamins A, B, C, and E (Rajapakse, 2011). In this article, the nutritive value of *Gracilaria verrucosa* seaweed and the functional effects of its soluble fiber are discussed with a special reference to the digestive health promotion of human. Seaweed has potential nutrient and antioxidants content such as carotenoids, vitamins, fatty acids, carbohydrates, minerals, and other essential substances (El-Baky *et al.*, 2007). In Bali several types of seaweed are generally consumed as vegetables and salad by the local people and known by local names as *soup and salad of bulung sangu* (*Gracilaria verrucosa*) (Suprapto, 2014; Widhiaanugrah, 2016).

Since ancient times Balinese people have been consuming seaweed as a fresh vegetable. Balinese women believe that consuming *jukut bulung* (seaweed vegetables) and *rujak bulung* (seaweed salad) will keep them look young for longer. Therefore, *jukut bulung* and *rujak bulung* emerged as one of the most favorite traditional snacks for women in Bali (Sri Andani, 2014). (Farida & Amalia, 2009; Julyasih *et al.*, 2013; Wiraguna *et al.*, 2013). A key problem associated with *bulung sangu* is that they are very difficult to find in the market since if it is exported abroad, the price is almost the same as the price of shrimp. Therefore, this study was conducted to review *bulung sangu* (*Gracilaria verrucosa*) Balinese seaweed, nutritions and health benefits.

Nutritions Benefits of Consuming *Jukut* and *Rujak Bulung Sangu*

Seaweed has potential nutrient and antioxidants content such as carotenoids, vitamins, fatty acids, carbohydrates, minerals, and other essential substances (El-Baky*et al*., 2007). According to Julyasih *et al.* (2009) the highest content of carotenoids in seaweed is found in *bulung sangu*, in addition to vitamins A, C, E and low cost.

Mineral contents in *bulung sangu* are I, Zn, Fe, Cu, Mn, Na, K, Mg, Ca, P and Cr (Wiraguna *et al*., 2013; Limantara & Rahayu, 2008). According to Maslukah *et al.* (2010) and Hutama (2015) the highest content of iodium (I) in seaweed is found in *bulung sangu.* Essential nutrients in *bulung sangu* are trance element, mainly iodium (Chaidir, 2007). According to Riskedas (2013), households which consume enough iodized salt is only 77%. Iodium deficiency results in physical and mental disorder, goiter, low IQ, laziness and sluggishness and low learning ability in children (Yuniastuti, 2008).

Besides high in iodium, seaweed is also high in fiber. According to Chaidir (2007) the amount of iodium contained in seaweed *bulung sangu* is 29,94 ppm (% dw) and 9,76 % of dietary fiber (% ww). Fiber is essential in overcoming the problem of nutrition, resulting in degenerative diseases such as coronary heart disease, cancer, *diabetes mellitus*, hypertension, and others.

Polyunsaturated fatty acids (PUFA) are the major fatty acids of *bulung sangu.* Typical *n*-3 and *n*-6 PUFA such as 18:3*n*-3, 18:4*n*-3, 20:5*n*-3, 18:2*n*-6, and 20:4*n*-6 are found in significant amount in all species of seaweed. All two extracts exhibited potent antimicrobial activity against human food pathogenic bacteria and anti-inflammatory activity (Thilahgavani & Charles, 2014). The fatty acid compositions of *Gracilaria verrucosa* were determined. Arachidonic and eicosapentaenoic acids (EPA) predominated among the fatty acids. EPA biosynthesis from arachidonic or from α-linolenic acids in *Gracilaria verrucosa* are discussed (Khotimchenko*et al.,* 1991). According to Yusasrini*et al.* (2016) *bulung boni* can significantly increase the secretion of insulin so it has the potential to be developed as an antidiabetic agent. *Bulung boni* can raise the level of HDL, so it will also be beneficial for people with diabetes (Julyasih *et al.,* 2013).

Research results showed that the composition of the pigment in *bulung boni* chlorophyll a (26.817%), chlorophyll b (12.906%), as well as xantofil (41.546%) (Kusumastuti, 2008).*Jukut* and*rujak bulung sangu*is a very harmonious combination of food, a potential source of nutrients, and antioxidants (Farida & Amalia, 2009; Julyasih *et al.,* 2013; Wiraguna *et al.,* 2013

Health Benefits of Consuming *Jukut* and *Rujak Bulung Boni* or *Bulung Sangu*

The growing risk of health hazards in the modern world and the use of expensive drugs which are not free from toxic side effects compel us to pay more attention to the preventive measures to be adopted to combat the diseases. The best prevention could be the propagation of food, which is rich in antioxidants and which consists of several secondary metabolites favouring the health conditions. Antioxidants are compounds that protect cells against the damaging effects of reactive oxygen species. Antioxidants can cancel out the cell-damaging effects of free radicals. Carotenoids have an important biological function as an antioxidant and immunostimulatory which can prevent diseases, antiinflammatory, antistress, antiaging, and protect the skin from the harmful effects of ultraviolet radiation.The results of several research stated that total carotenoids and iodiumishigher in *bulung sangu*, and that has significant potency as antistress, anticancer, antiinflammatory, antistroke and antipathogenic bacteria. Carotenoids have an important biological function as an antioxidant and immunostimulatory which can prevent diseases, antiinflammatory, antistress, antiaging, and protect the skin from the harmful effects of ultraviolet radiation (Myers, 2005; Wiragun*et al.,* 2013). They also have significant roles as normolipidemic, antidiabetic, antiatherosclerotic, antiosteoporotic, and antiaging (Winarsi, 2007). Consumption of *bulung sangu* has been associated with reduced cancer risk, diabetes risk, heart disease risk, osteoporosis risk. Research suggests that the antioxidant content is higher in *bulung sangu.*(Limantara &Rahayu, 2008). Natural products derived from *bulung sangu* protect cells by modulating the effects of oxidative stress. Because oxidative stress plays important

roles in inflammatory reactions and carcinogenesis, *bulung sangu* natural products have the potential for use in anti-cancer and anti-inflammatory drugs (Lee *et al*., 2013). The application of *bulung sangu* antioxidants in foods, food supplements, nutraceuticals, and medicine is considered from the perspective of benefits to human health (Lynn *et al*., 2010).

Functional food of *Jukut rujak bulung sangu* is a combination of food (food combining diet) is very compatible, increase the effectiveness of the absorption of nutrients and bioactive substances it contains, to increase the efficacy of the antiatherogenic (Farida &Amalia, 2009). They synergize in increasing the activity of bioactive substances it contains, mainly equally nutritious and is a source of antioxidants, which act as anti-inflammatory and antiatherogenic, thus providing hope in the prevention of CHD (coronary heart disease) (Farida &Amalia, 2009; Winarsi, 2007). Chlorophyll as food can help the absorption of nutrients, clean the circulatory system, maintain the acid-base balance of the body, reduce bad breath and maintain healthy digestive system, increase endurance, energy sources, help repair tissue and help the liver in producing red blood cells (Limantara & Rahayu, 2008).

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EPA can prevent blood platelets. Platelets in the blood in large quantities will interfere with blood flow and is the major cause of heart attacks and strokes (Utari, 2011).

Conclusion

Jukut and *rujak Bulung sangu* has potential nutrient and antioxidants content such as protein, carotenoids, vitamins, fatty acids, carbohydrates, minerals, and other essential substances

References

El-Baky, HH, El-Baz, FK, El-Baroty, GS. (2007). Production of Carotenoids from Marine Microalgae and its Evaluation as Safe Food Colorant and Lowering Cholesterol Agents American Eurasian. J. Agric. Sci. 2(6): 792-800.

Farida, I & Amalia, N. (2009). *Diet SehatdanEfektifdenganMetode Food Combining*. Yogyakarta. BukuBiru Press.

Julyasih, KSM, Wirawan, IGP, Harijani, WS, Widajati, W. [Internet]. (2009). AktivitasAntioksidanBeberapaJenisRumputLautKomersial di Bali: https://core.ac.uk/download/pdf/1221029.pdf; [update 2009 Dec]

Khomtimchenko, SV., Vaskovsky, V.E., Przhemenetskaya, V.F. (1991).Distribution of Eicosapentaenoic and Arachidonic Acids in Different Species of *Gracilaria. J. Phytochemistry 30 (1): 207-09.*

Kusumastuti, K. (2008). Pengaruh Pengeringan terhadap Komposisidan Kandungan Pigmen Algae hijau Caulerpa sp. *Skripsi*. Universitas Diponegoro.

Limantara, L., Rahayu, P. (2008). Sains dan Teknologi Pigmen Alami. *Proceedings of the National Seminar Pigments UKSW*, Salatiga. p 79.

Lee JC.,Hou MF., Huang HW., Chang FR., Yeh CC., Tang JY., Chang HW. (2013). Marine algal natural products with anti-oxidative, anti-inflammatory, and anti-cancer properties. Cancer Cell International 13:55.

Lynn CM., David GJ. (2010). Antioxidants from macroalgae : potential applications in human health and nutrition. Algae, 25 (4).

Maslukah, Lilik, Rudiana, Esti, Pringgenies, Delianis.[Internet]. (2004). Kajian tentangKandunganYodiumpadaEkstrak BeberapaJenisRumputLaut yang Terdapat di

PerairanJeparadanSekitarnya.Eprints.undip.ac.id/22855/1/229-i-fpik-2005-a.pdf; [updated 2005 Nov.]

Myers, S. [Internet]. (2005). The Carotenoids Palette. An Array of Colors, Researched Health Benefits and Formulation Challengers Highlight The Future of Carotenoids: www.naturalproductsinsider.com.;[updated2007 Jun] .

Rajapakse, N., Kim, SK. (2011). Nutritional and Digestive Health Benefits of Seaweed. Advances in Food and Nutrition Research. Vol. 64.

Sri Andani, NM. [Internet]. (2014). *Jukut Bulung*, Sayur Rumput Laut untuk Kesehatan dan Kecantikan.https://nimadesriandani.wordpress.com/2014/09/06/jukut-bulung-sayur-rumput-laut-untuk-kesehatan-dan-kecantikan/; [updated 2014 Sept.]

Suprapto. [Internet]. (2014). Bulung. RRI.co.id.; [updated 2014 July].*tesis*. Bogor : Bogor Agricultural University.

Thilahgavani, N and Charles, SV, (2014). Nutritional and bioactive properties of three edible species of green algae, genus *Caulerpa* (Caulerpaceae). Journal of Applied Phycology vo 26, issue 2 Springer, Netherlands

Utari, DM. (2011). Efek Intervensi Tempe terhadapProfil Lipid, SOD, LDL, HDL, dan MDA padaWanita Menopause. *thesis.* Bogor : Bogor Agricultural University.

Widhiaanugrah. [Internet]. Resep Rujak Bulung khas Bali Asli Nikmat. widhiaanugrah.com; [updated 2016 Sept].

Winarsi, H. (2007).*Antioksidan Alamidan Radikal Bebas, Potensidan Aplikasinya dalam Kesehatan.* Yogyakarta. Kasinius Press. p 9-108.

Wiraguna, AAGP, Pangkahila, W, Mantik-Astawa, N. (2013). Photochemo protection of *Caulerpa sp*. Active Component on Rat Model Skin. Ind. J. of Biomedical S. [Internet][cited 2013 July]; 7(2): 52-56. Available from :http://www.ojs.unud.ac.id.

Yusasrini, ANL, Darmayanti LPT. (2016). Pengaruh Diet Rumput Laut *Caulerpa*dan *Gracilaria* terhadap Kadar Glukosa Darah dan Histopatologi Pankreas Tikus Diabetik. Media Ilmiah Teknologi Pangan 3(1): 53-61.