

**CHAPTER**

**7**

**PHENOLIC CONTENT AND  
ANTIOXIDANT PROPERTIES  
OF SEAWEED**

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**7.1 INTRODUCTION**

Seaweeds are scientifically known as algae. Seaweeds are macro algae that are rarely consumed in unprocessed form of food. Seaweeds are a valuable food sources of carbohydrates, vitamins, minerals and polysaccharides (Macartain et al., 2007). In Asian region, edible seaweeds are popularly consumed as fresh dried or ingredients in foods. Western people consume seaweed in a form of extracts such as laminaran, alginate and fucoidan from brown algae (Rioux et al., 2007), ulvans from green algae (Jaulneau et al., 2010) and agar or carrageenan from red algae are available as gelling and stabiliser agents in food and pharmaceuticals industries (Mohamed et al., 2012).

Early 1978, the seaweed cultivation was held in Sabah. National Seaweed Technical Committee (NSTC) under the supervision of Malaysia government had initiated the seaweed cluster project (SCP) in Semporna to assist seaweed development to an optimum level. Several farming approaches are being established such as the use of poly floats replacing the recycled plastic bottles, the use of cement anchoring systems as well as the

implementation of Malaysian Good Aquaculture Practises (MyGAP) certification scheme (Nor et al., 2016).

Seaweeds are also being fundamental to food chains of all aquatic ecosystems due to their ability to produce oxygen and organic compounds through photosynthesis (Pereira, 2015). In ancient time, China named seaweed a perfect food as it serves an optimum nutritional value. Nori, a red seaweed is an ingredient used in sushi, a traditional Japanese dish. However, Romans used them to treat burns, rashes and wounds while Egyptians may have applied them to treat serious illnesses like breast cancer. This chapter focuses on discussing all the three groups of seaweeds. The sub-topics comprise of chemical and nutritional composition of seaweeds, phytochemicals of seaweeds and its bioactivities, phenolic compound of seaweeds with different extraction methods, and antioxidant properties.

## 7.2 TYPES OF SEaweeds

Macroalgae or so-called seaweeds, are living plant-like organisms that found attached to hard substrata or rock in coastal areas. Seaweeds have diverse species that referring to distinguish morphological types such as complexity, structure and environmental adaptations. Brown algae (*Phaeophyta*), green algae (*Chlorophyta*) and red algae (*Rhodophyta*) are the most common class of macro algae, as illustrated in Table 7.1.

**Table 7.1** Types of edible seaweed (Source: Brownlee et al., 2012; McDermid & Stuercke, 2003)

Types of Seaweed	Genus	Common Name
Phaeophyta (Brown Seaweed)	<i>Alaria</i>	<i>Kelp/ bladderlocks</i>
	<i>Himantalia/ Bifurcaria</i>	<i>Sea spaghetti, fucals</i>
	<i>Laminaria</i>	<i>Kelp/ kombu/ kumbu/ sea tangle</i>
	<i>Saccharina</i>	<i>Sugar wrack</i>
	<i>Undaria</i>	<i>Wakame</i>
	<i>Ecklonia</i>	<i>Kajime</i>
	<i>Ascophyllum</i>	<i>Egg wrack</i>

continue

**Table 7.1** (continued)

Types of Seaweed	Genus	Common Name
Phaeophyta (Brown Seaweed)	Fucus	<i>Bladder wrack, rockweed</i>
	Sargassum	<i>Mojaban/ Indian brown seaweed/ Limu Kala/ Sea holly</i>
	Hizikia	<i>Hijiki</i>
	Dictyota	<i>Limu Alani</i>
	Eisenia	<i>Arame</i>
Chlorophyta (Green Seaweed)	Ulva/ Enteromorpha	<i>Laver/ sea lettuce/ sea grass/ nori/ Limu Pālahalaha</i>
	Caulerpa	-
	Codium	<i>Limu Wawae'iole</i>
	Monostroma	-
Rhodophyta (Red Seaweed)	Rhodymenia/ Palmaria	<i>Dulse</i>
	Porphyra	<i>Nori/ haidai/ kim/ gim/ Limu Pahe'e</i>
	Chondrus	<i>Irish moss/ carrigeen</i>
	Mastocarpus/ Gigartina	<i>Stackhouse, Guiry</i>
	Gracilaria	<i>Limu Manauea</i>
	Asparagopsis	<i>Limu Kohu</i>
	Grateloupia	-
	Ahnfeltiopsis	<i>Limu 'Aki'aki</i>
	Kappaphycus/ Eucheuma	
	Halymenia	<i>Limu Lepe-o-Hina</i>
Laurencia	<i>Limu Mane'one'o/ Limu Lipe'epe'e</i>	

### 7.2.1 Brown Seaweeds

*Cutleriales*, *Desmarestiales*, *Dictyotales*, *Ectocarpales*, *Fucales*, *Laminariales*, *Ralfsiales*, and *Sphacelariales* are a list of order included in the brown macroalgae category (Pereira, 2015). Brown seaweeds from the genus *Laminaria* are the most common type of seaweed found on rocky beaches, within the low water spring tide level to the shallow sublittoral in Sabah region located in Malaysia. They usually have a method to attach themselves to rock surfaces and also accumulated in the shallow sublittoral zone. Wakame, from the genus *Undaria* is popular among East Asians and being eaten fresh or dried. In Japan, Wakame is an important food ingredient added into miso soup while Korean usually consume it in Miyeokguk.