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# Why Seaweeds Can Be Utilized as Biostimulants



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## Introduction

Marine algae are defined as aquatic plants belonging to the thallophyte of plant kingdom [1]. This kingdom of particular plants revealed as a potential source bioactive molecule, nutrients, phytohormones and other compounds with crucial role in biology [2]. Several researches showed the wonderful effect marine algae on plant growth development, since germination stage to

final growth. Additionally, root development, plant resistance against hostile environment were recorded [3,4]. Consequently, the application of marine algae could be regarded as a suitable alternative to instead of chemical fertilizers who are demonstrated as responsible of environmental pollution. This mini review summarizes the multiple effects of marine algae in agriculture.

## Global composition of marine algae

**Table 1:** Global composition marine algae.

Mineral compounds (µg/g of extract)	Red alga	Green alga	Brown alga
Copper	4.89	0.38	8.641
Manganese	57.5	62	8.75
Zinc	15.8	1.01	19.92
Iron	915	0.37	858.5
Potassium	5.176	113	29.65
Magnesium	25.8	1.8.3	9.6
Cobalt	0.082	0.06	3.47
Chromium	0.82	nd	16.6
Lead	0.158	nd	0.4
Nickel	1.84	10.4	25.2
Cadmium	0.07	2	5.9
Sodium	4.15	185	39.11
Calcium	351.5	195.26	2053.4
Organics compounds	Agars, agaroids	Amylase	Alginates
	Carrageenans	Amylopectin	Cellulose
	Cellulose	Cellulose	Complex sulfated heteroglucans
	Xylans,	Laminaran	Lichenan-like glucan
		Pectin	

Alanine	+++	+++	++
Glycine	+++	++	++
Valine	++	++	++
Leucine	++	++	+
Isoleucine	++	++	+
Serine	++	++	+
Threonine	+++	+++	+
Cystein	+	+	+
Methionine	+	+	+
Aspartate	+++	+++	++

Marine algae promote plant by different mechanisms involving several ingredients, such as phytohormones, plant nutrient and some unknown molecules [5]. Then, organic matter contained in the biofertilizer influences directly the plant growth. Additionally, Seaweeds provide soil by N, P and K and other minerals requested for plant growth and soil fertilization [6] Marine algae are known by their richness by mineral and organic compounds, protein, vitamins [7-9]. Mineral composition of seaweeds was found relatively higher as compared to land vegetables (Table1).

### Marine algae as source of biostimulants

Marine algae are considered as a potential source of organic matter and simulative elements, their composition allowed to their utilization as biofertilizers in agriculture [10]. It was demonstrated that marine algae fertilizer is a natural bioactive substantial [11]. It also has been reported that brown algae are used to soil fertilizers, this is due to their richness in alginate as responsible agent of organic matter decomposition by bacteria [12]. It's also well demonstrated that many marine algae are used since ancient times directly or in composted form as a soil amendment to improve the crop productivity [13,14]. They have an excellent effect on crop growth and nutritional response plus chemical properties of a fine-textured soil [15]. Additionally, marine algal extracts are known to stimulate and improve crops directly through the release of some plant regulators such as phytohormones and micronutrients [4,16].

### Phytohormones

Marine algae as used as fertilizers because they are rich in many hormones involved in crop improvement such as cytokinin's, gibberellins, trace elements, vitamins, amino acids, and micronutrients [11].

### Biostimulants

Marine algae are demonstrated as crucial fertilizers, resulting in less nitrogen and phosphorus runoff than the one from the use of livestock manure [17]. Several researches revealed the effect of marine algae on seed germination and root development, frost resistance, nutrient uptake, increased resistance to pathogenic fungi, reduced incidence if insect attack, restauration and stimulation of plant growth under saline or non-saline soil,

respectively [4,18]. Application of liquid fertilizers on some plant species has been reported to decrease application doses of nitrogen, phosphorus and potassium on some crop plants as well as stimulating growth and production of many plants [19].

### Osmoprotectants

Osmoprotectants are implicated in the protection of plants against high osmolarity in saline soil. This phenomenon is known to hinder plant growth in arid and semi-arid regions [4]. In this way, marine algae are implicated as solution for soil reclamation and challenge the osmotic stress affecting plants growth. Moreover, these algae improve plant resistance toward salinity by release some organic compounds such as proline, betaines, DMSP, polyamines are synthesized accumulated in high concentrations then are intimately involved in the osmotic stress adjustment [20-26].

### Conclusion

Beneficial effects of marine algae bio stimulant in agriculture are summarized. The main composition of marine algae as crucial source of different metabolites involved in plant resistance to different hostile environments and agricultural soils fertilization are highlighted. Marine algae could be considered as a good bio stimulant and biofertilizer in agriculture.

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