Biostimulants Seaweed Extracts and Acadian

Chemical Composition and Bioactivity

Comparison and Differentiation with other Biostimulants

Earth Smart January 9, 2026

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SEA BEYOND

Acadian Formulator Technology

- Acadian provides quality *Ascophyllum nodosum* alkaline extracts and extract ingredients (soluble powders and liquids) as an ingredient for use in formulations.

- Acadian Formulator Technology supports these customers using our extract ingredients in their own proprietary formulations.
  - We also provide support to the customer in creating new products containing seaweed for their product portfolios.

- The company also provides agronomic and scientific support related to how these ingredients work in the crop plant and how they can be implemented into a crop management system as a stand-alone product or as an ingredient in a more complex formulation.

- Acadian spends significant resources providing our customer with clear points of differentiation to enable its customers to compete in a marketplace with a constantly increasing number of biostimulant, all making similar claims.

Biostimulants Defined

Plant Biostimulants are products that improve plant growth and development, enhance nutrient use efficiency, and increase tolerance to abiotic stress (like drought or salinity). These products, derived from natural or biological sources or synthesized chemically, don't directly provide nutrients but rather **stimulate the plant's natural processes**.

US Biological Products Industry Association (BPIA)

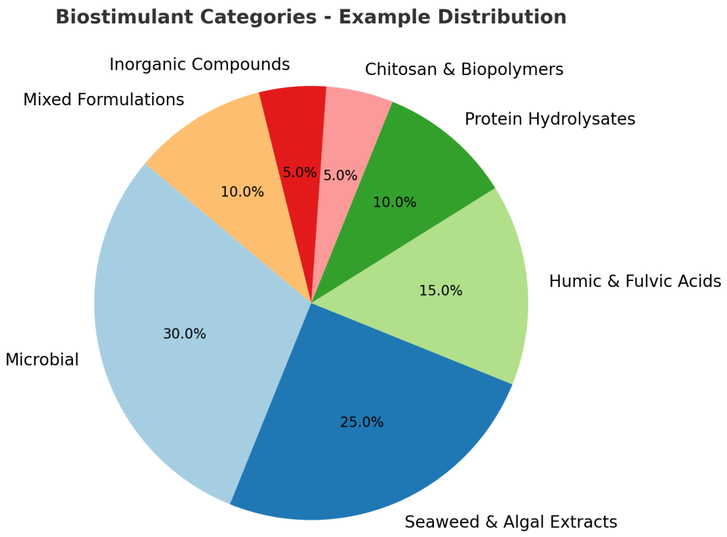
https://www.bpia.org/solutions-provided-by-biological-products-biostimulants/#:~:text=the%20popular%20literature.-,Biostimulants%20are%20a%20diverse%20group%20of%20materials%20that%20are%20used,to%20increase%20water%20use%20efficiency

A "plant biostimulant" is defined as a substance or microorganism that, when applied to plants, **stimulates natural processes** to enhance nutrient uptake, nutrient efficiency, tolerance to abiotic stress, or crop quality and yield, independently of the biostimulant's nutrient content.

California Department of Food and Agriculture

https://www.cdfa.ca.gov/is/ffldrs/docs/fertilizer/notice_to_industry-beneficial_substances_plant_biostimulants-final-12-11-24.pdf

Biostimulant Category of Crop Inputs



Crop Benefits	Seaweed Extracts	Humic & Fulvic Substances	Amino acids	Microbials (Bacteria, Fungi AMF)	Microbial Metabolites**
Key Bio Actives	Alginates, Mannitol, Fucoidans etc.	Humic and Fulvic Acid	Peptides/Protein Hydrolysates	E.g. Bacillus sp. Rhizobium sp. Mycorrhiza Fungi	Lactic/Acetic Acid, Microbial Metabolites
Improved Nutrient Uptake	✓	✓		✓	?**
Increased Root Growth	✓		✓	✓	?**
Frost or Cold Stress Tolerance	✓		✓		?**
Drought or Heat Stress Tolerance	✓	✓	✓		?**
Salinity Tolerance	✓	✓	✓		?**
Stimulates soil microbial activity	✓	✓	✓	✓	?**

Similar claims from a different source of actives means different target pathways resulting in similar response in the plant – combining multiple active sources can result in synergies.

****There are very few microbial metabolite products in the market and the effectiveness of these products has not been confirmed by third party academic research only internal company data.**

https://www.soilquality.org.au/factsheets/biological-inputs-northern-grain-growing-region
https://a-connect.com/insight/the_case_for_adding_biostimulants_to_your_biologicals_portfolio/
https://www.sciencedirect.com/science/article/pii/S0304423815301850?via%3Dihub
https://www.humicchina.com/blog/whats-biostimulant-how-many-kinds-of-biostimulants-now.html

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Seaweed Extract Biostimulants Key Points of Differentiation

Seaweed Biostimulant Differentiation

Seaweed Species = Active Compound(s)

- Research evidence links the actives derived from specific seaweed species with the activity in the plant
- Most seaweed biostimulants are manufactured from different species of “brown seaweed” (Brown = Carbohydrates – Alginates, Fucose etc.)

Process (manufacturing)

- Manufacturing process used to make the product plays a big part in actives extracted from the raw seaweed and made soluble in water; bioactives = efficacy

Quality and Consistency

- Rigorous manufacturing process monitoring – same final product 365 days per year
- ISO 9000 quality system ensures all products meet Acadians strict quality specifications

Acadian Seaweed Extracts are derived exclusively from ***Ascophyllum nodosum***

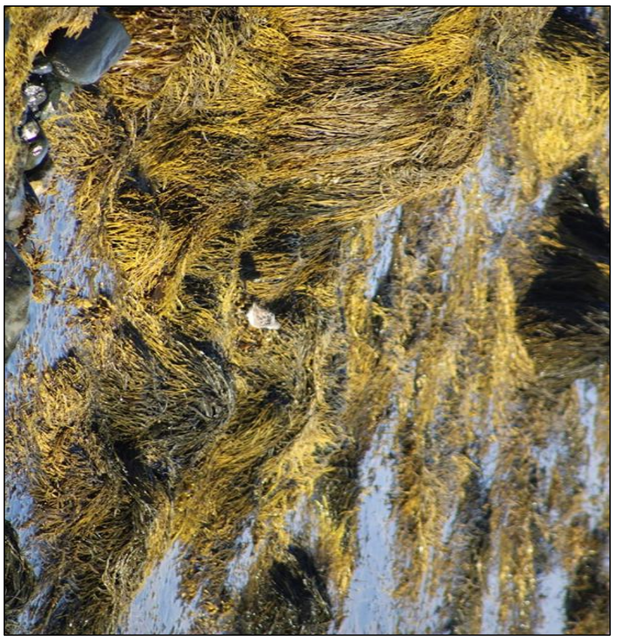
Ascophyllum nodosum is exclusive to the intertidal waters of the North Atlantic. It is exposed to extreme weather conditions and can thrive in very warm as well as sub-zero temperatures (-25°C/-13F in winter to +40°C/+104F in summer).

Ascophyllum nodosum experiences extreme tide variances (50 feet tide twice a day); emersion in cold, salt water at high tide and drought and extreme heat at low tide.

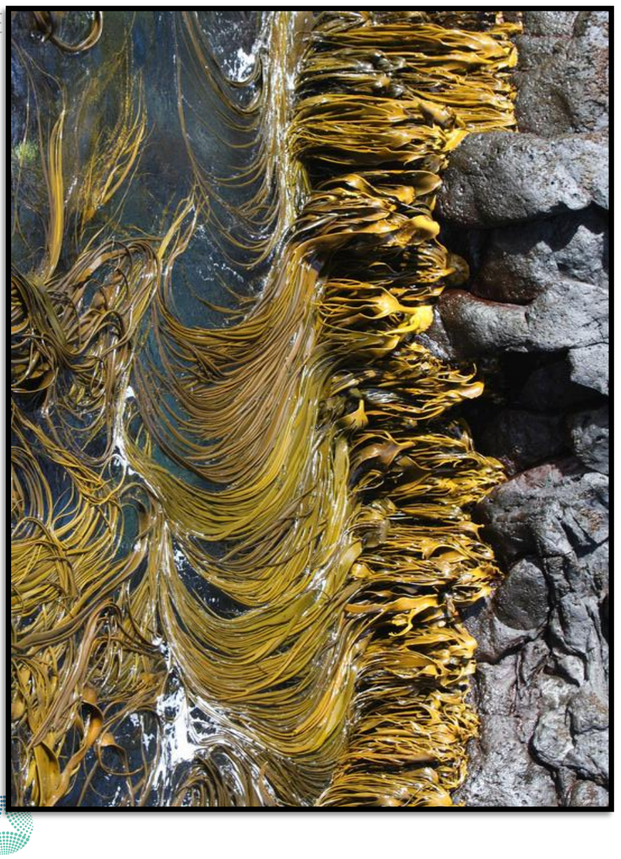
Ascophyllum nodosum has adapted to life in the intertidal zone by evolving its **biochemical compounds to overcome stress.**

Ecklonia in the subtidal zone

Ascophyllum in the intertidal zone



Durvillaea potatorum in the intertidal zone

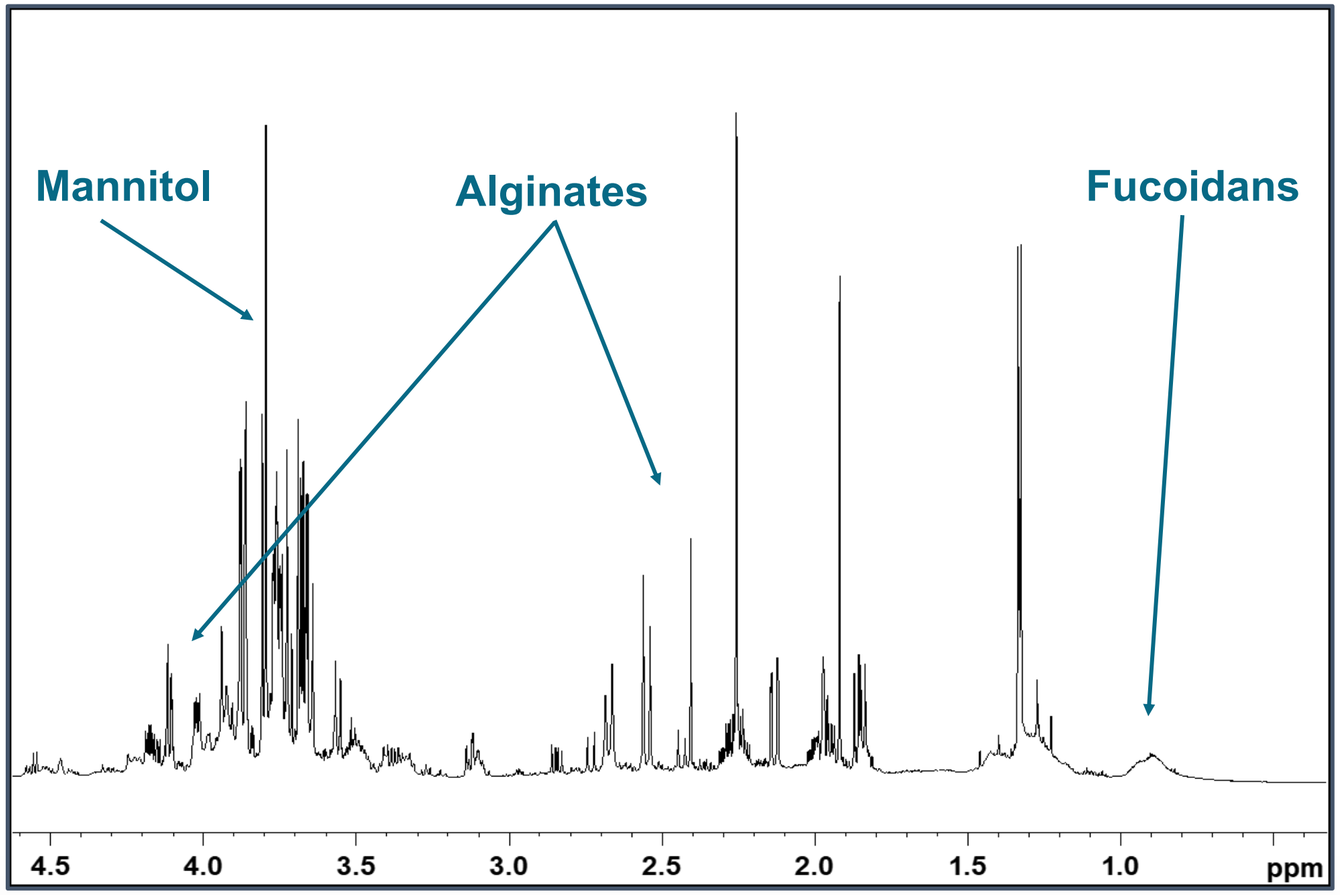


Macrocystis in the subtidal zone

Biochemical Fingerprint

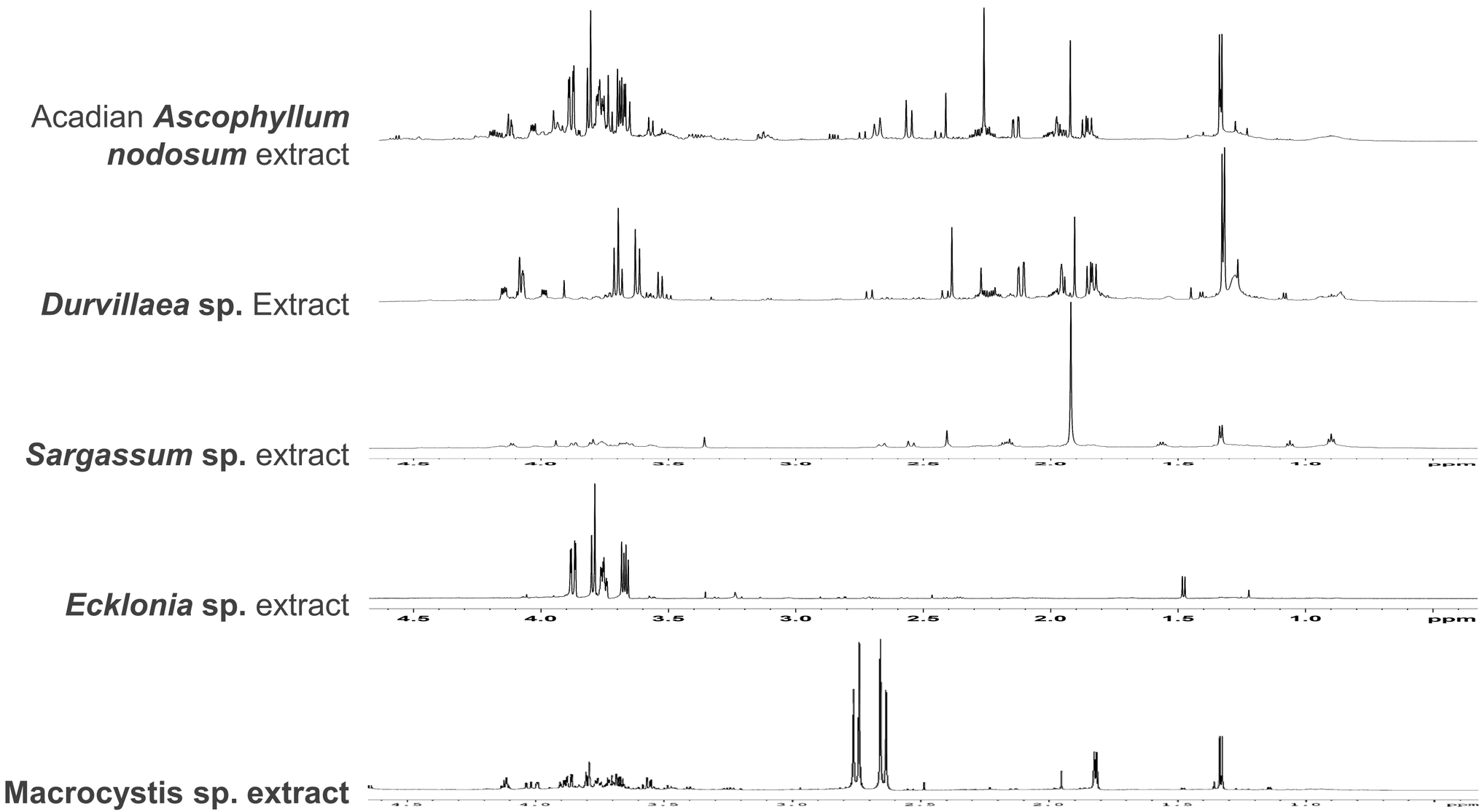
- Nuclear Magnetic Resonance (NMR) spectroscopy is used to analyze organic compounds
- Can be used to compare products based on biochemical similarity
- Can also be used to identify some components of a complex mixture like seaweed extract

Biochemical 3D Fingerprint



Craigie *et al*, J Appl Phycol (2007)

Extracts from other algal species are chemically different



Craigie et al, J Appl Phycol (2007)

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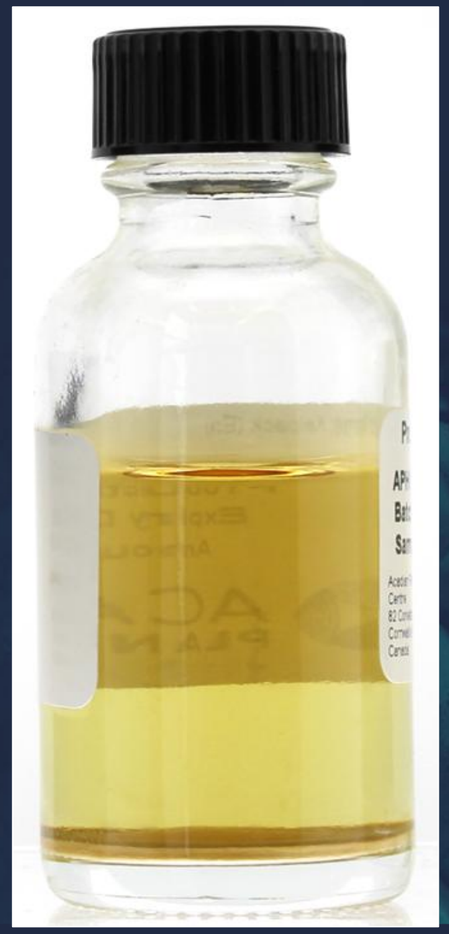
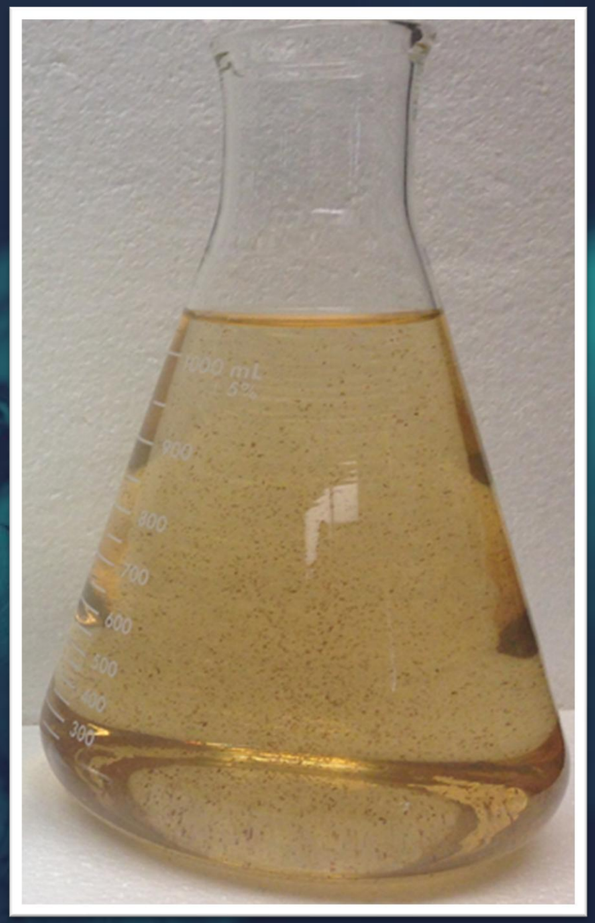
EXTRACTION PROCESS

ALKALINE



WATER EXTRACT



BIOLOGICAL
FERMENTED EXTRACT

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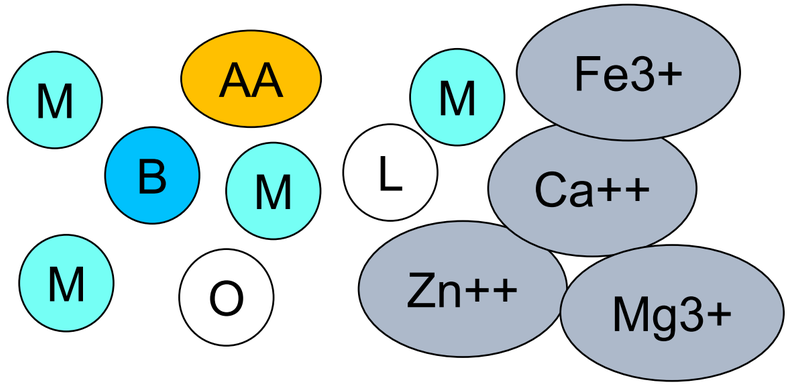
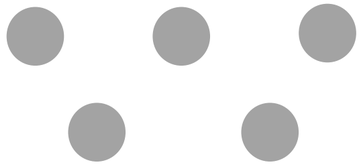
EXTRACTION PROCESS

Competitor *Ascophyllum* extracts could be similar, but not identical

Water Extraction

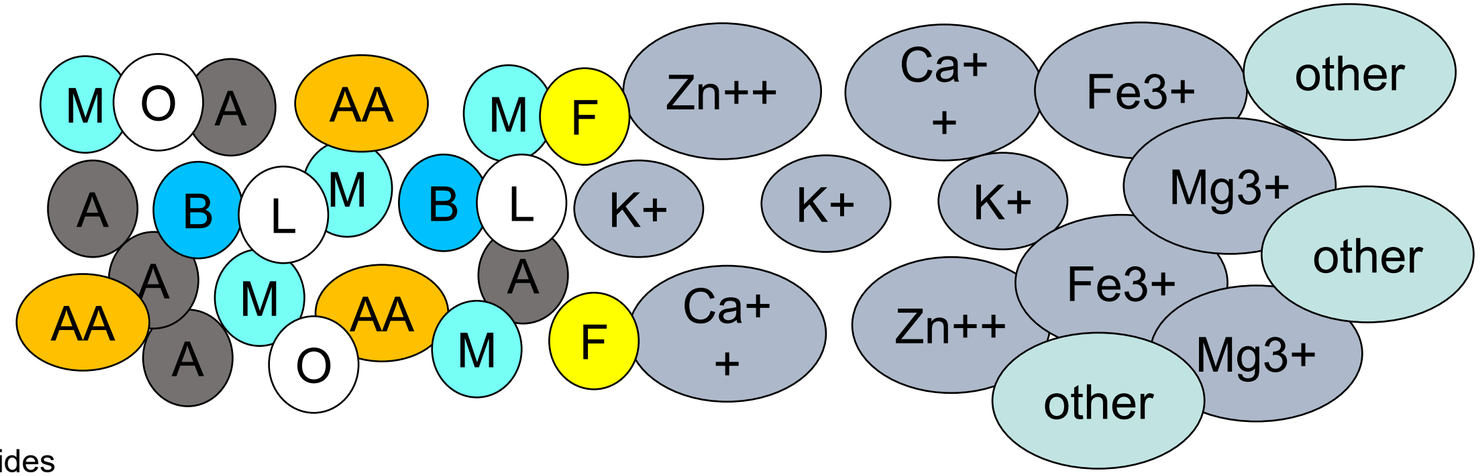


+ Grind



Fine particles of seaweed cell wall mixed with the water - soluble compounds

Water + KOH (Alkaline) Extraction



Only compounds that are dissolved in water are immediately plant available

M= Mannitol O = Oligosaccharides
A= Alginic Acid AA=Amino Acids
B = Betaines F= Fucose L=Laminarin

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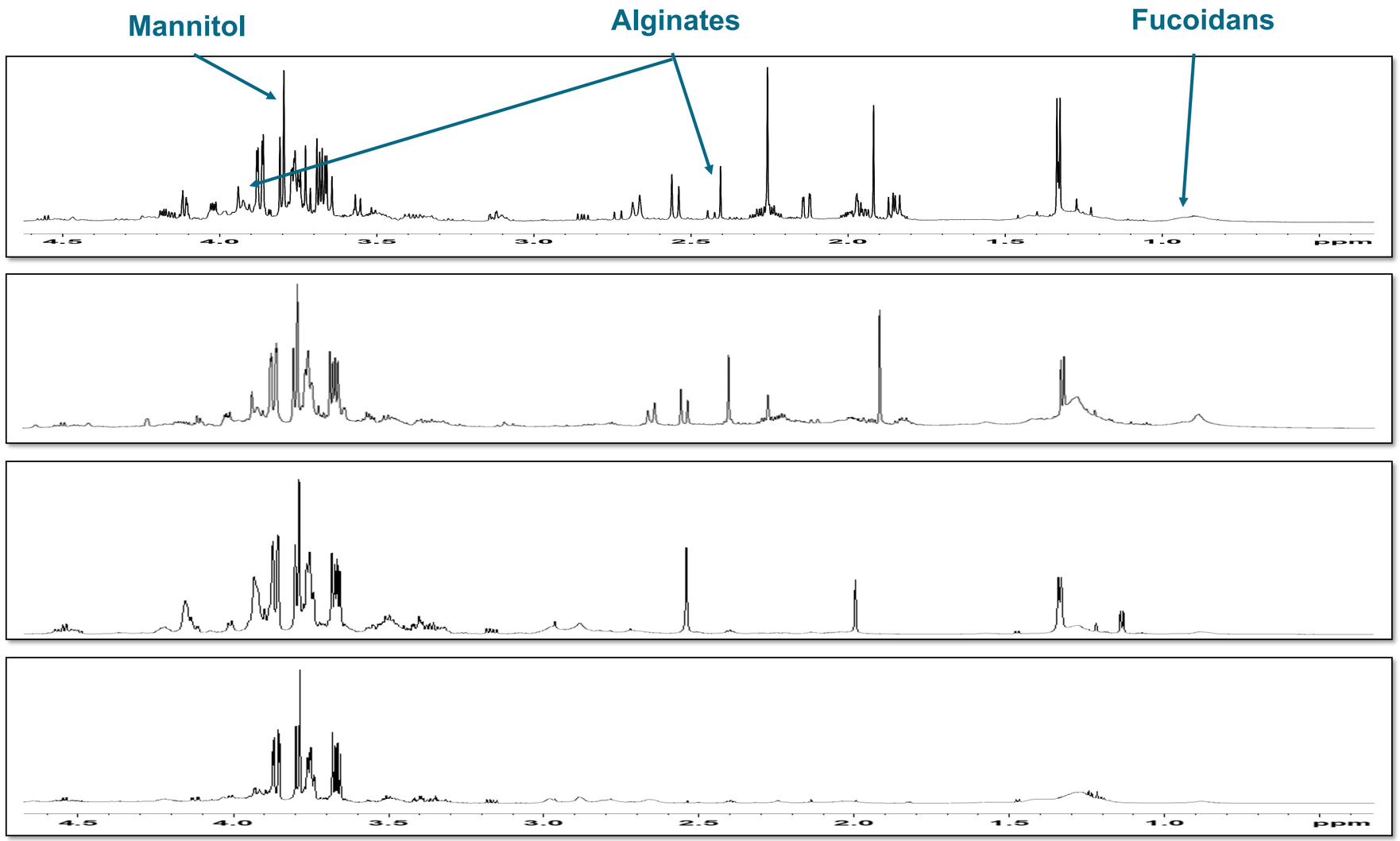
Competitor *Ascophyllum* extracts can be similar, but not identical



Acadian™ Atmospheric Alkaline

Pressurized Alkaline

Cold Water Extraction

Hot Water Extraction

Craigie *et al*, J Appl Phycol (2007)

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EXTRACTION PROCESS - BIOMARKERS

	Acadian Ascophyllum Alkaline Extract	Ascophyllum Water Extract
pH (10% solution)	8.0	4.2
Density	1.16 g/ml	1.02 g/ml
Dry Matter w/w	29%	6.9%
Organic matter	13 – 16 %	5.1%
Alginic Acid	3 – 5%	0.6%
Fucoidans	2 – 4%	0.2%
Mannitol	1 – 2%	0.6%
Ash (Minerals)	13 – 16%	1.8%
Potassium	4.0 – 5.5%	0.2%
Nitrogen	0.1 – 0.3%	<0.1%

Acadian alkaline extracts have higher levels of bioactive compounds compared to other types of extraction methods of Ascophyllum & higher than extracts of other seaweed species

Key Differentiation of Acadian Extract vs. Competitor Biostimulants

- *Ascophyllum nodosum* used for the manufacture of extract (**Source - Species**)

- APH extraction processes is alkaline extraction that maximizes extraction of biomarkers and actives from the seaweed (**Process**)

- **Quality and Consistency:** Manufactured by APH with complete control of quality and supply chain, not a technical ingredient purchased from 3rd party and used in a formulation with fertilizers (Quality)
  - Pure seaweed extract with no added fertilizers or other compounds
  - Highly consistent and stable formulation

- **Sustainability** – licensed government monitored harvest to conform to Canadian Environment Standards; annual available harvest sufficient to guarantee supply of extract to the customer

- **Technical/Scientific Support** – Mode of Action (How it works); Scientific Publications; Field Performance

AscoDri-TI	AscoDri-TI Rehydrated (10%)	Ocean Organics	Kelpak
			

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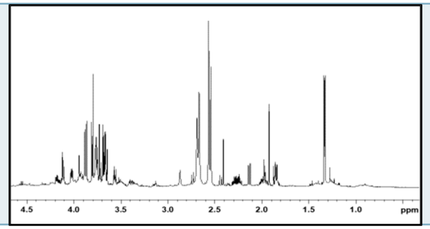
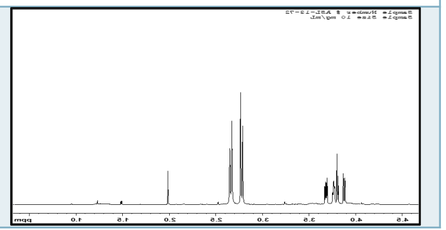
PRODUCT COMPARATIVE ANALYSIS

	AscoDri-TI	Ocean Organics	Kelpak
Seaweed Species	***Ascophyllum nodosum***	***Ascophyllum nodosum***	***Ecklonia maxima***
	Soluble Powder	Liquid	Liquid
Seaweed Extraction Process	Acadian Proprietary Alkaline Extract	Mild alkaline extraction (extracts very few alginates; reduced number of bio-active compounds)	Cold Burst/Water Extract
Concentration of Seaweed Extract Bioactive Actives	High Concentration of Seaweed Extract Actives (100%) 10% = 100g/L	Low Concentration of Seaweed Extract Actives 50 g/L (5%)	Low Concentration of Seaweed Actives 50 g/L (5%)
NPK	0-0-17	0-0-1	0-0-1
Appearance	Dry Form – Uniform Flake; Liquid Opaque, dark brown, flowable, homogeneous soluble liquid	Opaque, dark brown, flowable liquid	Semi-translucent, flowable brown liquid with visible suspended particles, sediment
NMR Fingerprint			

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Thank you

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