BioPower® Liquid Marine Plant Extract

BioPower Liquid - A pure seaweed bio stimulant extracted from fresh Ascophyllum nodosum, manufactured using biological fermentation under low temperature and negative pressure.

BioPower Liquid is among the highest quality seaweed products you can buy. It is derived from the seaweed species Ascophyllum nodosum which has proven to be the most effective seaweed bio stimulant.

BioPower Liquid is a natural plant food that provides a range of benefits for plant health and growth. Another one of the few natural 'miracle' foods that you can give to your crops.

BioPower Liquid will increase your crop's resistance to stresses such as excessive heat, wind and drought conditions. It will stimulate natural root growth, mineral uptake and overall plant growth and vigour.

You can use **BioPower Liquid** in conjunction with other fertilizers, or by itself. Use on all plants, seedlings fruit trees, houseplants in a regular health maintenance program.

Benefits of BioPower® Liquid

- Improves seed germination and increases root development.
- Increases bloom set and size of flowers and fruit.
- Increases and stabilizes chlorophyll in plants, which results in darker green leaves and increased sugar content in plants.
- Relieves stress in plants caused by extreme weather conditions.
- Increases plant vigor, and thus imparts a greater resistance to disease, insect attack, drought, and frost.
- Increases microorganisms in the soil that can fix nitrogen from the air.
- Increases mineral uptake from the soil.
- Increases the storage life of fruits and vegetables by retarding the loss of protein, chlorophyll, and ribonucleic acid (RNA).
- Retards the aging process in plants (senescence), thereby lengthening the production season.

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Harnessing the Natural Power of Ascophyllum nodosum

The World's Premium Marine Plant

Why is Ascophyllum nodosum the best marine plant for agriculture?

Ascophyllum nodosum is by far the most researched marine plant for agricultural purposes. Compared with extracts of other species Ascophyllum nodosum provides more consistent effects with measurable benefits to growers, with **BioPower Liquid**'s advanced methods of extraction playing a crucial role in the efficacy of the product. Also, soluble, hydrolyzed Ascophyllum nodosum extracts arguably provide the highest concentration of beneficial compounds of any marine plant extract.

What makes **BioPower Liquid** particularly suited for agriculture. Ascophyllum nodosum as a species has adapted to survive under the demanding growing conditions of the inter-tidal zone (extreme water temperatures ranging from icy cold in winter to moderate in late summer, full immersion in salty seawater at high tide and intense stresses of sun exposure at low tide.)

These conditions have forced the marine plant to develop unique survival strategies, such as anti-stress compounds, or the signaling compounds which cause the plants to produce them, are among the beneficial qualities extracted during the manufacturing process.

What are the key elements in Ascophyllum nodosum which contribute to healthy productive plants?

The biostimulatory capacity of marine plants is not isolated to one set of compounds. Plant bio-stimulants can all play a valuable role in different plant processes. Many of the carbohydrate fractions (comprised of poly-and oligosaccharides) are unique to Ascophyllum nodosum (such as alginates and mannitol) and can play a significant role in plant stimulation.

The **BioPower Liquid** extraction process is designed to release a great many of the attached molecules as well as hydrolyze some of the long-chain sugars (carbohydrates) into smaller units. It is becoming more widely understood that short-chain carbohydrates can act as growth stimulants affecting many plant processes.

The activity stimulated by **BioPower Liquid** is not caused by just one organic compound. Rather, when applied in a mixture as found in **BioPower Liquid** and in combination with low levels of one or more elemental nutrients, resulting interactions are very positive.

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Why is BioPower Liquid extracted using biological fermentation, low temperature, negative pressure manufacturing process?

The goal of this process is to extract the beneficial, natural products in the marine plant without destroying vital compounds. The extraction conditions must be aggressive enough to rupture the cells, but not so harsh as to degrade the beneficial compounds once released from the cells. It is generally accepted that cooking the marine plant at elevated pressures (and subsequent high temperatures) will increase the speed at which the extraction occurs, but is more likely to result in chemical changes to the natural compounds.

By limiting the temperature and pressure, **BioPower Liquid** strives to minimize any change to the compounds found in the fresh marine plant, while ensuring they are released and captured in the final products.

Quality - from source to finished product

- To ensure purity of our extract we harvest our raw material from seabeds with low occurrence of other non targeted marine plant species and apply rigourous quality assurance screening measures to the extraction process.
- Using only fresh Ascophyllum nodosum not dehydrated plants to minimise degradation of beneficial compounds for maximised crop benefit.
- A proprietary extraction process, managing the relationship between pressure and temperature, minimises the risk of damage to the marine plants compounds thus increasing the benefit to crops receiving the extract.
- Utilizing custom technology to produce fully soluble extracts that deliver efficacy, consumer cost effectiveness and trouble free application.
- Using the most responsible processes and constituents available. For example food grade biosides rather than industrial grade biosides.
- Producing potassium based extract rather than sodium based products to help manage salt levels in the agricultural environment.
- Investing in internal R&D in association with external research institutions to ensure quality and manufacturing advances to benefit the agricultural sector.

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Natural Plant Biostimulants enhance crop production* (reference source footnote page 5)

To achieve quality yields, many growers have adapted their management programs to include organic, natural or 'soft' products to influence crop growth and development. Ascophyllum nodosum is generally regarded as providing extracts having the greatest biostimulatory effect of all marine plant species. Ascophyllum extracts are also known as an important source of mineral nutrients and plant growth regulators.

How are seaweed products used?

The majority of seaweed products are applied as mineral nutrient supplements in integrated crop nutrition programs. They are used to induce beneficial effects attributed to the presence of natural plant growth hormones and other compounds.
Crop responses include:

- Increases in grower returns and enhanced marketable yields
- Beneficial impacts on fruit and vegetable sugars, fruit set and sizing
- Improve plant resistances and tolerance to environmental diseases and stresses
- Improved crop quality (larger, more uniform fruits and vegetables), and improved fertility

Ascophyllum extracts are often applied as foliar biostimulants or supplemental fertilisers. They can also be applied through irrigation or chemigation systems.

Ascophyllum biostimulants contain a large profile of minerals. Analysis indicates a wide array of macro-nutrients (N, P, K, Ca, Mg, S) as well as a large number of micro-nutrients (Mn, Cu, Fe, Zn) A range of organic compounds complements the list of mineral nutrients in the products. Many of the polysaccharides have been identified plus organic acids, amino acids and proteins that make up this natural product.

Cytokinins: The major active component

The major active ingredient in Ascophyllum nodosum based biostimulant products is a family of plant hormones called cytokinins. These are well known for their stimulation of protein synthesis, their influence on cell division and elongation and interaction with other plant hormones, most notably, the auxins. The manufacture of proteins is essential to growth and development and includes structural proteins, enzymes and other plant defense proteins. Auxins work closely with cytokinins to promote cell differentiation, the ability to determine specific functions and ultimately, plant growth. Auxins, betains (compounds which help maintain cell water balance and stimulate plant processes) and oligosaccharides (which have plant growth promoting properties), have all been identified in Ascophyllum marine plant based extracts. Cytokinins are implicated in all phases of plant growth including root, bud, stem and leaf formation.

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LIQUID MARINE PLANT EXTRACT

Biostimulants can also play a significant role in many other aspects of plant growth, Ascophyllum extracts promote disease tolerance by increasing the level of endogenous antioxidants. Antioxidants effectively calm or destroy damaging compounds, some of which are generated from normal metabolism. This ability to protect itself against invading disease and metabolic by-products is referred to as Systematic Acquired Resistance (SAR). Research by the USDA has also shown that cytokinins may play a role in insect resistance.

Methods, rates and timings for biostimulants

- Crop management programs include foliar and or soil applications.
- Seed treatments can promote early germination, enabling plants to cope with stresses during plant establishment.
- Application through irrigation (overhead, micro-jet), fertigation (drip or perforated tube) or furrow-run systems.
- Some crop protection products (fungicides, herbicides, insecticides) demonstrate greater efficacy when applied with marine plant biostimulants.

Ascophyllum nodosum - a member of the brown seaweed family phaeophyceae

*Footnote - excerpts from a paper by J. Norrie, Ph.D, P. Ag

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Elemental Breakdown - Seaweed Products

Element	Alga 600	Orca Plus	AgriSea	Seasol	BioPower® Liquid
	% w/w	% w/v	% w/v	% w/v	% w/w
N	0.5 - 0.8%	1%	0.00004%	0.143%	1.3 - 2.6%
P	N/A	2%	0.0035%	0.187%	2.3 - 4.6%
K	17 -19%	4.2%	0.0098%	3.08%	>18.0%
Mg	0.04%	0.012%	0.007%	0.044%	>0.04%
Ca	0.6 - 1.8%	0.18%	0.008%	0.10%	0.3 - 0.6%
Fe	0.15 - 0.3%	0.045%	0.0006%	0.03%	>0.2%
Cu	0.00070%	0.0002%	0.0026%	0.00064%	>0.0003%
S	1 - 1.5%	0.3%	0.0175%	0.22%	>2.2%
I	0.035 - 0.065%	0.011%	0.0108%	N/A	>0.050%

sourced from independent data

BioPower® Liquid 100% Ascophyllum nodosum liquid seaweed extract

Item	BioPower Liquid	Amino acids	gms per 100gms protein
Appearance	Deep green colour	Alanine	11.4
Odour	Sea	Arginine	0.7
Solubility	100%	Aspartic acid	16.3
Organic Matter	More than 150g/L	Cystine	trace
Nitrogen	More than 45g/L	Glutamic acid	23.1
Phosphorous	More than 8g/L	Glycine	9.5
Potassium	More than 40g/L	Histidine	1.3
Cytokinin	More than 70 ppm	Isoleucine	5.8
Auxins	More than 90 ppm	Leucine	14.5
Gibberellins	More than 85 ppm	Lysine	4
Sulphur	1g/L	Methionine	4.2
Magnesium	0.1g/L	Phenylalanine	8.5
Calcium	0.1g/L	Proline	13.3
Iron	0.1g/L	Serine	0.4
Boron	0.3g/L	Threonine	3.8
Copper	2 - 3 ppm	Tryosine	5.4
Molybdenum	-	Tryptophan	1.2
Manganese	0.1g/L	Valine	10.4
Carbohydrates	-		
Alginic Acid	21g/L		
Mannitol	5g/L		

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Ascophyllum nodosum comparison with Bull Kelp

SPECIES	IAA (ng/g) Indole acetic acid (Auxin)	GA3 (ng/g) Gibberellin	ZT (ng/g) Zeatin (cytokinin)
Ascophyllum nodosum	594.22	46.70	87.94
Dry Small Kelp	147.94	13.54	19.77
Dry Great Kelp	30.90	21.54	24.97
Fresh Sargasso	15.23	40.00	87.94
Fresh Small Kelp	20.53	33.96	93.95

Harvest the Power of the Sea

BioPower Liquid complements a good nutritional and pesticide program by:

- Improving uptake of soil-applied materials.
- Improving plant resistance to boitic and abiotic stresses making crop protection or nutritional products more effective.
- Helping plants tolerate stresses imposed by certain product inputs.

Additionally **BioPower Liquid** has:

- Complex characteristics to enhance the effectiveness and uptake of other materials.
- Carbohydrates that encourage healthy environments for microbes; this expands the effectiveness of other product inputs.

BioPower Liquid delivers a high level of performance with the ease and convenience expected, and can be used in almost all application methods.

BioPower Liquid is BioGro certified for organic production, is completely non-toxic and has no chemical odour.

Production of **BioPower Liquid** follows rigidly enforced process controls and quality assurance protocols to ensure the highest standards of quality, consistency and bioactivity.

Science, technology and innovation: A formula you can depend on.

Grosafe's BioPower Liquid Ascophyllum nodosum extract: Supports faster and stronger early plant growth

Grosafe is committed to ongoing research to identify new applications and exciting benefits of it's Ascophyllum nodosum extract products. **Grosafe** supports independent research to demonstrate the benefits that can be gained from regular applications of it's premium seaweed extract.

In controlled, replicated, laboratory studies, Ascophyllum nodosum extract was applied to wheat seedlings at an early growth stage Wheat seedling were used due to their low variability and rapid growth, offering dependable uniformity and enabling multiple replications. When compared to the non- treated control plants, the extract treated plants showed the following statistically significant results:

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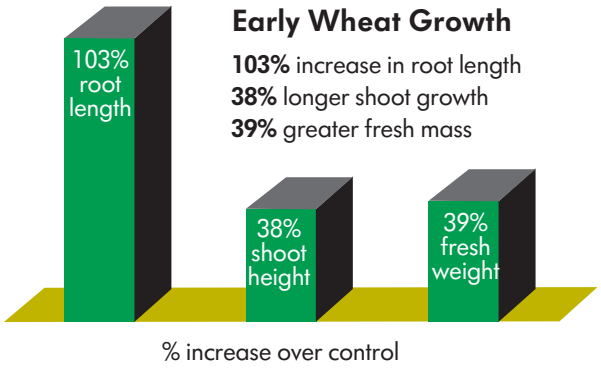
CERTIFIED INPUT FOR ORGANICS bio gro NZ CERT No.4547



What do these findings mean to farmers

- Faster plant establishment for a stronger start and enhanced yield potential.
- Increased root development for improved nutrient uptake and ability to withstand environmental and other stresses more effectively.
- Hardier growth for improved stress tolerence, healthier plants and improved crop quality and yield.

Ascophyllum nodosum extract contains a number of naturally occuring substances which stimulate plant growth. These substances include polysaccharides, organic acids, specialised amino acids and other organic compounds. It is beneficial in a number of crop management programs ranging from field and horticulture crops, to ornamentals and turf grass. The extract should be used as part of a good crop management program to help ensure acceptable yields of quality crops; it is not intended to replace other crop inputs.

In Summary, the characteristics of BioPower Liquid Seaweed Extract enable it to have the following effects on plants:

- **BioPower Liquid** supplies Nitrogen, Phosphorous, Potash as well as trace minerals like Zn, Mn, Mg, Fe, etc.
- **BioPower Liquid** contains natural plant growth material including auxins, gibberellins and cytokinins.
- The trace elements present in **BioPower Liquid** are in naturally chelated form and are readily available to plants.
- **BioPower Liquid** promotes the general health of plants including drought and frost resistance.
- Fruits and vegetables that are treated with **BioPower Liquid** have longer shelf life.
- **BioPower Liquid** promotes stronger stem and leaf growth. It accelerates photosynthesis and further develops healthy foliage.
- **BioPower Liquid** promotes faster germination of seeds and faster plant growth.
- When applied as a basal dose **BioPower Liquid** improves soil texture and promotes natural flora and worms. As a basal application, it is an excellent supplement to chemical fertilisers. It adds humus to the soil, improves soil fertility and makes nutrients and hormones directly available to plants in a natural form.
- **BioPower Liquid** reduces transplant shock. It shows an increase in resistance to some fungi, molds, aphids and mites which attack plants at various stages.
- **BioPower Liquid** induces flowering, prevents shedding of leaves and prevents fall of unripe fruits.
- **BioPower Liquid** enlarges fruit size, increases yield and improves quality.

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