

Boost Soil Health With Biostimulants.

A balance between soil's physical, chemical, and biological factors influences how crops grow and yield. With soil health at the centre of regenerative agriculture, improving the community of soil microbes holds immense potential for improving both soil health and crop productivity. Using *Ascophyllum nodosum* biostimulants as part of an integrated strategy aims to enhance both crop and soil management practices.

Digging deeper into soil health.

The Soil Health Institute has identified three key measurements as crucial indicators: 1) Soil aggregation 2) Increased soil organic matter, and 3) Active soil microbes (carbon mineralization). The abundance and diversity of soil's microbes can influence plants' growth and productivity; and hence, can play an important role in plant health.

Microbes in the rhizosphere called arbuscular mycorrhizal fungi (AMF) colonize more than 80% of land plants, including crops. AMF form symbiotic relationships with plants; the AMF needs a host plant to create carbohydrates and carbon. Carbon derived from roots during growth and then as root residues play a critical role in increasing soil carbon. In return, AMF extends the reach of the plant's root system. This provides the host plant with better nutrient access, water access and retention, stress tolerance, and protection against pathogens. AMF also benefits soil with better aggregation and structure, which aids in storing water, nutrients, and soil carbon.

Benefits of APH biostimulants:

Increases soil microbial activity, biodiversity, and biomass

Increases AMF growth

Increases soil aggregation and improves soil structure

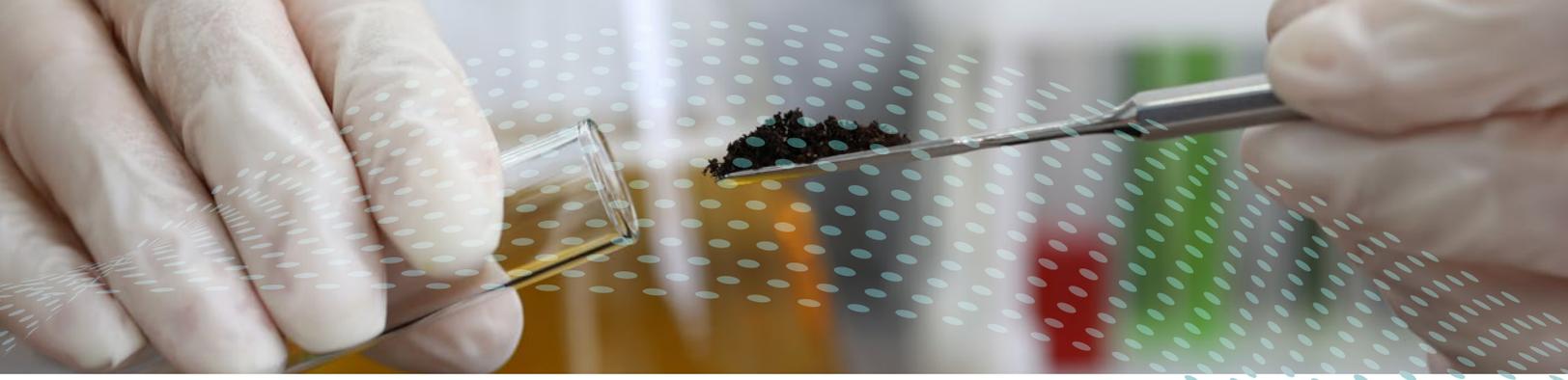
Increases availability and uptake of nutrients and water

Increases and supports healthy root growth

Increases root nodulation

Builds plant resiliency against abiotic stress

Promotes carbon content in soil through increased root biomass

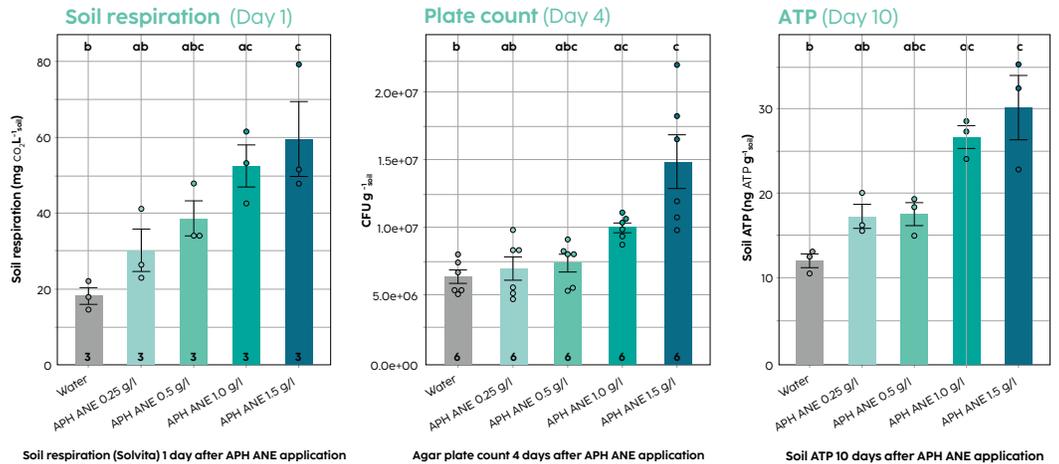


What happens when microbes and biostimulants team up?

Evidence shows that applications of Acadian Plant Health's *Ascophyllum nodosum* seaweed-based biostimulants increase biodiversity, biomass, and microbial activity in the rhizosphere.

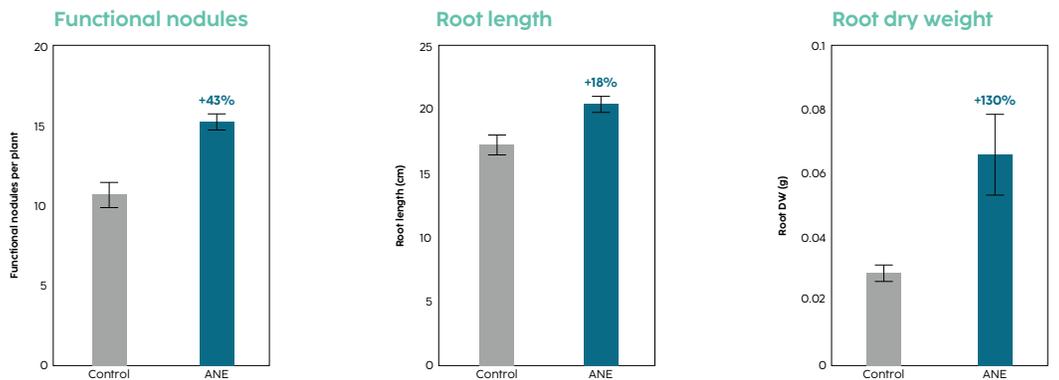
Promotes soil microbe activity

APH's seaweed extracts improve microbial abundance and growth through multiple mechanisms. Soil respiration is linked to soil's ability to cycle carbon and nutrients. Increased plate counts indicate APH products support greater microbial abundance, and increased ATP indicates a rise in living microbes.



Promotes nodulation

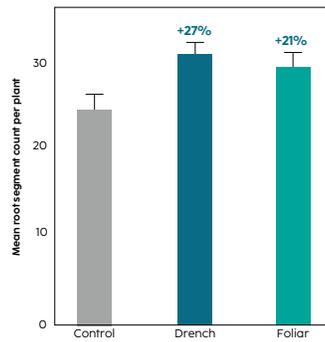
This study looked at the effects of *Ascophyllum nodosum* applications on nitrogen fixing nodules and alfalfa growth.^[1] The biostimulant treatment increased the number of functional nodules per plant, indicating more nitrogen fixation, and increased root length and biomass.



[1] Khan, W., Palanisamy, R., Critchley, A. T., et al. (2013). "Ascophyllum nodosum Extract and Its Organic Stimulate Rhizobium Root Nodulation and Growth of Medicago sativa (Alfalfa)." *Communications in Soil Science and Plant Analysis*, 44(5), p. 900-908.

Both soil and foliar applications of *Ascophyllum nodosum* increase AMF colonization, germination, branching, and growth. ANE enhances mycorrhization through direct stimulation of AMF growth and through stimulation of the plant's accommodation of the rhizobia. Together, they promote the establishment of this vital plant-microbe symbiosis.

Extent of colonization^[2]



[2] Hines, S., van der Zwan, T., Shiell, K. et al. Alkaline extract of the seaweed *Ascophyllum nodosum* stimulates arbuscular mycorrhizal fungi and their endomycorrhization of plant roots. *Sci Rep* 11, 13491 (2021). <https://doi.org/10.1038/s41598-021-93035-9>

How APH biostimulants strengthen soil and plant health.

Ascophyllum nodosum biostimulants contain complex bioactive compounds that encourage optimal soil health:



Organic acids help produce energy for plants and encourage production of new compounds, boosting plant production.



Oligosaccharides elicit plant abiotic defense mechanisms to help keep plants healthy.



Betaines help plants adjust water levels, salt, and other substances within cells and better manage abiotic stress and protect chlorophyll.



Mannitol protects and adjusts the amount of water in plant cells in times of water-related stresses.



Alginic acid helps chelate nutrients, making them more available to plants, and serves as a food source for beneficial soil microbes.



Fucose containing polysaccharides increase antioxidant levels and help protect plants from stress in general.



Alkaline-extracted *Ascophyllum nodosum* biostimulants unlock synergies that enhance crop productivity, increase soil health, and lay the groundwork for future yields.



ACADIAN™
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Toll Free: 1 800 575 9100 · Tel: +1 902 468 2840 · info@acadian.ca
 30 Brown Avenue, Dartmouth, Nova Scotia, Canada, B3B 1X8

WeSeaBeyond.com

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