

The Benefits of Kelp in Plant Nutrition



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How Seaweed-Based Inputs Support Plant Health and Growth



**KELP SUPPORTS GROWTH.
NATURE-BASED PLANT SUPPORT.**



ROOT SUPPORT
Encourages healthy root development and nutrient uptake



PLANT VIGOR
Supports natural growth processes and overall plant performance



STRESS SUPPORT
Helps plants cope with heat, drought, and other stress



PROGRAM FIT
Works best as part of a balanced fertility program

Kelp and other seaweed-derived materials have been used in agriculture for generations. Today, kelp extracts are increasingly incorporated into crop nutrition programs not simply for the nutrients they contain, but for the broader ways they may support plant growth, nutrient uptake, root development, and tolerance to environmental stress.

Unlike a conventional fertilizer that is primarily valued for supplying measurable amounts of nitrogen, phosphorus, and potassium, kelp products are often used as **plant biostimulants**. Their role is generally to support the plant's natural physiological processes and help it make more effective use of the nutrients and growing conditions already available.

Understanding what kelp does, and what it does not do, can help growers decide where it fits within a well-balanced fertility program.

What Is Kelp?

Kelp is a group of large brown marine algae that grows naturally in nutrient-rich coastal waters. Although commonly referred to as a seaweed, kelp is technically an algae rather than a terrestrial plant.

Agricultural kelp products can be manufactured from several species and may be available as:

- Liquid extracts
- Concentrated solutions
- Kelp meal
- Kelp powder
- Blended fertilizer ingredients

The composition and performance of a kelp product can vary depending on the kelp species, harvesting conditions, processing method, concentration, and formulation.

The USDA recognizes kelp, kelp extracts, kelp meal, kelp powder, liquid kelp, and other marine aquatic plant extracts among materials used in agricultural production. (USDA Agricultural Marketing Service)

Is Kelp a Fertilizer or a Biostimulant?

It can have characteristics of both, depending on the product.

Kelp naturally contains minerals and other compounds accumulated from its marine environment. However, many kelp extracts contain relatively modest amounts of primary plant nutrients compared with fertilizers formulated specifically to supply nitrogen, phosphorus, and potassium.

For this reason, much of the agricultural value of kelp is associated with its **biostimulant activity**.

Plant biostimulants are materials used to stimulate natural plant processes in ways that may improve nutrient uptake, nutrient-use efficiency, plant development, crop quality, or tolerance to environmental stress.

Seaweed extracts are widely studied and used within this category. (University of Minnesota Extension; USDA)

Kelp should therefore generally be viewed as a complement to a sound fertility program rather than as a substitute for the nutrients a crop requires.

How Can Kelp Support Nutrient Uptake?

Providing nutrients to the soil does not automatically mean the plant will use them efficiently.

Plants must develop an effective root system, absorb nutrients from the root zone, transport them through plant tissues, and incorporate them into the physiological processes that support growth.

Research involving seaweed-derived biostimulants has shown potential improvements in nutrient uptake and nutrient-use efficiency. These responses may result from several interacting effects, including changes in root growth, plant metabolism, and physiological activity.

Recent research continues to identify nutrient acquisition and nutrient-use efficiency as important components of the response to seaweed-based biostimulants.

This does not mean kelp creates nutrients that are not present. Instead, it may help support the plant systems responsible for obtaining and using available nutrients more effectively.

Why Is Root Development Important?

A healthy root system is one of the foundations of productive plant growth.

Roots provide the plant with access to:

- Water
- Nitrogen
- Phosphorus
- Potassium
- Secondary nutrients
- Micronutrients

A larger or more active root system can explore a greater volume of soil and potentially provide the plant with better access to these resources.

Seaweed extracts have been associated in numerous studies with changes in root architecture, root biomass, and root development. Researchers have also observed improvements in nutrient uptake associated with these responses.

The practical significance is straightforward: supporting root development can help strengthen the plant's ability to obtain the water and nutrients required for continued growth.

What Naturally Occurring Compounds Are Found in Kelp?

Kelp-derived materials can contain a complex mixture of naturally occurring compounds rather than a single active ingredient.

Depending on the species and extraction process, seaweed extracts may contain compounds such as:

- Polysaccharides
- Amino acids
- Organic compounds
- Polyphenols
- Betaines
- Vitamins
- Mineral elements

- Compounds associated with plant growth regulation

Scientists increasingly believe that the effects of seaweed extracts result from interactions among many of these constituents rather than from one compound acting independently.

Processing matters as well. Different extraction methods can substantially influence which compounds remain in the finished product and how biologically active they are.

For growers, this means that two products labeled as kelp or seaweed extract should not automatically be assumed to perform identically.

Can Kelp Help Plants During Environmental Stress?

One of the most heavily researched areas involving seaweed-based biostimulants is plant response to **abiotic stress**.

Abiotic stresses are environmental conditions that can limit plant performance, including:

- Drought
- Salinity
- Temperature extremes
- Water stress
- Other unfavorable growing conditions

Research has shown that seaweed extracts can influence physiological and metabolic processes involved in plant stress responses. Studies involving several crops have reported improved plant performance under certain drought and salinity conditions following seaweed-extract applications.

Recent large-scale analyses of published research have also found generally positive effects from seaweed-derived biostimulants on crop growth and productivity across a variety of growing conditions. (Frontiers in Plant Science)

These findings should not be interpreted to mean that kelp can eliminate environmental stress. A plant suffering from severe drought, nutrient deficiency, salinity, or another major limitation still requires the underlying problem to be addressed.

Kelp may instead help support the plant's ability to function under challenging conditions.

Does Kelp Supply Micronutrients?

Marine algae can contain a broad range of mineral elements absorbed from seawater.

The actual nutrient contribution of an agricultural kelp product, however, depends heavily on the source material, concentration, processing method, formulation, and application rate.

For that reason, growers should not assume that applying a kelp product automatically satisfies a crop's micronutrient requirements.

A fertilizer label, product analysis, soil test, and plant tissue analysis provide much better information for determining whether a particular nutrient is being supplied in agronomically meaningful quantities.

Kelp's broader contribution may come from supporting nutrient acquisition and plant metabolism in conjunction with a properly designed nutrient program.

How Is Kelp Applied?

Kelp-based products may be applied through several agricultural systems depending on the formulation.

Common application methods include:

- Foliar application
- Soil application
- Fertigation
- Transplant or root-zone applications
- Incorporation into blended fertilizers

Foliar applications place the product directly on plant surfaces, while soil and fertigation applications deliver it to the root zone.

Neither approach is automatically superior in every situation. Crop species, growth stage, environmental conditions, product formulation, concentration, and production system can all influence the response.

Growers should follow the specific manufacturer's application instructions rather than assuming that application rates are interchangeable between different kelp products.

More Kelp Is Not Necessarily Better

Biostimulants do not follow the simple assumption that increasing the application rate will always increase the response.

Research with seaweed extracts has frequently demonstrated that plant responses vary with concentration and application timing. An effective rate for one crop, product, or production system may not be appropriate for another.

Applying more than the recommended rate can waste product and may fail to produce additional benefit.

As with fertilizers, effective use begins with the correct product, rate, timing, placement, and growing conditions.

Kelp Works Best as Part of a Complete Nutrition Program

Kelp can be a valuable component of plant nutrition, but it should not distract from the fundamentals of crop fertility.

Productive crops still depend on adequate supplies of essential nutrients, appropriate soil conditions, water management, proper application rates, and sound agronomic practices.

A well-designed program may combine:

- Primary nutrients such as nitrogen, phosphorus, and potassium
- Secondary nutrients
- Micronutrients where needed
- Organic nutrient sources
- Kelp or other biostimulant ingredients
- Soil and tissue testing
- Crop-specific nutrient management

The objective is not simply to apply more inputs. It is to create a growing environment in which the crop can use available resources efficiently.

The Bottom Line

Kelp is more than a source of marine-derived nutrients.

Its greatest agricultural value may come from the naturally occurring compounds that can influence root development, nutrient uptake, nutrient-use efficiency, plant metabolism, and responses to environmental stress.

At the same time, kelp is not a replacement for nitrogen, phosphorus, potassium, or other essential nutrients when those nutrients are required.

Used appropriately, kelp can serve as a complementary component of a balanced plant nutrition program, helping support the biological processes that allow plants to make effective use of the resources available to them.

Disclaimer: This material is provided for general educational purposes only. Growing conditions, soil characteristics, crop requirements, application rates, and regulatory requirements vary. Always follow product label directions as well as all governmental and safety regulations or recommendations, and consult appropriate agronomic, regulatory, or crop-management professionals when making site-specific fertilizer or soil-management decisions.

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