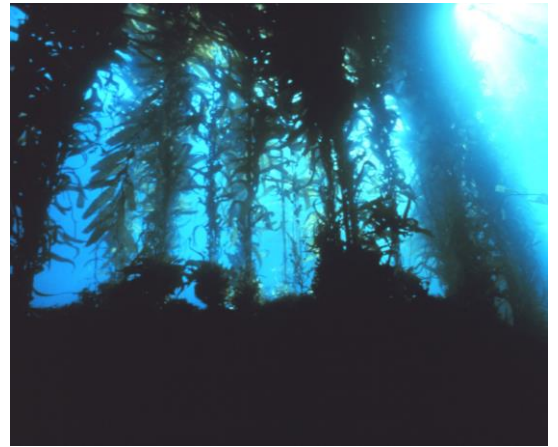


# THE EFFICACY AND ENVIRONMENTAL CONSEQUENCES OF KELP-BASED GARDEN PRODUCTS



Processed seaweeds, especially kelps, are heavily marketed to gardeners as biostimulants, fertilizers, soil conditioners, disease suppressants, and environmental stress reducers. This publication reviews the published research on seaweed products regarding their effectiveness in home gardens and landscapes. It also discusses the ecological and environmental consequences of using wild-harvested kelps.

## Kelp-Based Products for the Garden

Though kelps and other seaweeds are a crucial part of the marine environment (Figure 1), they have also played significant roles among human populations for tens of thousands of years. Coastal tribal communities have a rich cultural history of using several species of kelps and seaweeds for food and medicine. As early as the 16th century, seaweeds were collected for the iodine industry (Stagnol et al. 2013). More recently, they have been put to medical and industrial use. Some of these uses have found their way into products intended for home garden application. Kelps and seaweeds are harvested, dried, and ground into a fine powder, referred to as “kelp meal,” that is added to products such as fertilizers and potting media.

## The Claims

Because seaweeds are functionally similar to plants, they contain the same basic biochemicals, including growth hormones. Formulations of seaweed, which may contain auxins, cytokinins, and gibberellins, are marketed as growth enhancers—loosely defined as compounds with too few nutrients to qualify as

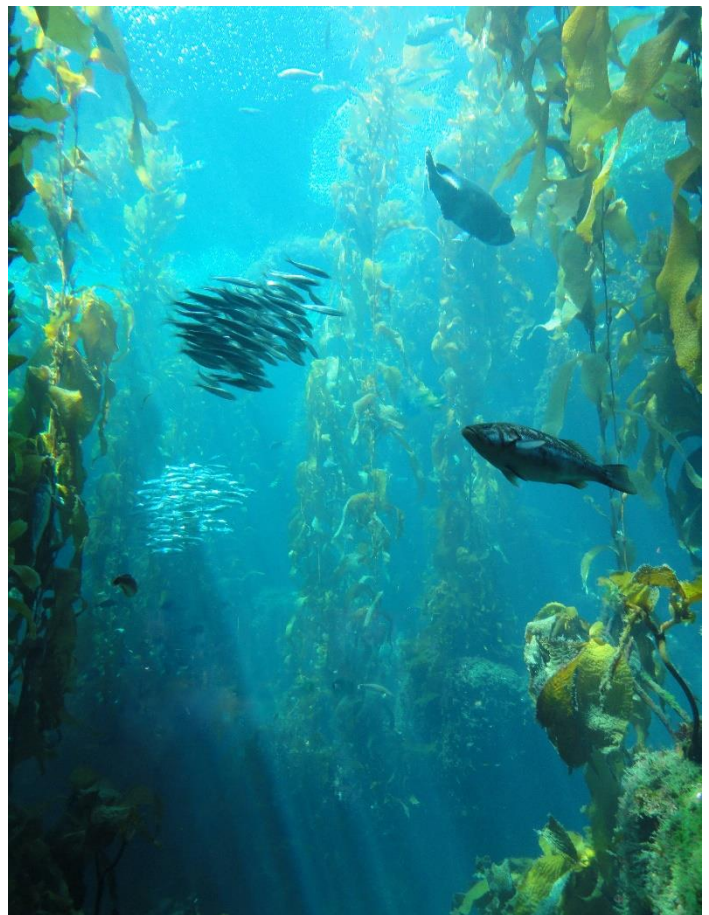


Figure 1. Kelp forests house a rich assortment of marine life (photo courtesy of Wikipedia).

fertilizers and are thus labelled as biostimulants. Often these products are enhanced with additional plant nutrients, allowing them to be classified as fertilizers (Figure 2). Producers of biostimulants claim these products will combat environmental stress and allow plants to grow faster and bigger than plants grown under normal conditions.



Figure 2. A popular seaweed-based product. The high levels of potassium are derived from the potassium hydroxide—not the seaweed (image: Chalker-Scott).

## The Research

Researchers have studied kelp-based agricultural products for several decades, but much of the work has focused on intensive agricultural production. Commercial fields and orchards, often maintained as monocultural, input-heavy systems, bear little resemblance to the home gardens and landscapes most gardeners care for. These latter plantings are more likely to feature a mixture of groundcovers, annuals, perennials, shrubs, and trees, which makes them more biologically rich and naturally resilient to environmental stressors, pests, and disease.

This distinction is important to keep in mind, because agricultural application of kelp products can sometimes have beneficial effects. However, there is no product with demonstrated effectiveness in settings that are comparable to home gardens and landscapes. Good quality research on kelp-containing biostimulants has been performed by several researchers in different climatic regions using different species of woody plants in natural settings. None of them reported success:

- Roots of newly planted trees treated with biostimulants showed no improved growth compared to control trees

(Barnes and Percival 2006; Gilman 2004; Popenoe et al. 2017).

- The best performing trees and shrubs were those that were irrigated frequently for 38 weeks post installation (Gilman 2004) or received a simple topdressing of pine bark mulch immediately after planting (Figure 3; Abbey and Rathier 2005).

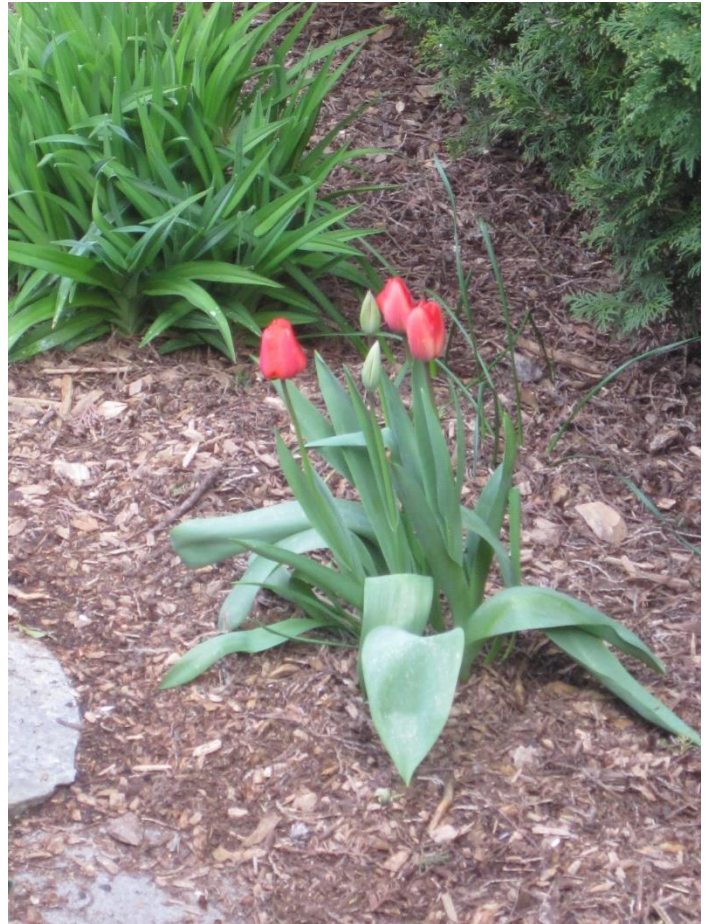


Figure 3. Wood chip mulches have demonstrated benefits for landscape plants and soils alike (photo: Chalker-Scott).

- Trees treated with biostimulants and assessed two years after planting were not significantly different than those receiving only water (Keltling et al. 1998).
- No biostimulant was able to confer increased protection to shrubs and trees against drought or salt damage compared to plants treated with water (Banks and Percival 2014).
- Researchers who tested biostimulants that were reported by local growers to be highly effective could find no evidence to support that belief (Popenoe et al. 2017). In fact, some of the products were worse than the controls.

There is no documented benefit to applying plant hormones to newly planted or established plants in gardens and landscapes. Hormones are produced naturally by the plant and transported to the tissues that require them. The two most important additions new transplants require are water and mulch.

# Ecological Importance of Kelp

All seaweeds are distant relatives of terrestrial plants, and this relationship can be seen in the structural, functional, and chemical similarities that each group possesses. Larger species of seaweed, also called macroalgae or kelps, are similar to the trees in a forest. They are the base of the nearshore food web, providing food and habitat for other marine plant and animal life. Seaweeds are only found in the relatively narrow boundary between ocean and land (Figure 4) where water is shallow enough for sunlight to penetrate to the bottom (Figure 5). This tidal zone is the most biodiverse of all the marine habitats thanks to the resources provided by kelp.



Figure 4. The interface between land and ocean is a richly biodiverse ecosystem (photo courtesy of NOAA photo library).



Figure 5. Kelps grow where sunlight can penetrate to the ocean floor (photo courtesy of NOAA photo library).

## Environmental Consequences of Kelp-Product Use

Kelp-based products, like products derived from peat bogs, represent the destructive harvesting of a natural ecosystem for a product with insignificant value to home gardens and landscapes. “Kelp harvest removes all canopy-forming kelp plants, leaving either a barren track or a track that is vegetated by small kelp plants that ensure re-growth” (Lorentsen et al. 2010). Research has shown that it takes several years for associated algae (Anderson et al. 2006) and fish (Lorentsen et al. 2010) populations to recover after kelp harvesting (Figure 6).



Figure 6. Kelp is crucial for many fish species for food and breeding habitat (photo courtesy of NOAA photo library).

It is worth considering human impact on these systems, as the European Union did in 2009 when it took precautionary steps to ensure sustainable harvesting methods (Stagnol et al. 2013). Combined with extreme weather events that are increasing in intensity and frequency (Byrnes et al. 2011), the potential damage to kelp-dependent fisheries is increasing as well. Thus, the choice to use a kelp-based product represents an important ethical decision (Banks and Percival 2014) rather than a horticultural decision.

Finally, there is a potential environmental contamination issue to consider if using kelp-based products. Smelting and other industrial activities around the Puget Sound area and elsewhere have left unknown quantities of toxic heavy metals, such as arsenic, in the surrounding soil and water. Macroalgae, especially brown algae which include kelps, are known to accumulate and tolerate high levels of heavy metals in their tissues, including arsenic (Ma et al. 2018).

Washington is one of the few states that analyzes heavy metal content of all products registered as fertilizers, including those containing seaweeds. The WSDA website, [Metals in Fertilizers](#), contains analyses for heavy metals, such as arsenic, over the past several years. There are nine seaweed or kelp products on this list whose arsenic levels range from 0.509 to 6.14 ppm. Washington State’s limit for arsenic in soil is 0.594 ppm. While all but one of these seaweed-based fertilizers surpass this limit, they still meet the standard “if only a small amount is applied to the soil” (WSDA 2017a; WSDA 2017b). But kelp- and seaweed-based products have no such cautionary information on their labels nor are there recommended limits for application. Gardeners are left without any indication that they may be using products containing substantial levels of arsenic and other toxic heavy metals.

## Action Items for Gardeners

- Select landscape plants wisely. Species that are well suited to your site conditions are going to be healthier and require fewer inputs than those that struggle.
- Use commercially available organic fertilizers for plant nutritional needs rather than seaweed products. Commercial fertilizers have guaranteed nutrient analysis listed on the container so you can add precisely what you need.
- Use commercially available auxins for rooting cuttings. Commercial rooting hormones (Figure 7) have been well researched and manufactured for effectiveness. The registrant is legally required to provide a product that contains the exact percentage of active ingredients listed on the container label.

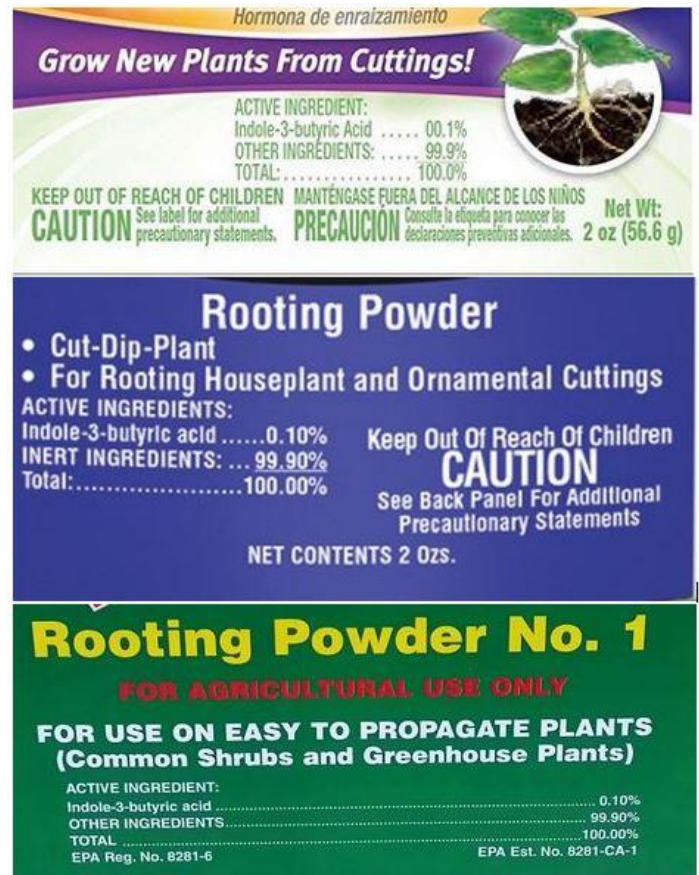


Figure 7. Commercial rooting powders contain no active ingredient but rooting hormone (image: Chalker-Scott).

- Use good quality woody mulches, such as arborist chips, to address soil concerns in landscape plantings. Coarse woody mulch has been shown to reduce compaction and erosion, improve water retention, and nourish both plant roots and beneficial soil microbes (Banks and Percival 2014; Chalker-Scott 2015).
- Understand that there are no research-substantiated benefits to using kelp products in home gardens and landscapes.
- Read product labels carefully! There are many products, including potting media, that contain kelp meal (Figure 8). It is not a critical component for potting media.
- Be sure to test your soil for heavy metals if you have routinely used kelp products and you are growing edible plants. Look for university or government labs who specialize in soil tests for home gardens and landscapes. Once heavy metals have been introduced into your garden soil, they are there to stay.



Figure 8. This “sustainable” potting media contains kelp meal (photo: Chalker-Scott).

Before you purchase any material that contains kelp, ask these questions:

- Is this a product you really need? Or can something else which is more sustainable take its place (Figure 9)?
- Is the kelp sustainably harvested? If it is not labelled as such, it probably is not.
- Does your garden need kelp more than the marine ecosystem it came from?

## Additional Resources

Washington State Department of Agriculture (WSDA). 2019. [Metals in Fertilizers](#).

*This WSDA website contains continually updated information.*

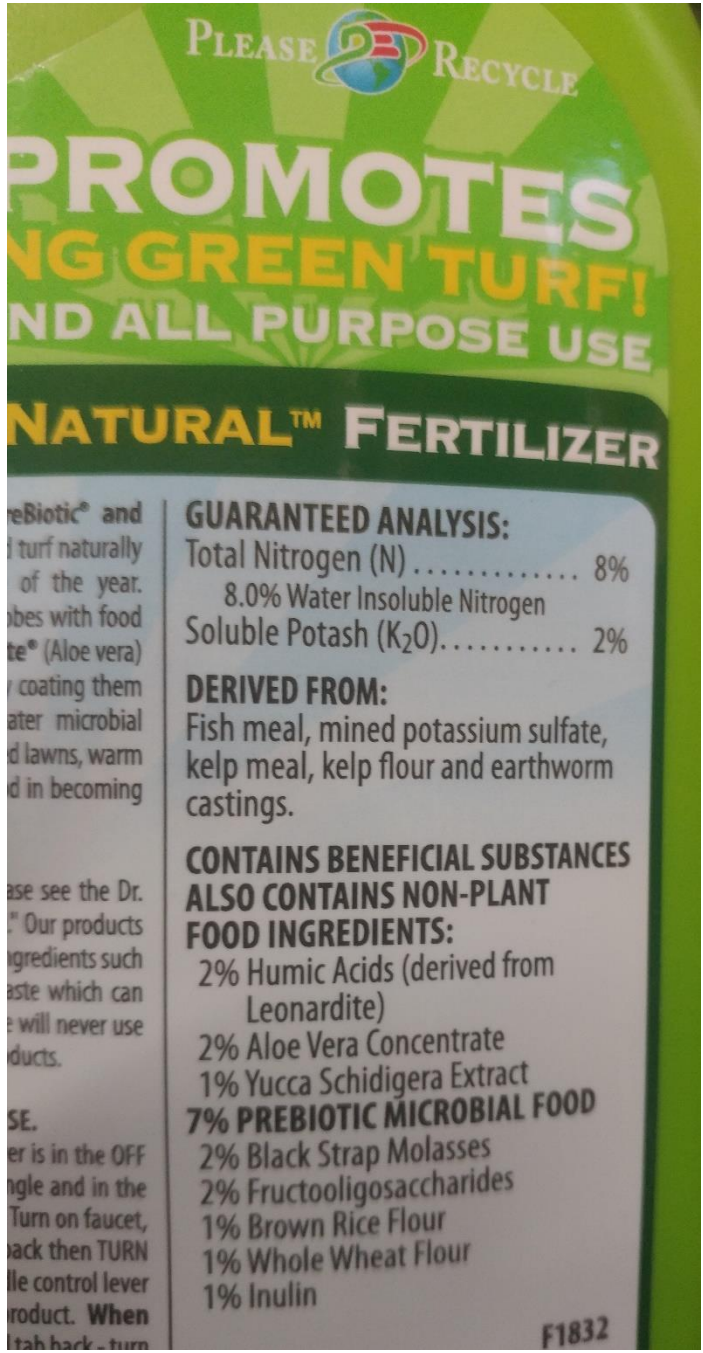


Figure 9. There is no research supporting the inclusion of kelp products in fertilizers (photo: Chalker-Scott).

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