

Seaweeds in Turf Management

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Background

A visit to the seaside and we are quickly reminded that the word seaweed covers a wide range of plant forms and colours - green, brown and red - found either living between the tides, or cast from the depths below low-water. The seaweeds of main interest to us are the large brown wracks and tangles, especially the knotted wrack (*Ascophyllum nodosum*) found on sheltered shores, or the tangle (*Laminaria*) growing below low-tide but often cast ashore during storms.

Seaweed has been used as a natural fertiliser for centuries, mainly in coastal regions where cast weed can be readily collected from the shore. It has proved particularly useful in improving the general fertility of the soil, as well as supplying a rich and balanced mixture of trace elements.



The chemistry of these brown seaweeds is fairly complex. They have a very high and variable content of organic carbon, dominated by carbohydrates such as alginic acid, laminaran and mannitol. In terms of NPK, seaweeds are very low in N and P, but has a relatively high and available K content. Seaweeds are perhaps best known to growers for their trace mineral content and the presence of a range of biologically active, growth promoting substances which give many seaweed products their unique properties.

Making seaweeds available to all

There are those willing to travel vast distances to collect fresh seaweed, including a well-known IOG 'senior' member who regularly travelled from the Preston area up to NW Scotland to collect seaweed for use on both a bowling green and today still does for his own garden compost! However, most want to be able to buy a product off the shelf.

Seaweed products fall into two broad categories:

- seaweed meal,
- liquid seaweed .

Seaweed meal can be simply dried, ground meal from *Ascophyllum*, or the same meal processed to make it more easily broken down in the soil. Meal treated in this way is often termed 'composted', but it has been treated chemically, with alkali to 'soften' some of outer tissue and is often blended with other materials to enhance its 'soil conditioning' function. Breakdown products from these meals provide a rich carbon source for soil micro-organisms, which along with their ion-exchange properties, could give them a promising future in root zone formulations.

When we come to the liquid products, which are my own special interest, we come to the mix between proven science and 'muck and magic'. As I hope to explain, seaweeds offer some very important properties of value to all plant growers, including those working with turf. Since the 1950s, the use of seaweed liquid products, usually as foliar sprays, has been shown to be beneficial and a wide range of effects shown, including improved crop yields, quality and appearance of leaves, better seed germination and seedling establishment. Unfortunately, several products have been marketed with over-ambitious claims, often developing as many critics (cynics) as fans amongst growers. It was interesting, however, that when I questioned the audience (members) at the recent IOG Annual Conference I found over 60% claiming to be 'fans' of seaweed use and no-one willing to admit to being a total cynic!

Liquid products currently on the international market fall into two broad categories:

- solubilised seaweed - cocktails of partially broken up (hydrolysed) compounds mainly carbohydrate; potassium (K), together with trace minerals, amino acids and varying levels of growth promoters;
- seaweed extracts - typically extracts of growth promoting substances, with potassium (K), and extracted trace minerals.

The 'solubilised' products are thick, dark products where the degraded carbohydrate cocktail provides a rich carbon source for micro-organisms. Unfortunately, these can be beneficial or disease causing organisms, so you need to know what you are doing.

The 'extracts' are designed to perform a more defined function reflecting their rich natural growth promoter content, with secondary benefits from mineral content.

What are these growth promoters, how do they work and how they offer important support for turf management?

There are several naturally-occurring compounds that work as growth promoters in seaweeds, but the most important are the cytokinins and the betaines. In addition, some forms of laminaran promote stress resistance e.g. to climatic extremes, especially frost. These compounds enhance three main and inter-related functions within plants:

- cell division
- cell differentiation, e.g. flower, shoot or root initiation
- enhancement of uptake across living membranes;

which produce such observable results as

- stimulation of root growth
- promotion of new root and shoot formation
- increased uptake of nutrients (and other chemicals where used, e.g. pesticides) into both roots and especially leaves.

In treatment of turf, these actions result in:

- development of healthy extensive root system by both increased tillering and promotion of growth of all roots

- rapid responses to deficiencies, especially when treatment run in parallel iron feeding
- increased resistance to pests and disease
- resistance to and recovery from mechanical stress
- overall greening of the turf.....

... the overall effect is a good root system, and through that a healthy turf.

When these seaweed extracts are employed in a tightly controlled turf management regime, benefits can be found through blending with other treatments, usually resulting in the opportunity to reduce many chemical / pesticide dosing levels.

Taking the seaweed extract one step further

Several of the differences in performance achieved with seaweed extracts seem to result from many users not knowing how to apply the products effectively and often expecting 'wonders' - back to that 'muck and **magic**' ! However, probably the commonest cause is the massive variation that can exist in product chemistry, reflecting the varying histories of raw materials, in turn reflecting different species, harvesting locations and seasons.

With a personal interest in seaweeds going back to the 1960s, in the mid-1990s I considered it was time to develop, from first principles a liquid extract designed to provide a quality-controlled, consistent natural, organic product for use in conventional or organic agriculture, horticulture and turf management. This involved four key steps:

- choose a seaweed known to be very fast growing itself, and be rich in these growth promoters - ANSWER : use the 'tangle' (*Laminaria*) (see photo);
- find a location where it grows very strongly and where there is a plentiful supply - ANSWER : Orkney Islands off the north of Scotland;
- establish an environmentally friendly way of harvesting, compatible with other users of the seas - ANSWER : a special grab that lifts the weed without moving boulders, damaging lobsters etc (see photo) - SECOND ANSWER: use local lobster fishermen;
- use a truly organic method of processing - ANSWER: excuse me if I don't give the detail but simply say it is a four-step completely physical process, no added chemicals or even heat.

The initial development of the product received major EU funding (under an initiative called ECLAIR), and involved trials in the UK, Ireland and the Netherlands. The focus of early trials was on potential use in organic agriculture and this is still a key market for us, as is glasshouse crop growers especially tomatoes. However, its powerful root growth promoting properties have proved of considerable interest to many groundsmen.



With the success of the development product, a company was established in Orkney, and a new processing plant has been set up on a northern island - Westray, which is surrounded by rich, healthy beds of tangle. This new plant has gone into production this spring.

As some members know, I started with an interest in the growth of grass before becoming drawn into marine studies and it is an interesting opportunity to complete the loop back through this seaweed - turf interaction. If anyone wants to know more about the Orkney Company - Orkney Seaweed Company - check out its web site (<http://www.orkneyseaweed.co.uk>). I am always interested to talk to anyone with seaweed interests, and obviously we are looking for links with companies interested in our product! If you want just a trial batch, or tens of tonnes let us know, we distribute from a base in central Scotland.

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