



# A SEA OF FISH

## *Fertilizers*

by Donald Lester

Despite recent controversy, fish fertilizers can be used successfully in outdoor, indoor, organic and hydroponic gardens. Sound fishy? It's not. Read on to discover the various advantages and how to implement sea sustenance into your garden.

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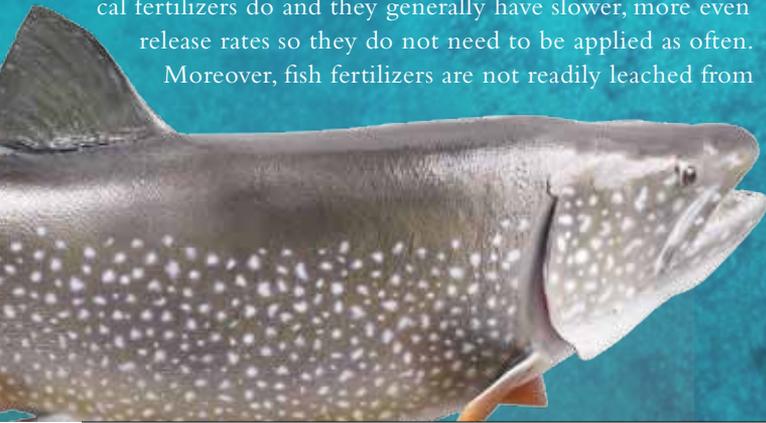


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The use of fish as a fertilizer for food crops has a long history. Perhaps the best-known stories are those relating to the coastal Native Americans placing a whole fish in the planting hole with their corn seeds—fish products have come a long way since then!

Fish fertilizers offer several advantages over their chemical counterparts. They can be totally organic, with all the associated benefits such as improved soil structure, increased microbial activity and better plant health, they don't cause plant burn (phytotoxicity) as readily or as commonly as chemical fertilizers do and they generally have slower, more even release rates so they do not need to be applied as often. Moreover, fish fertilizers are not readily leached from



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**“Fish fertilizers offer several advantages over their chemical counterparts. They can be totally organic, with all the associated benefits such as improved soil structure, increased microbial activity and better plant health.”**

the soil but are instead slowly broken down by microbes that convert the fish into plant food. Fish fertilizers also often contain trace nutrients not found in chemical formulas. Finally, with the technological advances in fish farming, fish are considered to be a sustainable, renewable resource whereas the mined minerals used in chemical fertilizers are not.

Unfortunately, fish products have taken on a bad name in recent years because two unscrupulous fertilizer manufacturers were caught spiking their ‘certified organic’ fish fertilizers with synthetic nitrogen. The main culprit is now out of business but these incidents have created a firestorm of controversy in the organics industry, leaving many to question the thoroughness of the organic certification process. These examples of fraud were an embarrassment not only to the organic certifying agency involved but also to the USDA that oversees the organic certification process—the stories made the national news and congressional hearings were held on the matter. Since then increased oversight has been implemented. Now, any fertilizer considered for organic certification with a nitrogen content greater than three per cent is considered to be a ‘high-nitrogen product’ and is subject to additional scrutiny and mandatory yearly inspections by the organic certifying agencies. Regulatory burdens like this and the resulting increased costs have already driven several organic fish product manufacturers out of the market.

Rather than using whole fish as a fertilizer, manufacturers today offer processed fish products in several easy-to-use forms, the most common being fish emulsion, fish hydrolysate and fish meal, all of which are usually available in both conventional and organic versions. Each formulation has its own set of pros and cons for indoor gardening.

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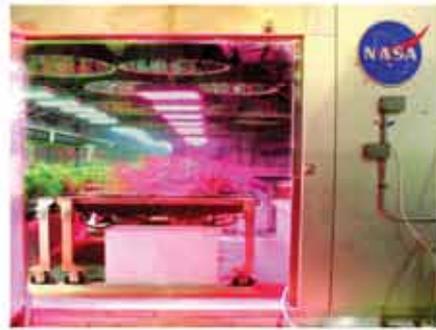
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## A SEA OF FISH FERTILIZERS

Fish meals are made by grinding fish carcasses after a heating process has removed much of the oil—waste water left over from making fish meal can then be concentrated to produce fish emulsions. Finally, fish digested in vats using enzymes or strong acids or bases—instead of heat—produces fish fertilizers called hydrolysates. Basically, this process breaks down protein into its component amino acids, which are the building blocks used by plant cells.

### FISH EMULSION

Over the years fish emulsion has meant anything from ground-up fish to fish excrement. In fact, there is a misapprehension that fish excrement or fish emulsion added to a hydroponics system makes it an aquaponics system. But, technically, aquaponics actually refers to a growing system where fish are grown in a tank and their waste is cycled through to the plant roots to act as a natural fertilizer. An aquaponics system does not need additional fish-based products added to work properly.

Fish typically have a high oil content, which is beneficial not only for humans but also for plant growth. In recent years, however, omega-3 oils have been singled out for their health



benefits for the heart and brain, which has led to much of the oil being removed from fish products and only the remaining leftovers used for agricultural products. Often users will ask manufacturers what the oil content is in their fertilizer product, and typically the oil content is in the 40 to 45 per cent range. Marine species of fish like salmon typically have higher omega-3 levels and are therefore more likely to be processed for that oil, while freshwater species have lower oil levels to begin with so as a rule they are often considered to be less desirable for use in commercial plant production. In California the rules state that for a product to be a fish emulsion it must contain greater than 40 per cent solids in the product.



**“Technically, aquaponics actually refers to a growing system where fish are grown in a tank and their waste is cycled through to the plant roots to act as a natural fertilizer.”**

Some manufacturers have told me they average about 38 per cent solids, so to avoid a penalty for low solids content they avoid using the term fish emulsion on the label at all and instead label it a ‘liquid fish product’.

**FISH HYDROLYSATE**

Fish hydrolysates are another class of fish-based product available for use in agriculture and indoor gardening. In commercial fish processing plants the meat is usually removed as a filet and the remaining head and body are discarded. This discarded material is often kept on ice to reduce odor and then sold to other companies like fertilizer manufacturers for further processing into things like fish protein products. Animal protein is not actually very useful in plant production—what is more desirable are the amino acids that make up the protein. There are three primary ways in which to break down protein into its amino acid building blocks: you can treat it with a strong acid (low pH) or a strong base (high pH) or with enzymes. Generally these acids and bases are synthetic in nature and so are not permitted in organic production, but an allowance has been made for manufacturers to allow them to use just enough of these materials to do the job while not adding any other nutrients to the final product. Using an acid has the side benefit of bringing down the pH of the final product into a pH range of 3.5, which prevents the growth of odor-causing bacteria and human pathogens. Enzymes tend to be more expensive than acids or bases.

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### Sugar Peak Recovery System Chart

General use rates at tsp (teaspoons) per U.S. Gallon and ml (milliliters) per Liter. Rates may be adjusted to individual needs. For non-recovery, hand-feeding, topping-off use 1/2 strength solution.

Formula	Vegetative	Flowering		Grand Finale		Briximus Maximus (Foliar Spray)	
		tsp	ml	tsp	ml	tsp	ml
Starts	1	1	1.3				
Vegetative	3 to 4	4	5.3				
Flowering	2 to 4		6.00	7.9			
Ripening	2 to 4				4.00	5.3	12.00 15.9

Accurately measure, add and mix into the desired volume of fresh water.

**For best results:** continuously aerate reservoir solutions.

**Recovery-Non-Recovery systems:** do not let the pH exceed 6.8. If pH exceeds 6.8, lower to 5.4-6.0.

**Recovery systems:** drain and add fresh solution every 14 days.

**Hand-Feeding:** do not adjust the solution's pH. Use with each watering (feeding). For slower growth and/or low light levels use every 2-4 weeks or as needed.

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### FISH MEAL

Unlike liquid hydrolysates and emulsions, fish meals are granular or powdered in form. Fish is heated to remove fats and oils to use in various health and cosmetics products and the lean carcasses that remain are ground up into a meal, sprayed with phosphoric or sulfuric acid for stabilization and deodorization and then dried. Generally, fish meals contain more protein than emulsions, but less than hydrolysates.

Fish meals usually have an NPK analysis of around 10-6-2 or 12-6-2. The high nitrogen content obviously makes them good for vegetative growth and the relatively high phosphorus content makes fish meals good for root development and bloom as well. The downside is that fish meals have a strong odor—after application they continue to smell for a few days and are therefore usually buried into the root zone. They are not recommended for indoor use, but if you can stand the smell they can be mixed into potting or bulk soils where they act as a slow-release fertilizer.

### SUITABILITY FOR HYDROPONICS AND FOLIAR APPLICATIONS

Fish emulsions and fish hydrolysates can be used in hydroponics systems because they are liquid in form. Emulsions are more soluble and some of their nutrients are useable by plants



Fish meal



without the need for beneficial microbiology, but both product types work best in organic systems with microbes present. Toxins and heavy metals may be present in these products and odor is always a concern, especially with emulsions, although some manufacturers are introducing fish emulsion products into the market that have essential oils like lavender added to improve the smell.

If you use a filter in your system, fish hydrolysates may need straining to prevent clogging of the filter's fine mesh screen. For soil applications with a drip system be sure the fish product will pass through at least a 70 mesh screen to minimize emitter plugging and fouling.

#### **BENEFICIAL BIOLOGY**

Organic fish fertilizers excel at supporting the beneficial microbe populations that are the base of the soil food chain. They all provide some NPK and most of these products, at least those made from sea fish, also provide trace elements, micronutrients, vitamins, minerals and other desirable materials.

Fish hydrolysates in particular come about as close as possible to duplicating the practice of burying a whole fish, although the hydrolysis process actually makes the fish more available to microbes, breaking down large molecules into tiny ones.

**“Fish meals also support increased microbial activity. They contain tremendous amounts of protein and are a great food source for bacteria and the annuals and vegetables that prefer a bacterial dominance in their soil.”**

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Microbes can and do readily feed on the organic matter and proteins from the meat and guts. Calcium from the fish bones is also retained in hydrolysates and the oils make great fungal food for those plants that prefer fungal-dominated soils: perennials, trees and shrubs. For this reason, hydrolysates make great fungal food for inclusion in compost and compost teas.



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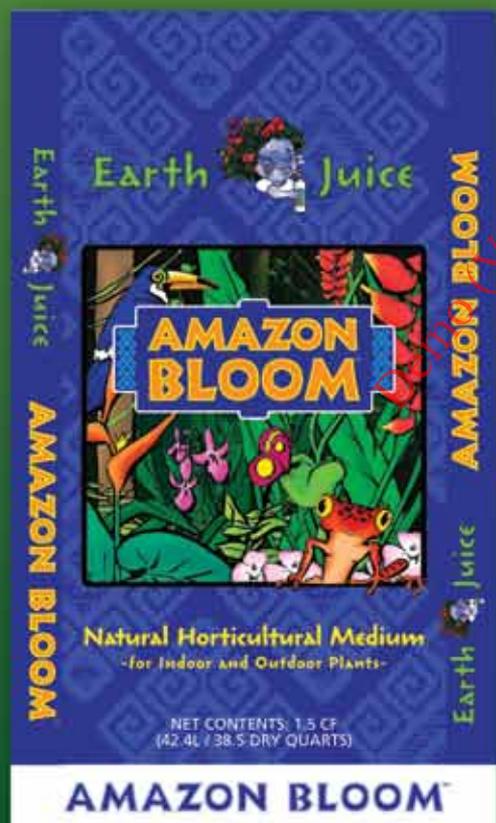
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Fish meals also support increased microbial activity. They contain tremendous amounts of protein and are a great food source for bacteria and the annuals and vegetables that prefer a bacterial dominance in their soil. Covered with bacteria, fish meal added to a compost pile gets the pile cooking due to the heat generated by high microbial metabolism. In addition, flies (and fly larvae) readily feed on it, which in turn attracts other members of the soil food web.

Not all products sold as fish fertilizers are made just from fish. Some contain non-fish organic additives, primarily seaweed and crab shells.

The seaweeds are full of micronutrients and plant hormones like auxins and cytokinins, while crab shells provide chitin, which is found in the cell walls of fungi and is a big structural component in insect exoskeletons.

The right fish fertilizers or combinations of fish fertilizer products can be great for your plants. Fish hydrolysates provide more nutrients, vitamins, hormones and micronutrients, fish meals are slower acting but more suitable for outdoor use and larger areas, while fish emulsions are ideal for quick-acting foliar sprays. With such a nice array of choices perhaps you should consider adding fish products to your plant feeding program! **MY**



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