



Trilogy 631

TECHNICAL GUIDE



**A UNIQUE BLEND OF THREE REFINED NATURAL
SOIL & PLANT BENEFICIAL COMPOUNDS**



For more information,
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Seasol
a better way to grow



Trilogy 631

TECHNICAL INFORMATION

OVERVIEW

Trilogy 631 is a unique blend of three refined natural soil & plant beneficial compounds. Seasol (Kelp), PowerFish (Fish extract) and Organic* Humate. **Trilogy 631** enhances plant and root growth, supplying the soil carbon and nitrogen cycle, supplying plants with amino acids, leaves the soil with Soil Organic* Matter, and converting more sunlight.



Seasol Liquid
Seaweed extract



PowerFish Liquid
Fish extract



Liquid Humate
extract

Each of the extracts have ingredients for specific roles:

- **Seasol Liquid Seaweed** extract for plant productivity and stress tolerance - providing an organically diverse and plant active composition.
- **PowerFish Liquid Fish** extract for available organic* nitrogen - providing free amino acids.
- **Liquid Humate** extract for available carbon - providing Humic acids and Fulvic acids.

In combination with growing plants, Seasol Trilogy 631 supplements the soil ecosystem processes needed for plant productivity and enhanced soil fertility by:

- **Enhancing plant and root growth** - plants then pump additional root exudates (photosynthate carbon) into the soil and feed soil microbiology at the rhizosphere.
- **Supplying the soil carbon and nitrogen cycle** - with available organic* nitrogen and accessible carbon.
- **Supplying plants with amino acids** - and peptides for enhanced plant growth.
- **Leave the soil with Soil Organic* Matter** - from increased plant and microbe organic* matter.
- **Converting more sunlight** - due to increased plant growth, plants produce more photosynthate, pump relatively more exudates into the soil and enhance the functioning of the overall soil ecosystem.

Productive soils rely on soil ecosystem processes and the nitrogen and carbon cycles being synchronised. However, in depleted soils that are farmed intensely with limited crop diversity, the natural ecosystem processes become disconnected. Similarly, a dependency upon inorganic fertiliser eventually results in fragmented biological, plant, soil and microbe ecosystems.



Seasol Trilogy 631 is a product to boost, connect and regenerate the soil processes for better agricultural productivity and longer-term soil fertility (*Figure 1*).

Seasol Trilogy 631 - For priming the photosynthesis carbon pathway

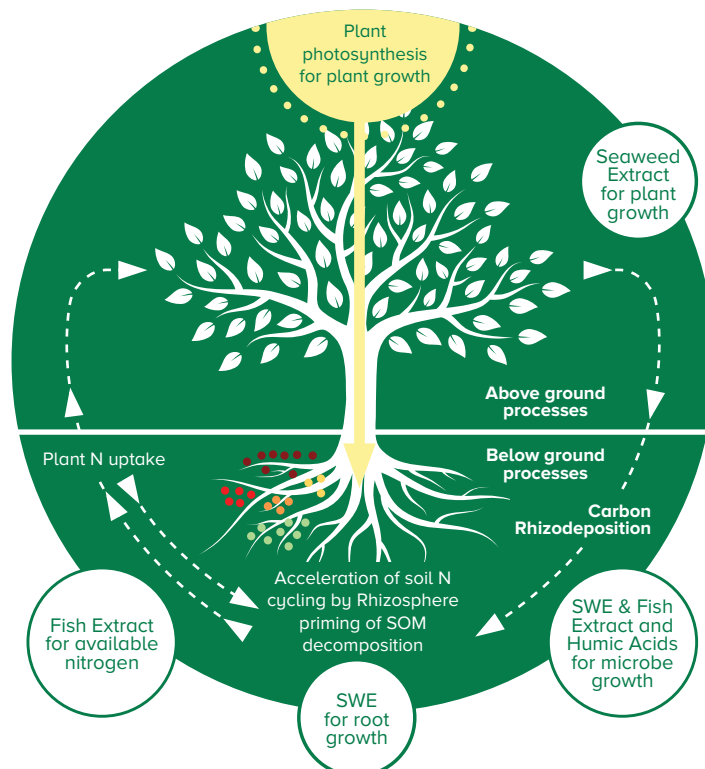


Figure 1 - Depiction of Seasol Trilogy 631 boosting, connecting and regenerating the soil ecosystem processes for better agricultural productivity and longer-term soil fertility.



SEASOL

For improved plant growth and stress tolerance

Seasol seaweed extract is rich in organic* content, has a high molecular diversity and contains a range of trace elements. Seasol seaweed extract has 17% total solids content and 3.7% (w/v) Potassium (*Typical Analysis April 2017*). Seasol seaweed extract is manufactured from two types of seaweeds producing a refined liquid seaweed extract and filtered to 150micron for agricultural use.

Seaweed extracts are effective across a wide variety of plants and soils, and have many beneficial plant growth and plant health properties (*Arioli et al, 2015; Shukla et al, 2019; Islam et al, 2020*):

Increases plant productivity - Field trials have been used extensively to demonstrate that seaweed extracts improve plant growth, yield and fruit quality. The benefits have been found across a wide variety of crops such as grapes, sugarcane, almond, potatoes, tomatoes, strawberries, and garden plants.

Increase tolerance to plant stress - Seaweed extracts offer increased tolerance to a diversity of non-lethal stresses including heat, drought and cold stresses, and to pathogen stresses. Seaweed extracts increase plant tolerance to

stress by earlier triggering of natural plant responses and associated gene expression networks.

Increase root growth - Plant roots are used to capture soil nutrients for plant growth and interaction with functionally important microbes that benefit plant growth and soil ecosystems. Seaweed extracts increase root structure and particularly root length. This ability enables plants to better utilise the nutrients in their soils and feed microbes with exudates released by the expanded root system.

Seaweed meal is liquefied by chemical hydrolysis using alkaline extraction. Seaweed extracts are complex and heterogenous in nature which makes their precise characterisation limited. The complex seaweed extracts are biologically rich activating multiple plant responses and growth systems. Rather than chemical composition, Seaweed extracts rely on plant and field testing to demonstrate their beneficial plant and soil properties. Chemical composition tends to be used for quality control in the manufacturing of seaweed extracts.

Their ability of seaweed extracts to promote root structure expands the beneficial root interactions associated with the soil carbon and nitrogen ecosystem processes.

PowerFish

For organic* nitrogen

PowerFish is a fish extract rich in organic* nitrogen and composed of free amino acids and partially digested protein (polypeptides). PowerFish has 2.8% (w/v) organic* nitrogen and 28% total solids content (*PowerFish Technical Analysis April 2017*). The amino acids are in a biologically active form to the plant and soil microbes. PowerFish is made from dried fish meal producing a refined fish extract with low oil content and filtered to 150micron for agricultural use.

Fish extracts are useful in agriculture because they increase plant growth, productivity, and quality across a wide range of crops (*Madende et al, 2020; Colla et al, 2017*). Fish extracts increase root mass, shoot length, leaf area, total chlorophyll content and photosynthetic rate.

Fish extracts are manufactured using chemical hydrolysis to liberate free amino acids and short proteins (polypeptides) (*Adamczyle et al, 2010; Paungfoo.Lohienne et al 2008; Waterworth & Bray 2006*).

Plants can use a wide range of organic* nitrogen sources for growth (*Adamczyle et al, 2010; Paungfoo.Lohienne et al 2008; Waterworth & Bray 2006*) such as amino acids, peptides (short proteins) and proteins.

- **Amino acids** are ready-for-uptake by plants and this feature helps plants to save energy on amino acid synthesis.

- **Amino acids** are ready-to-use and be made into plant proteins.

- **Peptides and proteins** are assimilated by plants after root exudates (containing proteases) are used to cleave proteins into smaller peptides and individual amino acids that can be assimilated by plants.

- The combination of smaller peptides and individual amino acids provide a steady and dynamic pool of accessible nitrogen for plant growth.

Plants assimilate amino acids with varying efficiencies. The process is influenced by the type of plant and their root architecture, the composition of the root exudates, the amino acid concentration in the soil and soil microbe composition and abundance.

Organic* nitrogen in fish extracts is less prone to leaching because the amino acids are readily available to the plants and soil microbes for assimilation. Amino acids used by the soil microbiology (and food web) later become part of the soil organic* matter.

Fish extracts and seaweed extracts are synergistic. The rhizosphere, where growing roots interface with soil and microbes, is an important niche for amino acid and nutrient uptake. Seaweed extracts promote root growth which enables the effective utilisation of the organic* nitrogen supplied by the fish extracts.

LIQUID ORGANIC* HUMATE

For improved soil properties

Liquid organic* humate is an extract rich in organic* carbon content and composed of accessible carbon in the forms of humic and fulvic acids. Liquid organic* humate has a 21% total solids content and 2.4% (w/v) Potassium (*Typical Analysis April 2017*). The humic and fulvic acids are biologically active and accessible to soil microbes for decomposition. Liquid organic* humate is made from a dried Humic and Fulvic extract of lignite producing a refined liquid organic* humate product and filtered to 150micron for agricultural use.

Humic substances such as humic and fulvic acids are natural organic* molecules originating from the biological and chemical transformations of plant matter that eventually decomposed to form peat (*Canellas et al 2015*). The carbon in these forms are available to the soil microbiology for processing. Other fractions of the Soil Organic* Matter are resistant to decomposing and slower to entry the soil carbon cycle.

Humic substances can be extracted by liquefying humate in lignite using chemical hydrolysis and acid and alkaline processing. Humic acids are complex and heterogenous in chemical structure, have amphiphilic (having both hydrophilic and hydrophobic parts) properties, are linked by intramolecular associations which makes their precise characterisation difficult despite possessing a distinguishable carbon backbone.

Humic acids are useful in agriculture for their soil improving properties and accessible carbon (*Canellas et al 2015; Jindo et al 2020; Zanin et al 2019*). Liquefied humic substances are generally applied as a soil drench to improve:

- **Soil Structure:** The addition of humic acids to soils triggers the formation of clay-humic complexes which increase soil aggregation. Improved soil aggregation results in improved structural stability and soil porosity, increased water holding capacity, less soil compaction and improved soil aeration. Soil treated with Humic acids have improved soil aggregate stability after successive wetting and drying cycles.
- **Buffering capacity:** Humic acids are rich in reactive acid-functional groups which provide an inherent buffering capacity. Humic acids buffer over a wide pH range which is useful as many fertilisers acidify the soil.
- **Chelation:** Humic substances have chelation properties. The abundance of functional groups in the complex humic substances allows them to have positive and negative charges. In the soil these charges attract both cations and anions making more of these ions available to the plant. The aliphatic (open chain) nature enables humic acids to reduce nutrient leaching, enhances fertiliser efficiency and prolongs the period that the bound nutrients are available to the plant.
- **Microbial activity and soil carbon:** Humic acids are a source of food for various microorganisms and can increase microbial activity, abundance and biomass. Lower molecular weight fractions of humic acids tend to be the most biologically active. Increases in microbe activity enhances the mineralization of soil organic* matter, thus increasing the pool of nutrients available to plants.

Humic acids have been found to be more effective under soil conditions of poor fertility and low organic* matter content. Humic acids are synergistic with agricultural products that increase plant root growth because of improved nutrient availability and access to plants.

PLANT EXUDATES

For Agriculture

Plant root exudates have been reported to improve soil properties by increasing soil carbon, fertility and microbiology (*Olanrewaju et al, 2019; Vives-Peris et al, 2020*). The root-soil interface (called the rhizosphere) is a specialized ecological niche where the microbial communities are shaped cooperatively by their surrounding plants and soils. The microorganisms drive carbon sequestration, nutrient cycling, soil organic* matter decomposition and the functioning of the soil ecosystem. Plants use their exudates to sequester microbial communities to facilitate nutrient uptake and enhanced plant tolerance to pathogens (*Rolfe et al, 2019*).

Increased plant growth and root growth enable plants to contribute relatively more root exudates into the soil and leave more plant matter for decomposition.

Increasing soil fertility relies on biodiversity in the soil. By using different types of plants to pump root exudates into the soils, supplying diverse types of root exudates from different plant species, continually growing mixed plantings to capture photosynthate has proved to be practical for farmers wanting to regenerate soil fertility and improve profitability (*LaCanne and Lundgren 2018*).

By improving plant and root growth, seaweed extracts are complimentary to the way plants use their root exudates to improve soil fertility and plant productivity.

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Trilogy 631

FOR A BETTER WAY TO GROW!



3 IN 1 DRUM!

Seasol

- Root growth
- Stress protection

PowerFish

- Proteins, amino acids for soil & plant
- Natural source of nutrition

Liquid Humate

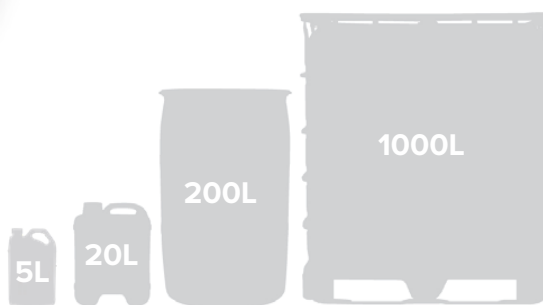
- Microbial activity
- Water & nutrient holding

AVAILABLE IN 4 SIZES

Whatever your requirements, we now have sizes to suit your needs. Seasol Trilogy 631 is available in 5L, 20L, 200L & 1000L quantities.

For sales information or to order contact your local area sales manager by calling **1800 335 508**

SEASOL INTERNATIONAL
1027 Mountain Highway, Bayswater, VIC, 3153
Toll Free (within Australia) **1800 335 508**
www.seasol.com.au



Thinking roots?
Think Seasol.





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Seasol[®]
**HORT
& AG**

INSTRUCTIONS USE

1. Trilogy 631 must be diluted in water. Use sufficient water to achieve adequate coverage when applying as a foliar spray. **2.** Shake or agitate before use. Maintain agitation during dilution & application if possible. **3.** Climatic stress - use 8.5/17L / ha 3-7 days prior to and after extreme stress events (e.g. heatwave and frost) to mitigate crop damage and assist recovery.

APPLICATION GUIDELINES

Category	Crops	Rate	Application / Critical Comments
Nut Trees	Almonds, Hazelnuts, Macadamias, Pecans	8.5-17L/ha or 1.7ml per sq mtr of plant area	Planting - drench or water in with 1:250 dilution. Apply from green tip/first growth flush. Recommend 5 applications at critical growth stages inc post harvest. Use higher rate for larger trees
Deciduous Fruit Trees	Pome Fruits, Stone Fruits other deciduous species	8.5-17L/ha or 1.7ml per sq mtr of plant area	Planting - drench or water in with 1:250 dilution. Apply at each growth flush or 5 applications at critical growth stages and post harvest. Higher rates for larger trees
Evergreen Tree Crops	Avocados, Bananas, Citrus, Olives	8.5-17L/ha or 1.7ml per sq mtr of plant area	Planting - drench or water in with 1:250 dilution. Apply from Bud initiation and at each growth flush. 17 L/ha/month on mature trees, fertigated in every month that you irrigate
Fruiting Annuals	Capsicums, Cucurbits, Strawberries, Tomatoes, Pumpkins	8.5L/ha	Apply at seedling and transplanting and from 15cm growth. Every 10-14 days or 4 applications as required
Leafy Vegetables	Asparagus, Brassicas, Celery, Herbs, Lettuces	8.5L/ha	Planting out - 1:250 dilution (4ml/L or 4.0L/1,000L water), for watering in of seedlings in a water wheel planter or similar device. Apply at seedling and transplanting and from 3-4 leaf. Every 10-14 days or 4 applications as required
Root Vegetables	Carrots, Onions, Potatoes, Sweet Potatoes	17L/ha	Apply from in furrow. 4-5 applications at critical growth stages
Vine & Berry Crops	Blueberries, Raspberries, Wine & Table Grapes	8.5-17L/ha or 1.7ml per sq mtr of plant area	Apply regularly during the growing season. As a minimum, use the product at times of plant stress or recovery such as Pre-Flowering, Fruit Filling & Post Harvest. Higher rates for larger canopies. Do not apply directly over flowers where flowers are essential to crop productivity where bloom is a feature of fruit (e.g. blueberries & table grapes) do not apply as a foliar spray once the bloom develops to avoid any damage
Broadacre	Canola, Cotton, Pasture Crops / (inc Lucerne) Sugar Cane, Turf	8.5-17L/ha or 1.7ml per sq mtr of plant area	Apply at the start of the growing season and after each cut or grazing event in a rotational or strip grazing situation. Apply post emergence, 4-5 applications at critical growth stages. Seed coating (Cereals) Up to 8.5-17L/tonne of seed. Do not exceed a total of 17L of total liquid per tonne. Sugar Cane - 8.5L/ha in furrow or billet dip, 2nd app 17L/ha at tillering. Ratoon crops 17L/ha at tillering. Do not graze pasture with ruminant animals for 3 weeks after application

GENERAL INSTRUCTIONS

FOLIAR SPRAYING: Apply the product as soon as possible after mixing in the spray tank. Maintain agitation in spray tank if possible. **Trilogy 631** can be used as a foliar application or applied directly to the soil and can be applied with boom sprays, air blast sprays, drip systems, travelling irrigators, centre pivots and by aerial application.

FERTIGATION: Agitate the product regularly in the fertigation tank. For best results use the product on its own. **Trilogy 631** can be mixed with a number of agricultural chemicals, **DO NOT COMBINE WITH CALCIUM NITRATE** See tank mix compatibility information at www.seasol.com.au

STORAGE AND HANDLING: Not to be kept for prolonged periods in hot conditions (>30°C) or in direct sunlight. Always use safe work practices for lifting and handling drums. Once diluted, the product should be applied within 24 hours. Agitate the product prior to using and re-agitate if the product is left standing for an extended period of time.

SAFETY DIRECTIONS: Not to be taken. Keep out of reach from children. May irritate the skin and eyes. Avoid inhalation. Use in a well-ventilated space. Wash hands after use. Wash all edible plants before eating. If splashed, wash off with water. If swallowed or irritation persists, seek prompt medical advice. Additional information is listed in the Safety Data Sheet.

CONDITIONS OF SALE: This product must be used strictly in accordance to the directions. The efficacy of the product may be influenced by environmental conditions and application procedures and no warranty, express or implied is offered.

**This product is allowable for use on farms (or in facilities) certified to the Australian Certified Organic Standard.*

