

BF4-Kelp Fertilizer

Agritein, LLC

Part Number: **Not Available**

Version No: **1.2**

Safety Data Sheet according to OSHA HazCom Standard (2012) requirements

Issue Date: **01/05/2023**

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L.GHS.USA.EN

SECTION 1 Identification

Product Identifier

Product name	BF4- Kelp Fertilizer
Synonyms	Not Available
Other means of identification	Not Available

Recommended use of the chemical and restrictions on use

Relevant identified uses	Not Available
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Name, address, and telephone number of the chemical manufacturer, importer, or other responsible party

Registered company name	Agritein, LLC
Address	304 Estate Dr W Mandeville LA 70448 United States
Telephone	1-985-352-7870
Fax	Not Available
Website	www.agritein.com
Email	info@agritein.com

Emergency phone number

Association / Organisation	Not Available
Emergency telephone numbers	1-985-352-7870
Other emergency telephone numbers	Not Available

SECTION 2 Hazard(s) identification

Classification of the substance or mixture


NFPA 704 diamond



Note: The hazard category numbers found in GHS classification in section 2 of this SDSs are NOT to be used to fill in the NFPA 704 diamond. Blue = Health Red = Fire Yellow = Reactivity White = Special (Oxidizer or water reactive substances)

Classification	Sensitisation (Skin) Category 1
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Label elements

Hazard pictogram(s)	
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Signal word	Warning
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Hazard statement(s)

H317	May cause an allergic skin reaction.
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Hazard(s) not otherwise classified

Not Applicable

Precautionary statement(s) Prevention

P280	Wear protective gloves and protective clothing.
P261	Avoid breathing mist/vapours/spray.
P272	Contaminated work clothing must not be allowed out of the workplace.

Precautionary statement(s) Response

P302+P352	IF ON SKIN: Wash with plenty of water.
P333+P313	If skin irritation or rash occurs: Get medical advice/attention.
P362+P364	Take off contaminated clothing and wash it before reuse.

Precautionary statement(s) Storage

Not Applicable

Precautionary statement(s) Disposal

P501	Dispose of contents/container to authorised hazardous or special waste collection point in accordance with any local regulation.
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SECTION 3 Composition / information on ingredients

Substances

See section below for composition of Mixtures

Mixtures

CAS No	%[weight]	Name
84775-78-0	<4	<u>kelp extract</u>
532-32-1	<1	<u>sodium benzoate</u>
24634-61-5	<1	<u>potassium sorbate</u>
7732-18-5	>94	<u>water</u>

SECTION 4 First-aid measures

Description of first aid measures

Eye Contact	If this product comes in contact with eyes: <ul style="list-style-type: none">▸ Wash out immediately with water.▸ If irritation continues, seek medical attention.▸ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact	If skin contact occurs: <ul style="list-style-type: none">▸ Immediately remove all contaminated clothing, including footwear.▸ Flush skin and hair with running water (and soap if available).▸ Seek medical attention in event of irritation.
Inhalation	<ul style="list-style-type: none">▸ If fumes, aerosols or combustion products are inhaled remove from contaminated area.▸ Other measures are usually unnecessary.

Ingestion

- ▶ Immediately give a glass of water.
- ▶ First aid is not generally required. If in doubt, contact a Poisons Information Centre or a doctor.

Most important symptoms and effects, both acute and delayed

See Section 11

Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5 Fire-fighting measures**Extinguishing media**

The product contains a substantial proportion of water, therefore there are no restrictions on the type of extinguishing media which may be used. Choice of extinguishing media should take into account surrounding areas.

Though the material is non-combustible, evaporation of water from the mixture, caused by the heat of nearby fire, may produce floating layers of combustible substances.

In such an event consider:

- ▶ foam.
- ▶ dry chemical powder.
- ▶ carbon dioxide.

Special hazards arising from the substrate or mixture**Fire Incompatibility**

None known.

Special protective equipment and precautions for fire-fighters**Fire Fighting**

- ▶ Alert Fire Brigade and tell them location and nature of hazard.
- ▶ Wear breathing apparatus plus protective gloves in the event of a fire.
- ▶ Prevent, by any means available, spillage from entering drains or water courses.
- ▶ Use fire fighting procedures suitable for surrounding area.
- ▶ **DO NOT** approach containers suspected to be hot.
- ▶ Cool fire exposed containers with water spray from a protected location.
- ▶ If safe to do so, remove containers from path of fire.
- ▶ Equipment should be thoroughly decontaminated after use.

Fire/Explosion Hazard

- ▶ The material is not readily combustible under normal conditions.
- ▶ However, it will break down under fire conditions and the organic component may burn.
- ▶ Not considered to be a significant fire risk.
- ▶ Heat may cause expansion or decomposition with violent rupture of containers.
- ▶ Decomposes on heating and may produce toxic fumes of carbon monoxide (CO).
- ▶ May emit acid smoke.

Decomposes on heating and produces toxic fumes of:
carbon dioxide (CO₂)
metal oxides
other pyrolysis products typical of burning organic material.
May emit corrosive fumes.

SECTION 6 Accidental release measures**Personal precautions, protective equipment and emergency procedures**

See section 8

Environmental precautions

See section 12

Methods and material for containment and cleaning up**Minor Spills**

- ▶ Clean up all spills immediately.
- ▶ Avoid breathing vapours and contact with skin and eyes.
- ▶ Control personal contact with the substance, by using protective equipment.
- ▶ Contain and absorb spill with sand, earth, inert material or vermiculite.
- ▶ Wipe up.
- ▶ Place in a suitable, labelled container for waste disposal.

Continued...

Major Spills

Moderate hazard.

- Clear area of personnel and move upwind.
- Alert Fire Brigade and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water course.
- Stop leak if safe to do so.
- Contain spill with sand, earth or vermiculite.
- Collect recoverable product into labelled containers for recycling.
- Neutralise/decontaminate residue (see Section 13 for specific agent).
- Collect solid residues and seal in labelled drums for disposal.
- Wash area and prevent runoff into drains.
- After clean up operations, decontaminate and launder all protective clothing and equipment before storing and re-using.
- If contamination of drains or waterways occurs, advise emergency services.

Personal Protective Equipment advice is contained in Section 8 of the SDS.

SECTION 7 Handling and storage

Precautions for safe handling

Safe handling

- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.
- **DO NOT** enter confined spaces until atmosphere has been checked.
- **DO NOT** allow material to contact humans, exposed food or food utensils.
- Avoid contact with incompatible materials.
- **When handling, DO NOT** eat, drink or smoke.
- Keep containers securely sealed when not in use.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately. Launder contaminated clothing before re-use.
- Use good occupational work practice.
- Observe manufacturer's storage and handling recommendations contained within this SDS.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.
- **DO NOT** allow clothing wet with material to stay in contact with skin

Other information

Conditions for safe storage, including any incompatibilities

Suitable container

- Polyethylene or polypropylene container.
- Packing as recommended by manufacturer.
- Check all containers are clearly labelled and free from leaks.

Storage incompatibility

None known



X — Must not be stored together

O — May be stored together with specific preventions

+ — May be stored together

Note: Depending on other risk factors, compatibility assessment based on the table above may not be relevant to storage situations, particularly where large volumes of dangerous goods are stored and handled. Reference should be made to the Safety Data Sheets for each substance or article and risks assessed accordingly.

SECTION 8 Exposure controls / personal protection

Control parameters

Occupational Exposure Limits (OEL)

INGREDIENT DATA

Not Available

Continued...

Emergency Limits

Ingredient	TEEL-1	TEEL-2	TEEL-3
sodium benzoate	61 mg/m3	680 mg/m3	810 mg/m3

Ingredient	Original IDLH	Revised IDLH
kelp extract	Not Available	Not Available
sodium benzoate	Not Available	Not Available
potassium sorbate	Not Available	Not Available
water	Not Available	Not Available

Occupational Exposure Banding


Ingredient	Occupational Exposure Band Rating	Occupational Exposure Band Limit
sodium benzoate	E	≤ 0.01 mg/m³
potassium sorbate	E	≤ 0.01 mg/m³

Notes: Occupational exposure banding is a process of assigning chemicals into specific categories or bands based on a chemical's potency and the adverse health outcomes associated with exposure. The output of this process is an occupational exposure band (OEB), which corresponds to a range of exposure concentrations that are expected to protect worker health.

MATERIAL DATA

Exposure controls

Appropriate engineering controls	<p>Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection.</p> <p>The basic types of engineering controls are:</p> <p>Process controls which involve changing the way a job activity or process is done to reduce the risk.</p> <p>Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment. Ventilation can remove or dilute an air contaminant if designed properly. The design of a ventilation system must match the particular process and chemical or contaminant in use. Employers may need to use multiple types of controls to prevent employee overexposure.</p> <p>General exhaust is adequate under normal operating conditions. If risk of overexposure exists, wear SAA approved respirator. Correct fit is essential to obtain adequate protection. Provide adequate ventilation in warehouse or closed storage areas. Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to effectively remove the contaminant.</p>	
	Type of Contaminant:	Air Speed:
	solvent, vapours, degreasing etc., evaporating from tank (in still air)	0.25-0.5 m/s (50-100 f/min)
	aerosols, fumes from pouring operations, intermittent container filling, low speed conveyer transfers, welding, spray drift, plating acid fumes, pickling (released at low velocity into zone of active generation)	0.5-1 m/s (100-200 f/min.)
	direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)	1-2.5 m/s (200-500 f/min)
	grinding, abrasive blasting, tumbling, high speed wheel generated dusts (released at high initial velocity into zone of very high rapid air motion).	2.5-10 m/s (500-2000 f/min.)
	Within each range the appropriate value depends on:	
	Lower end of the range	Upper end of the range
	1: Room air currents minimal or favourable to capture	1: Disturbing room air currents
	2: Contaminants of low toxicity or of nuisance value only	2: Contaminants of high toxicity
	3: Intermittent, low production.	3: High production, heavy use
	4: Large hood or large air mass in motion	4: Small hood - local control only
	<p>Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 1-2 m/s (200-400 f/min.) for extraction of solvents generated in a tank 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.</p>	

Individual protection measures, such as personal protective equipment	
Eye and face protection	<ul style="list-style-type: none"> ▸ Safety glasses with side shields. ▸ Chemical goggles. ▸ Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59], [AS/NZS 1336 or national equivalent]
Skin protection	See Hand protection below
Hands/feet protection	<ul style="list-style-type: none"> ▸ Wear chemical protective gloves, e.g. PVC. ▸ Wear safety footwear or safety gumboots, e.g. Rubber <p>NOTE:</p> <ul style="list-style-type: none"> ▸ The material may produce skin sensitisation in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact. ▸ Contaminated leather items, such as shoes, belts and watch-bands should be removed and destroyed. <p>The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.</p> <p>The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and has to be observed when making a final choice.</p> <p>Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.</p> <p>Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include:</p> <ul style="list-style-type: none"> · frequency and duration of contact, · chemical resistance of glove material, · glove thickness and · dexterity <p>Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739, AS/NZS 2161.1 or national equivalent).</p> <ul style="list-style-type: none"> · When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374, AS/NZS 2161.10.1 or national equivalent) is recommended. · When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374, AS/NZS 2161.10.1 or national equivalent) is recommended. · Some glove polymer types are less affected by movement and this should be taken into account when considering gloves for long-term use. · Contaminated gloves should be replaced. <p>As defined in ASTM F-739-96 in any application, gloves are rated as:</p> <ul style="list-style-type: none"> · Excellent when breakthrough time > 480 min · Good when breakthrough time > 20 min · Fair when breakthrough time < 20 min · Poor when glove material degrades <p>For general applications, gloves with a thickness typically greater than 0.35 mm, are recommended.</p> <p>It should be emphasised that glove thickness is not necessarily a good predictor of glove resistance to a specific chemical, as the permeation efficiency of the glove will be dependent on the exact composition of the glove material. Therefore, glove selection should also be based on consideration of the task requirements and knowledge of breakthrough times.</p> <p>Glove thickness may also vary depending on the glove manufacturer, the glove type and the glove model. Therefore, the manufacturers technical data should always be taken into account to ensure selection of the most appropriate glove for the task.</p> <p>Note: Depending on the activity being conducted, gloves of varying thickness may be required for specific tasks. For example:</p> <ul style="list-style-type: none"> · Thinner gloves (down to 0.1 mm or less) may be required where a high degree of manual dexterity is needed. However, these gloves are only likely to give short duration protection and would normally be just for single use applications, then disposed of. · Thicker gloves (up to 3 mm or more) may be required where there is a mechanical (as well as a chemical) risk i.e. where there is abrasion or puncture potential <p>Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.</p>
Body protection	See Other protection below
Other protection	<ul style="list-style-type: none"> ▸ Overalls. ▸ P.V.C apron. ▸ Barrier cream. ▸ Skin cleansing cream. ▸ Eye wash unit.

Respiratory protection

Type A Filter of sufficient capacity. (AS/NZS 1716 & 1715, EN 143:2000 & 149:2001, ANSI Z88 or national equivalent)

Selection of the Class and Type of respirator will depend upon the level of breathing zone contaminant and the chemical nature of the contaminant. Protection Factors (defined as the ratio of contaminant outside and inside the mask) may also be important.

Required minimum protection factor	Maximum gas/vapour concentration present in air p.p.m. (by volume)	Half-face Respirator	Full-Face Respirator
up to 10	1000	A-AUS / Class1	-
up to 50	1000	-	A-AUS / Class 1
up to 50	5000	Airline *	-
up to 100	5000	-	A-2
up to 100	10000	-	A-3
100+			Airline**

* - Continuous Flow ** - Continuous-flow or positive pressure demand

A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO₂), G = Agricultural chemicals, K = Ammonia(NH₃), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

- ▶ Cartridge respirators should never be used for emergency ingress or in areas of unknown vapour concentrations or oxygen content.
- ▶ The wearer must be warned to leave the contaminated area immediately on detecting any odours through the respirator. The odour may indicate that the mask is not functioning properly, that the vapour concentration is too high, or that the mask is not properly fitted. Because of these limitations, only restricted use of cartridge respirators is considered appropriate.
- ▶ Cartridge performance is affected by humidity. Cartridges should be changed after 2 hr of continuous use unless it is determined that the humidity is less than 75%, in which case, cartridges can be used for 4 hr. Used cartridges should be discarded daily, regardless of the length of time used

SECTION 9 Physical and chemical properties

Information on basic physical and chemical properties

Appearance	Not Available		
Physical state	Liquid	Relative density (Water = 1)	Not Available
Odour	Not Available	Partition coefficient n-octanol / water	Not Available
Odour threshold	Not Available	Auto-ignition temperature (°C)	Not Available
pH (as supplied)	Not Available	Decomposition temperature (°C)	Not Available
Melting point / freezing point (°C)	Not Available	Viscosity (cSt)	Not Available
Initial boiling point and boiling range (°C)	Not Available	Molecular weight (g/mol)	Not Available
Flash point (°C)	Not Available	Taste	Not Available
Evaporation rate	Not Available	Explosive properties	Not Available
Flammability	Not Available	Oxidising properties	Not Available
Upper Explosive Limit (%)	Not Available	Surface Tension (dyn/cm or mN/m)	Not Available
Lower Explosive Limit (%)	Not Available	Volatile Component (%vol)	Not Available
Vapour pressure (kPa)	Not Available	Gas group	Not Available
Solubility in water	Miscible	pH as a solution (1%)	Not Available
Vapour density (Air = 1)	Not Available	VOC g/L	Not Available

SECTION 10 Stability and reactivity

Reactivity	See section 7		
Chemical stability	<ul style="list-style-type: none"> ▶ Unstable in the presence of incompatible materials. ▶ Product is considered stable. 		

	▶ Hazardous polymerisation will not occur.
Possibility of hazardous reactions	See section 7
Conditions to avoid	See section 7
Incompatible materials	See section 7
Hazardous decomposition products	See section 5

SECTION 11 Toxicological information

Information on toxicological effects

Inhaled	The material is not thought to produce adverse health effects or irritation of the respiratory tract (as classified by EC Directives using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable control measures be used in an occupational setting. Not normally a hazard due to non-volatile nature of product
Ingestion	The material has NOT been classified by EC Directives or other classification systems as "harmful by ingestion". This is because of the lack of corroborating animal or human evidence. The material may still be damaging to the health of the individual, following ingestion, especially where pre-existing organ (e.g liver, kidney) damage is evident. Present definitions of harmful or toxic substances are generally based on doses producing mortality rather than those producing morbidity (disease, ill-health). Gastrointestinal tract discomfort may produce nausea and vomiting. In an occupational setting however, ingestion of insignificant quantities is not thought to be cause for concern.
Skin Contact	The material is not thought to produce adverse health effects or skin irritation following contact (as classified by EC Directives using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable gloves be used in an occupational setting.
Eye	Although the liquid is not thought to be an irritant (as classified by EC Directives), direct contact with the eye may produce transient discomfort characterised by tearing or conjunctival redness (as with windburn).
Chronic	Practical experience shows that skin contact with the material is capable either of inducing a sensitisation reaction in a substantial number of individuals, and/or of producing a positive response in experimental animals. Substances that can cause occupational asthma (also known as asthmagens and respiratory sensitisers) can induce a state of specific airway hyper-responsiveness via an immunological, irritant or other mechanism. Once the airways have become hyper-responsive, further exposure to the substance, sometimes even to tiny quantities, may cause respiratory symptoms. These symptoms can range in severity from a runny nose to asthma. Not all workers who are exposed to a sensitiser will become hyper-responsive and it is impossible to identify in advance who are likely to become hyper-responsive. Substances that can cause occupational asthma should be distinguished from substances which may trigger the symptoms of asthma in people with pre-existing air-way hyper-responsiveness. The latter substances are not classified as asthmagens or respiratory sensitisers Wherever it is reasonably practicable, exposure to substances that can cause occupational asthma should be prevented. Where this is not possible the primary aim is to apply adequate standards of control to prevent workers from becoming hyper-responsive. Activities giving rise to short-term peak concentrations should receive particular attention when risk management is being considered. Health surveillance is appropriate for all employees exposed or liable to be exposed to a substance which may cause occupational asthma and there should be appropriate consultation with an occupational health professional over the degree of risk and level of surveillance.

PowerGrow	TOXICITY	IRRITATION
	Not Available	Not Available
kelp extract	TOXICITY	IRRITATION
	Not Available	Not Available
sodium benzoate	TOXICITY	IRRITATION
	Dermal (rabbit) LD50: >2000 mg/kg ^[1]	Not Available
	Inhalation(Rat) LC50: >12.2 mg/L4h ^[1]	
potassium sorbate	TOXICITY	IRRITATION
	dermal (rat) LD50: >2000 mg/kg ^[1]	Eye: adverse effect observed (irritating) ^[1]

	Oral (Rat) LD50: >6650 mg/kg ^[2]	Eyes (rabbit) (-) Irritant [Manufacturer]
		Skin (rabbit) (-) Irritant
		Skin: no adverse effect observed (not irritating) ^[1]
water	TOXICITY	IRRITATION
	Oral (Rat) LD50: >90000 mg/kg ^[2]	Not Available
Legend:	1. Value obtained from Europe ECHA Registered Substances - Acute toxicity 2. Value obtained from manufacturer's SDS. Unless otherwise specified data extracted from RTECS - Register of Toxic Effect of chemical Substances	

KELP EXTRACT

The Cosmetic Ingredient Review (CIR) Expert Panel (Panel) assessed the safety of 82 brown algae-derived ingredients, which are frequently reported to function in cosmetics as skin-conditioning agents. The Panel concluded that the following 6 of the 82 reviewed brown algae-derived ingredients are safe in cosmetics in the present practices of use and concentration and also concluded that the available data are insufficient to make a determination that the remaining 76 ingredients are safe under the intended conditions of use in cosmetic formulations

"Kelp" (the dehydrated, ground product prepared from *Macrocystis pyrifera*, *Laminaria digitata*, *Laminaria saccharina*, and *Laminaria cloustoni*) is approved as a food additive for direct addition to food for human consumption as a source of iodine or as a dietary supplement. In animal drugs, feeds, and related products, brown algae (kelp; *Laminaria* spp. and *Nereocystis* spp.) are generally regarded as safe (GRAS) as natural substances and as solvent-free natural extractives used in conjunction with spices and other natural seasonings and flavourings.

Extraction methods and solvents vary, depending on the desired composition of the final ingredient. Powders, however, are generally the dried algae pulverized by milling. Inorganic arsenic, usually in the form of arsenosugars, is a natural constituent of brown algae and the amount in the harvested algae can be reduced by several methods. In addition to arsenic, brown algae exhibit an affinity for heavy metals and uptake is strongly dependent on environmental parameters.

Several brown algae constituents, such as phytosterols, phytosteryl ingredients, and alginic acid were previously found to be safe

Toxicity:

In oral human clinical trials, adverse effects of an *Ascophyllum nodosum* powder (0.5 g/d), an *Ecklonia cava* extract (up to 400 mg/day), and an *Undaria pinnatifida* powder (average intake 3.3 g per day) were mild and transient. The adverse effects included nausea, indigestion, dyspepsia, and diarrhea.

Acute oral administration of brown algae extracts was not toxic to mice, rats, and dogs. *Cystoseira Compressa* Extract was not toxic to mice up to 2000 mg/kg by gavage. *Ecklonia Cava* Extract was not toxic to rats and dogs up to 3000 mg/kg by gavage. The oral LD50s of two different *Fucus Vesiculosus* Extracts were 500 mg/kg and greater for mice and rats. There were no signs of toxicity at up to 4000 mg/kg *Laminaria Japonica* Extract orally administered to rats. *Sargassum Fulvellum* Extract and *Sargassum Thunbergii* Extract administered by gavage were not toxic to mice.

In oral short-term and subchronic studies, there were some adverse effects observed. In rats, *Cladosiphon Okamura* Extract (1200 to 4000 mg/kg by gavage) caused a dose-dependent increase in clotting time and decrease in alkaline phosphatase (ALP); there were no other adverse effects reported. An enzyme extract of *Ecklonia Cava* Extract (starting at 2000 mg/kg) administered by gavage for 2 weeks caused reduced ovary and brain weights in female rats. Hepatic effects in rats were observed in an alcohol *Ecklonia Cava* Extract at 2000 mg/kg/day for 4 weeks and at 1500 mg/kg/day when administered for 13 weeks (the hepatic effects resolved after 4 weeks of recovery). There were increased liver weights in male rats treated with two ethanol *Fucus Vesiculosus* Extracts (starting at 200 mg/kg/day) administered by gavage for 4 weeks. Vomiting was the only adverse effect when *Ecklonia Cava* Extract capsules (in increasing amounts up to 1000 mg/kg over 8 days) were orally administered to dogs. In other oral short-term and subchronic studies, there no adverse effects observed. *Ascophyllum Nodosum* was not toxic to pigs for 23 days or to rats for 4 weeks administered in feed at up to 10% and 15%, respectively. While consuming high-fat diets, there were no adverse effects caused by alcohol *Ecklonia Cava* Extract (up to 5 mg/day) administered to mice by gavage daily for 4 weeks and an ethanol *Laminaria Japonica* Extract (up to 400 mg/kg) administered by gavage for 6 weeks caused decreased body weight gain, fat-pad weights, and serum and hepatic lipid levels in rats. A *Ecklonia cava* powder (up to 0.15%; inference for *Ecklonia Cava* Extract and *Ecklonia Cava* Water) administered in feed for 28 days was not toxic to weanling pigs.

An orally administered *Undaria pinnatifida* extract for 28 days was not toxic to rats up to 1000 mg/kg/day, but ALT and triglyceride levels in males and HDL cholesterol in females increased at 2000 mg/kg/day. In a chronic oral toxicity study, the NOAEL of a *Laminaria Japonica* Extract administered to rats by gavage for 6 months was 300 mg/kg/day. In females, a decrease in AST was observed starting at 300 mg/kg/day and, at 2500 mg/kg/day, there was decreased serum glucose concentration; all effects returned to baseline after a 1-month recovery. *Laminaria Japonica* Powder incorporated into feed did not affect the lifespan of mice at up to 5%. In rats, *Undaria Pinnatifida* Extract administered as drinking water at 100% for 32 weeks and incorporated into the feed (at up to 5%) for 36 weeks did not cause any toxic effects.

Genetic toxicity:

In genotoxicity assays of several of the brown algae-derived ingredients, all results were negative with the exception of an *Ascophyllum Nodosum* Extract in one mammalian cell gene mutation test in which the extract was genotoxic starting at 1500 ug/ml in CHO cells. *Ascophyllum Nodosum* Extract was not genotoxic in an Ames assay and a mammalian cell gene mutation test (up to 500 ug/ml), and in chromosome aberration assays (up to 5 mg/ml). *Cystoseira Compressa* Extract (up to 5 mg/plate) was not genotoxic in an Ames assay. *Ecklonia Cava* Extract was not genotoxic in Ames assays (up to 5000 ug/plate) and chromosome aberration assays (up to 350 ug/plate). Aqueous *Fucus Vesiculosus* Extract was not genotoxic in a chromosome aberration assay and a comet assay (up to 1 mg/ml). *Laminaria Japonica* Extract (up to 5000 ug/plate) was not mutagenic in an Ames assay and a chromosome aberration assay. *Undaria Pinnatifida* Extract was not genotoxic in Ames assays and chromosome aberration assays (up to 5000 ug/ml). In micronucleus assays, *Ecklonia Cava* Extract (up to 3000 mg/kg), *Laminaria Japonica* Extract (up to 2000 mg/kg), and *Undaria Pinnatifida* Extract (up to 2000 mg/kg) were not genotoxic. An Ames test was performed according to OECD TG 471 using a trade name mixture containing 4.7% *Ascophyllum Nodosum* Extract in 94.5% water. No mutagenic activity was reported. None of the orally or dermally administered brown algae-derived ingredients tested (e.g., *Hizikia Fusiforme* Extract, *Saccharina Angustata* Extract (inference from *Saccharina Angustata* powder), *Undaria*

Pinnatifida Extract, and Undaria Pinnatifida Powder) were tumor (mammary and colorectal) promoters; instead, decreases in the number, incidence, and/or size of tumors in rats were reported. Rats administered methylnitronitrosoguanidine (MNNG) followed by 8 weeks of Sargassum Pallidum Extract (400 to 800 mg/kg/day) in drinking water exhibited decreased inflammatory responses.

Reproductive toxicity:

A Fucus vesiculosus extract exhibited estrogen effects in several in vitro studies. This extract (50 and 75 $\mu\text{mol/l}$) reduced 17-beta-estradiol levels in human granulosa cells and also competed with estradiol and progesterone for binding to their receptors. In another study, a Fucus vesiculosus (bladderwrack) extract competed for, and bound to, estrogen receptors ERalpha ($\text{IC}_{50} = 42.2 \mu\text{mol/l}$), ERbeta ($\text{IC}_{50} = 31.8 \mu\text{mol/l}$), and PR-B ($\text{IC}_{50} = 31.8 \mu\text{mol/l}$), with a slightly higher affinity for ERbeta. In co-treatments with E2 (12.5 pM; EC_{50}), a Fucus vesiculosus extract (2%) reduced the activation of the luciferase reporter by up to 50%, exhibiting potent ER antagonistic effects. ER-dependent and -independent cancer cell lines showed significantly decreased viability with increasing test material concentrations. The cell line-specific sensitivity suggests that Fucus vesiculosus extract was not toxic at up to 2%, but instead induces cell death through modulated pathways. In one study, aromatase activity following treatment of hLGCs with a Fucus vesiculosus extract (10 to 100 $\mu\text{mol/L}$) did not change. In vivo studies, a Fucus vesiculosus powder exhibited estrogenic effects. Daily oral administration (175 and 350 mg/kg/day) for 4 weeks resulted in a dose-dependent increase in the length of the estrous cycle and an overall 100% increase in the mean length of the dioestrus phase of the estrous cycle in the treated rats. Mean serum 17-beta-estradiol levels were reduced at 2 weeks and further reduced at 4 weeks. Female rats that had naturally high circulating estradiol had reduced serum 17-beta-estradiol (25% to 58% in all but 2 rats) after 1 week oral administration of a Fucus vesiculosus powder (350 mg/kg/day).

This powder (700 and 1400 mg/day) increased the menstrual cycle length and reduced the days of menstruation in a dose-dependent manner in three female human subjects with hypermenorrhea, dysmenorrhea, and other related ailments. In one subject, the plasma estradiol levels were decreased and the progesterone levels were increased in a dose-dependent manner.

Irritation studies

In an in vivo dermal irritation assay of an Ascophyllum nodosum extract (0.5 g in water) conducted in accordance with the OECD TG 404, a trade name mixture containing 4.7% Ascophyllum Nodosum Extract in 94.5% water was not considered to be an irritant. An Ascophyllum nodosum extract (0.5 g in water) administered to the shaved backs of rabbits under semi-occlusion for 4 h was not irritating. A skin cream containing a Laminaria japonica extract (10%; 20 mg) was not irritating to human subjects. According to a specifications data sheet, a trade name mixture containing 4.7% Ascophyllum Nodosum Extract in 94.5% water was practically non-irritating when used in a Het-Cam test. An Ascophyllum nodosum extract (100 mg) administered to the eyes of rabbits had a maximum irritation score was 6.7 out of 8 at 1 h post-installation. The score decreased to 0 by day 7 and was rated as a mild ocular irritant. The ophthalmic irritation potential of an eye cream containing 0.076% Sargassum Muticum Extract was tested in 31 subjects. The test material did not indicate a potential for ophthalmologic irritation and was considered safe for use by both contact and non-contact lens wearers.

A gel with an aqueous Fucus vesiculosus extract (1%; 0.2 ml) was applied to one cheek of human subjects at least twice per day (morning and evening) for 5 weeks. There were no signs of erythema or edema during the experiment

Sensitisation:

HRIPTs were performed using a night cream containing 0.05% Alaria Esculenta Extract, an eye cream containing 0.076% Sargassum Muticum Extract, and a skin care formulation containing 0.076% Sargassum Muticum Extract. No potential for dermal irritation or allergic contact sensitization was noted for any of the formulations.

Phototoxicity:

A phototoxicity study was performed according to OECD TG 432 using a trade name mixture containing 4.7% Ascophyllum Nodosum Extract in 94.5% water. No phototoxic activity was reported.

In an in vitro study examining the photo-protection potential involving a Sargassum Muticum extract, the effect of this extract against cell death induced by UVB radiation was studied. Cell viability was 61% in UVB (150 mJ/cm²) irradiated cells and 70% in UVB-irradiated cells treated with SME. Decreased numbers of apoptotic bodies as well as DNA fragmentation was apparent in cells exposed to SME and UVB versus UVB exposure alone.

Notes:

The ingredients in this safety assessment are derived from various species of brown algae. "Algae" is not a taxonomic group, but a functional group of convenience. Not all algae should be considered to be plant-like (seaweed; macroalgae). While some algae are seaweed, some are protozoa, and some are unique and belong in other kingdoms. However, these aquatic and oxygenic organisms are all part of the eclectic group called "algae."

There are several major groups of algae, and they are commonly referred to as brown algae (Phaeophyceae), green algae (Chlorophyta), diatoms (Bacillariophyceae), chrysophytes (Chrysophyta), blue-green algae (Cyanophyta), red algae (Rhodophyta), dinoflagellates (Pyrrhophyta), and euglenoids (Euglenophyta). The different algal phyla are differentiated by storage products, pigmentation, and cell wall composition.

Cosmetic Ingredient Review Safety Assessment of Brown Algae-Derived Ingredients as Used in Cosmetics: January 2019

http://www.cir-safety.org/sites/default/files/browna122018TR_0.pdf

Laxative properties of brown seaweeds (Phaeophyceae) have traditionally been attributed to the component alginic acid, a hydrophilic colloidal polysaccharide.

Kelp are frequently high in iodine content, and have been used traditionally for thyroid diseases. In humans, there are case reports of transient hyperthyroidism as a result of bladderwrack ingestion. Bladderwrack products contain up to 600 μg per gram of iodine, while normal human iodine intake is approximately 100-200 $\mu\text{g/day}$. Individuals ingesting bladderwrack or kelp products as food or supplements may ingest up to 30 times this amount. Chronic iodine toxicity may result in hypothyroidism, hyperthyroidism, goiter, or myxedema, although many individuals remain euthyroid. Systematic study of the effects of bladderwrack in humans is currently lacking, and there may be other active constituents. In terms of iodine content, a widely accepted standardization of iodine content in bladderwrack is lacking at this time, although some products may list iodine content on the label.

Theoretically, the thyroid stimulatory properties of bladderwrack may cause hypermetabolic weight loss. However, its anorectic properties have not been adequately evaluated in humans.

Doses of 700 to 1400 mg/day were found to increase the menstrual cycle lengths, decrease the days of menstruation per cycle, and decrease the serum levels of 17beta-estradiol while was later carried out and showed similar effects.

Kelp products should not be used in cases of hyperthyroidism or cardiac problems, or during pregnancy and lactation. Excessive dosage (many times the recommended dosage) may lead to hyperthyroidism, tremor, increased pulse rate and elevated blood pressure.

Based on animal evidence, sodium alginate (soluble algae polysaccharide) may lower lipid levels in the blood. Because cholesterol is needed to produce sex hormones, it has been suggested that oral ingestion of kelp may affect circulating sex hormone levels and menstrual cycling patterns. Researchers tested the effects of bladderwrack to determine if its effects on women with or at high risk for estrogen-dependent diseases. Three pre-menopausal women with abnormal menstrual cycling patterns and/or menstrual-related disease histories received bladderwrack. Bladderwrack significantly increased menstrual cycle length by 5.5-14 days. In addition, hormone measurements in one woman revealed significant anti-estrogenic and progestagenic effects. Mean baseline 17 β -estradiol levels were reduced from 626 \pm 91 to 164 \pm 30 pg/ml ($p=0.04$) following 700 mg daily, which decreased further to 92.5.0 \pm 3.5 pg/ml ($p=0.03$) with the 1.4 g daily dose. Mean baseline progesterone levels increased from 0.58 \pm 0.14 to 8.4 \pm 2.6 ng/ml with the 700 mg daily dose ($p=0.1$), which increased further to 16.8 \pm 0.7 ng/ml with the 1.4 g daily dose ($p=0.002$). The authors concluded that dietary bladderwrack may prolong the menstrual cycle and exert anti-oestrogenic effects in pre-menopausal women. The authors also suggested that seaweed may help reduce the risk of oestrogen-related cancers observed in Japanese populations. However, these preliminary findings need to be confirmed in well-controlled clinical trials.

For fucoidan: (a sulfated polysaccharide also known as galactofucan)

Fucoidan is reported to have a wide range of bioactive properties, such as anticancer, anti-inflammatory, anticoagulant and antiproliferative properties. The stimulatory effects of fucoidan depends on the species it is isolated from, molecular weight and position of and amount of the sulfate groups.

Because of the complex chemical structure of fucoidan, it cannot be fermented by gut microbiota. Still it has shown prebiotic-like effects and could increase the abundance of benign microbes in the gut, in a fashion similar to *Lactobacillus* spp. and short chain fatty acid (SCFA)-producers, whilst decreasing the number of opportunistic pathogens. These compositional changes in the gut could lead to indirect health promoting effects for the host and could potentially be used as a treatment of intestinal dysbiosis.

Fucoidan degrading enzymes may be a way of identifying various immunostimulatory effects. Both fucoidanases, cutting the fucoidan backbone, and sulfatases may be valuable tools in addressing which structural elements are causing biological effects. Fucoidan can stimulate the immune system by its ability to modify properties on the cell surface or act as an immunomodulator directly on macrophages, T-lymphocytes, B-cells, natural killer (NK) cells and induce production of interleukin 1 (IL-1) and interferon-gamma (INF-gamma), in vitro. Fucoidan also demonstrated to produce antitumor effects.

In several studies examining the role of fucoidan in the inflammatory processes associated with ischemia and collagen-induced arthritis in mice and in vitro macrophage cell lines, results indicated that low molecular weight fucoidan (LMWF) showed more potent bioactivity than high molecular weight fucoidan (HMWF). LMWF are usually isolated from algae or hydrolysed from HMWF. Both types of fucoidans showed an effect, but it was indicated that HMWF enhanced arthritis by increasing the activation of macrophages, while LMWF reduced arthritis through the suppression of specific cytokine-mediated immune reactions.

The anticoagulant properties of fucoidans from brown macroalgae have been studied. Results indicated that the structural differences not only determined anticoagulant potency, but also the mechanisms by which they carried out their activity. Fucoidan seemed to directly inhibit thrombin, and a single difference in one sulfate group per tetrasaccharide repeating unit altered the activity notably. In platelet aggregation assays, fucoidan with a high sulfate content ($>20\%$) have shown greater anticoagulant activity than LMWF. Fucoidan with a low sulfate content ($<20\%$).

Several studies have been performed on the effect of fucoidan on cell migration and proliferation in vitro. In a migration assay of osteoblast cells fucoidan treated cells showed slightly decreased migration compared to the control cells. In addition, the cells shrunk and showed decreased spreading and adhesion. Fucoidan isolated from *Ascophyllum nodosum*, stimulated cell growth in the presence of fibroblast growth factor-1 whilst inhibiting proliferation induced by fibroblast growth factor-2. Similarly, in the presence of another sulfated polysaccharide (heparin), the cell migration was also inhibited.

Sulfated polysaccharides (SP) represent a complex group of biopolymers with a wide range of important biological functions and activities. Besides the sulfated glycosaminoglycans of vertebrates, SP are ubiquitous components of marine algae and marine invertebrates. While carrageenans and agarans, two types of sulfated galactans extracted from red algae species, have been industrially applied as hydrocolloids, fucoidans, the typical SP of brown algae of the class Phaeophyceae, are increasingly attracting attention as promising candidates for numerous health-supporting and therapeutic applications. Interest has mainly focused on their potentially beneficial effects in humans including antitumor, immunomodulatory, anti-inflammatory, antiviral, antithrombotic, anticoagulant, and antioxidant effects, as well as specific activities against kidney, liver and urinary system disorders.

Different studies were performed testing the toxic potential of fucoidan. No evidence of mutagenicity was reported when an Ames test was performed using a trade name mixture containing 7% hydrolyzed fucoidan extracted from *Laminaria digitata*. A dermal irritation assay was performed using the same trade name mixture containing 7% hydrolyzed fucoidan. The product was classified as a non-irritant.

No phototoxic potential was reported when Balb/c 3T3 cells were exposed to a mixture containing 7% hydrolyzed fucoidan extracted from *Laminaria digitata*. A neutral red uptake assay was performed on BALB/c 3T3 cells using a trade name mixture containing 7% hydrolyzed fucoidan extracted from *Laminaria digitata*. The product was reported to be not/mildly irritating.

Anticancer activity:

Intact fucoidans showed anticancer activity. Moreover, when hydrolyzed in boiling water with HCl for 5 min, the anticancer activity of fucoidans significantly increased. Results suggest that anticancer activity of fucoidans could be markedly improved when they are depolymerized in mild conditions.

Fucoidan isolated from the sporophyll of New Zealand *U. pinnatifida* exhibits similar cell growth-inhibition effects in breast adenocarcinoma cell line MCF-7, lung carcinoma cell line A-549, and colon adenocarcinoma cell line WiDr, in comparison with commercial fucoidan isolated from *F. vesiculosus*. Similar results are reported by another group where breast cancer cell line T-47D and melanoma cancer cell line SK-MEL-28 are susceptible to the anticancer effect of fucoidan isolated from *U. pinnatifida* grown in Japan Sea. There was an enhanced inhibitory effect against melanin biosynthesis in B16BL6 melanoma cells with low molecular weight fucoidan. It has also been shown that fucoidan from *U. pinnatifida* has antiproliferation effect on prostate and hepatocellular cancer cells. Research suggests that fucoidan treatment could induce intrinsic and extrinsic apoptosis pathways via the activation of extracellular signal-regulated kinase (ERK1/2 MAPK), the inactivation of p38 MAPK and phosphatidylinositol 3-kinase (PI3K)/Akt signaling pathways, and the downregulation of the Wnt/ β -catenin signaling pathway. Further research suggested that fucoidan induces apoptosis via a ROS-mediated mitochondrial pathway. By

increasing reactive oxygen species (ROS) production, fucoidan induces mitochondrial oxidative damage, mitochondrial membrane potential (MMP) depolarization, and release of cytochrome c; combined with downregulation of Livin and XIAP mRNA and activation of caspase-3 and caspase-9. Another report demonstrates that fucoidan can ameliorate hepatic infrared injury in mice via JAK2/STAT1-mediated apoptosis and autophagy.

The anticancer activity of fucoidan is influenced by its sulfate content; low molecular weight fucans isolated from *Ascophyllum nodosum* exhibited increased antiproliferative activity on fibroblast cell line CCL39 with increased sulfate content. Likewise, oversulfated fucoidan from *F. vesiculosus* exhibited higher anti-angiogenesis potency on the growth of B16 melanoma cells, Lewis lung carcinoma, and Sarcoma 180 cell lines. This suggests that the sulfate content of fucoidan may be critical in influencing its anticancer activity.

Antioxidant activity:

The antioxidant capacity of fucoidan isolated from various seaweed species has been demonstrated in the literature. It has been reported that fucoidan typically exhibits strong secondary antioxidant activity that is comparable to synthetic antioxidants such as butylated hydroxyanisole (BHA) and butylated hydroxytoluene (BHT) that are known for causing side effects in humans including cancer. It has been reported that fucoidan isolated from *Sargassum binderi* exhibits significantly higher secondary antioxidant capacity, based on superoxide radical scavenging and hydrogen peroxide scavenging assays, than synthetic antioxidants BHA and BHT.

There have been numerous reports on the correlation between the antioxidant capacity of fucoidan and its sulfate content and molecular weight.

Besides sulfate content, a correlation between molecular weight and the antioxidant capacity of fucoidan has also been reported. The high molecular weight fucoidan fractions show low inhibitory effects on low-density lipoprotein (LDL) oxidation while the low molecular weight fractions exhibited higher inhibitory effects.

Anticoagulant effects:

Studies have confirmed the anticoagulant and antithrombotic activity of fucoidan from the brown seaweeds *Saccharina latissimi*.

The molecular weight of the fucoidan polymer is thought to be related to its anticoagulant activity. One study found that the fucoidan polymer exhibited the strongest anticoagulant activity with the molecular weight from approximately 10 kDa to 300 kDa. Fucoidans appeared to have no cytotoxic effect on the red blood cells, and the values of prothrombin time, activated partial thromboplastin time, and fibrinogen are significantly changed. The purified fucoidan significantly prolongs clotting time in a manner similar to heparin.

Antibacterial activity:

Antibacterial activity of fucoidan from *U. pinnatifida* has been tested and proven to be effective. Compared with Gram-negative strains, Gram-positive bacterial strains are more inhibited by fucoidan.

The antibacterial mechanism is due to a large amount of sulfuric acid and glucuronic acid in the depolymerization products of fucoidan, which have the property of polyanion. The depolymerized fucoidans bind to the bacterial membrane proteins and cause a membrane-disrupting effect that induces the expression of certain apoptotic factors, which leads to bacterial apoptosis.

Other benefits:

Fucoidin has significantly induced osteoblastic cell differentiation and has potential in use as a functional food ingredient in bone health supplement. Fucoidan from *C. okamuranus* (Phaeophyceae) protects gastric mucosa against acid and pepsin. Therefore, fucoidan can be developed as a potential antiulcer ingredient in functional foods.

Note:

It is generally challenging to produce marine SP in a reproducible quality, since they are not only usually complex, heterogeneous molecule mixtures, but they also vary substantially in their composition depending on the source material (e.g., alga species, harvest time), environmental parameters (e.g., light, nutrition, salinity, temperature), as well as the process of extraction and purification. Particularly, the fucoidans found in the cell walls and intercellular spaces of brown algae represent a tremendous number of structurally distinct fucose-containing SP ranging from homofucans to complex, highly branched heteropolysaccharides so that some authors consider the term fucose-containing sulfated polysaccharides more appropriate than the term fucoidan. Even crude fucoidan isolated from a single species of brown algae mostly consists of a mixture of structurally distinct polymers and the composition of this mixture may considerably vary depending on a multitude of factors. Aggravating this situation, the compounds indicated in literature as "fucoidans" considerably vary in their degree of purity, i.e., their content of co-extracted compounds like laminarin, alginic acid, proteins, polyphenols, etc. may influence the observed biological effect.

NOTE: Oral doses of 8-10g may cause nausea and vomiting, though tolerance in human is 50 g/day. Use in food limited to 0.1% [ICI]

For benzoates:

Acute toxicity: Benzyl alcohol, benzoic acid and its sodium and potassium salt can be considered as a single category regarding human health, as they are all rapidly metabolised and excreted via a common pathway within 24 hrs. Systemic toxic effects of similar nature (e.g. liver, kidney) were observed. However with benzoic acid and its salts toxic effects are seen at higher doses than with benzyl alcohol.

The compounds exhibit low acute toxicity as for the oral and dermal route. The LD50 values are > 2000 mg/kg bw except for benzyl alcohol which needs to be considered as harmful by the oral route in view of an oral LD50 of 1610 mg/kg bw. The 4 hrs inhalation exposure of benzyl alcohol or benzoic acid at 4 and 12 mg/l as aerosol/dust respectively gave no mortality, showing low acute toxicity by inhalation for these compounds.

Benzoic acid and benzyl alcohol are slightly irritating to the skin, while sodium benzoate was not skin irritating. No data are available for potassium benzoate but it is also expected not to be skin irritating. Benzoic acid and benzyl alcohol are irritating to the eye and sodium benzoate was only slightly irritating to the eye. No data are available for potassium benzoate but it is expected also to be only slightly irritating to the eye.

Sensitisation: The available studies for benzoic acid gave no indication for a sensitising effect in animals, however occasionally very low positive reactions were recorded with humans (dermatological patients) in patch tests. The same occurs for sodium benzoate. It has been suggested that the very low positive reactions are non-immunologic contact urticaria. Benzyl alcohol gave positive and negative results in animals. Benzyl alcohol also demonstrated a maximum incidence of sensitization of only 1% in human patch testing. Over several decades no sensitization with these compounds has been seen among workers.

Repeat dose toxicity: For benzoic acid repeated dose oral toxicity studies give a NOAEL of 800 mg/kg/day. For the salts values > 1000 mg/kg/day are obtained. At higher doses increased mortality, reduced weight gain, liver and kidney effects were observed.

SODIUM BENZOATE

	<p>For benzyl alcohol the long-term studies indicate a NOAEL > 400 mg/kg bw/d for rats and > 200 mg/kg bw/d for mice. At higher doses effects on bodyweights, lesions in the brains, thymus, skeletal muscle and kidney were observed. It should be taken into account that administration in these studies was by gavage route, at which saturation of metabolic pathways is likely to occur.</p> <p>Mutagenicity: All chemicals showed no mutagenic activity in <i>in vitro</i> Ames tests. Various results were obtained with other <i>in vitro</i> genotoxicity assays. Sodium benzoate and benzyl alcohol showed no genotoxicity <i>in vivo</i>. While some mixed and/or equivocal <i>in vitro</i> chromosomal/chromatid responses have been observed, no genotoxicity was observed in the <i>in vivo</i> cytogenetic, micronucleus, or other assays. The weight of the evidence of the <i>in vitro</i> and <i>in vivo</i> genotoxicity data indicates that these chemicals are not mutagenic or clastogenic. They also are not carcinogenic in long-term carcinogenicity studies.</p> <p>In a 4-generation study with benzoic acid no effects on reproduction were seen (NOAEL: 750 mg/kg). No compound related effects on reproductive organs (gross and histopathology examination) could be found in the (sub) chronic studies in rats and mice with benzyl acetate, benzyl alcohol, benzaldehyde, sodium benzoate and supports a non-reprotoxic potential of these compounds. In addition, data from reprotoxicity studies on benzyl acetate (NOAEL >2000 mg/kg bw/d; rats and mice) and benzaldehyde (tested only up to 5 mg/kg bw; rats) support the non-reprotoxicity of benzyl alcohol and benzoic acid and its salts.</p> <p>Developmental toxicity: In rats for sodium benzoate dosed via food during the entire gestation developmental effects occurred only in the presence of marked maternal toxicity (reduced food intake and decreased body weight) (NOAEL = 1400 mg/kg bw). For hamster (NOEL: 300 mg/kg bw), rabbit (NOEL: 250 mg/kg bw) and mice (CD-1 mice, NOEL: 175 mg/kg bw) no higher doses (all by gavage) were tested and no maternal toxicity was observed. For benzyl alcohol: NOAEL= 550 mg/kg bw (gavage; CD-1 mice). LOAEL = 750 mg/kg bw (gavage mice). In this study maternal toxicity was observed e.g. increased mortality, reduced body weight and clinical toxicology. Benzyl acetate: NOEL = 500 mg/kg bw (gavage rats). No maternal toxicity was observed.</p>
POTASSIUM SORBATE	<p>Substance has been investigated as a mutagen by cytogenetic analysis in rodents.</p> <p>Asthma-like symptoms may continue for months or even years after exposure to the material ends. This may be due to a non-allergic condition known as reactive airways dysfunction syndrome (RADS) which can occur after exposure to high levels of highly irritating compound. Main criteria for diagnosing RADS include the absence of previous airways disease in a non-atopic individual, with sudden onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. Other criteria for diagnosis of RADS include a reversible airflow pattern on lung function tests, moderate to severe bronchial hyperreactivity on methacholine challenge testing, and the lack of minimal lymphocytic inflammation, without eosinophilia. RADS (or asthma) following an irritating inhalation is an infrequent disorder with rates related to the concentration of and duration of exposure to the irritating substance. On the other hand, industrial bronchitis is a disorder that occurs as a result of exposure due to high concentrations of irritating substance (often particles) and is completely reversible after exposure ceases. The disorder is characterized by difficulty breathing, cough and mucus production.</p>
PowerGrow & SODIUM BENZOATE & POTASSIUM SORBATE	<p>The following information refers to contact allergens as a group and may not be specific to this product.</p> <p>Contact allergies quickly manifest themselves as contact eczema, more rarely as urticaria or Quincke's oedema. The pathogenesis of contact eczema involves a cell-mediated (T lymphocytes) immune reaction of the delayed type. Other allergic skin reactions, e.g. contact urticaria, involve antibody-mediated immune reactions. The significance of the contact allergen is not simply determined by its sensitisation potential: the distribution of the substance and the opportunities for contact with it are equally important. A weakly sensitising substance which is widely distributed can be a more important allergen than one with stronger sensitising potential with which few individuals come into contact. From a clinical point of view, substances are noteworthy if they produce an allergic test reaction in more than 1% of the persons tested.</p>
KELP EXTRACT & WATER	No significant acute toxicological data identified in literature search.

Acute Toxicity	✗	Carcinogenicity	✗
Skin Irritation/Corrosion	✗	Reproductivity	✗
Serious Eye Damage/Irritation	✗	STOT - Single Exposure	✗
Respiratory or Skin sensitisation	✓	STOT - Repeated Exposure	✗
Mutagenicity	✗	Aspiration Hazard	✗

Legend: ✗ – Data either not available or does not fill the criteria for classification
 ✓ – Data available to make classification

SECTION 12 Ecological information

Toxicity

	Endpoint	Test Duration (hr)	Species	Value	Source
	Not Available	Not Available	Not Available	Not Available	Not Available
PowerGrow					
	EC10(ECx)	72h	Algae or other aquatic plants	17.74mg/l	2
	EC50	72h	Algae or other aquatic plants	60.35mg/l	2
	LC50	96h	Fish	>100mg/l	2
kelp extract					
	NOEC(ECx)	72h	Algae or other aquatic plants	0.09mg/l	2
sodium benzoate					
	NOEC(ECx)	72h	Algae or other aquatic plants	0.09mg/l	2

Continued...

	LC50	96h	Fish	>100mg/l	2
	EC50	72h	Algae or other aquatic plants	>30.5mg/l	2
	EC50	48h	Crustacea	<650mg/l	1
potassium sorbate	Endpoint	Test Duration (hr)	Species	Value	Source
	NOEC(ECx)	72h	Algae or other aquatic plants	8.46mg/l	2
	LC50	96h	Fish	500mg/l	1
	EC50	48h	Crustacea	750mg/l	1
water	Endpoint	Test Duration (hr)	Species	Value	Source
	Not Available	Not Available	Not Available	Not Available	Not Available
Legend: <i>Extracted from 1. IUCLID Toxicity Data 2. Europe ECHA Registered Substances - Ecotoxicological Information - Aquatic Toxicity 4. US EPA, Ecotox database - Aquatic Toxicity Data 5. ECETOC Aquatic Hazard Assessment Data 6. NITE (Japan) - Bioconcentration Data 7. METI (Japan) - Bioconcentration Data 8. Vendor Data</i>					

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
water	LOW	LOW

Bioaccumulative potential

Ingredient	Bioaccumulation
	No Data available for all ingredients

Mobility in soil

Ingredient	Mobility
	No Data available for all ingredients

SECTION 13 Disposal considerations**Waste treatment methods**

Product / Packaging disposal	<ul style="list-style-type: none"> Containers may still present a chemical hazard/ danger when empty. Return to supplier for reuse/ recycling if possible. <p>Otherwise:</p> <ul style="list-style-type: none"> If container can not be cleaned sufficiently well to ensure that residuals do not remain or if the container cannot be used to store the same product, then puncture containers, to prevent re-use, and bury at an authorised landfill. Where possible retain label warnings and SDS and observe all notices pertaining to the product. <p>Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.</p> <p>A Hierarchy of Controls seems to be common - the user should investigate:</p> <ul style="list-style-type: none"> Reduction Reuse Recycling Disposal (if all else fails) <p>This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. If it has been contaminated, it may be possible to reclaim the product by filtration, distillation or some other means. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.</p> <ul style="list-style-type: none"> DO NOT allow wash water from cleaning or process equipment to enter drains. It may be necessary to collect all wash water for treatment before disposal. In all cases disposal to sewer may be subject to local laws and regulations and these should be considered first. Where in doubt contact the responsible authority. Recycle wherever possible. Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified. Dispose of by: burial in a land-fill specifically licensed to accept chemical and / or pharmaceutical wastes or incineration in a licensed apparatus (after admixture with suitable combustible material). Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.

SECTION 14 Transport information

Labels Required

Marine Pollutant	NO
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Shipping container and transport vehicle placarding and labeling may vary from the below information. Products that are regulated for transport will be packaged and marked as Dangerous Goods in Excepted Quantities according to US DOT, IATA and IMDG regulations. In case of reshipment, it is the responsibility of the shipper to determine the appropriate labels and markings in accordance with applicable transport regulations.

Land transport (DOT): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Air transport (ICAO-IATA / DGR): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Sea transport (IMDG-Code / GGVSee): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Transport in bulk according to Annex II of MARPOL and the IBC code

Not Applicable

Transport in bulk in accordance with MARPOL Annex V and the IMSBC Code

Product name	Group
kelp extract	Not Available
sodium benzoate	Not Available
potassium sorbate	Not Available
water	Not Available

Transport in bulk in accordance with the IGC Code

Product name	Ship Type
kelp extract	Not Available
sodium benzoate	Not Available
potassium sorbate	Not Available
water	Not Available

SECTION 15 Regulatory information

Safety, health and environmental regulations / legislation specific for the substance or mixture

kelp extract is found on the following regulatory lists

Not Applicable

sodium benzoate is found on the following regulatory lists

US DOE Temporary Emergency Exposure Limits (TEELs)

US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

potassium sorbate is found on the following regulatory lists

US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

water is found on the following regulatory lists

US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

Federal Regulations

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Section 311/312 hazard categories

Flammable (Gases, Aerosols, Liquids, or Solids)	No
Gas under pressure	No
Explosive	No
Self-heating	No
Pyrophoric (Liquid or Solid)	No
Pyrophoric Gas	No

Corrosive to metal	No
Oxidizer (Liquid, Solid or Gas)	No
Organic Peroxide	No
Self-reactive	No
In contact with water emits flammable gas	No
Combustible Dust	No
Carcinogenicity	No
Acute toxicity (any route of exposure)	No
Reproductive toxicity	No
Skin Corrosion or Irritation	No
Respiratory or Skin Sensitization	Yes
Serious eye damage or eye irritation	No
Specific target organ toxicity (single or repeated exposure)	No
Aspiration Hazard	No
Germ cell mutagenicity	No
Simple Asphyxiant	No
Hazards Not Otherwise Classified	No

US. EPA CERCLA Hazardous Substances and Reportable Quantities (40 CFR 302.4)
None Reported

State Regulations

US. California Proposition 65
None listed

National Inventory Status

National Inventory	Status
Australia - AIIC / Australia Non-Industrial Use	Yes
Canada - DSL	Yes
Canada - NDSL	No (kelp extract; sodium benzoate; potassium sorbate; water)
China - IECSC	Yes
Europe - EINEC / ELINCS / NLP	Yes
Japan - ENCS	No (kelp extract)
Korea - KECI	No (kelp extract)
New Zealand - NZIoC	Yes
Philippines - PICCS	No (kelp extract)
USA - TSCA	No (kelp extract)
Taiwan - TCSI	Yes
Mexico - INSQ	No (kelp extract)
Vietnam - NCI	Yes
Russia - FBEPH	No (kelp extract)
Legend:	<i>Yes = All CAS declared ingredients are on the inventory No = One or more of the CAS listed ingredients are not on the inventory. These ingredients may be exempt or will require registration.</i>

SECTION 16 Other information

Revision Date	01/05/2023
Initial Date	02/05/2023

Other information

Ingredients with multiple cas numbers

Name	CAS No
kelp extract	84775-78-0, 90046-12-1, 90046-13-2, 223751-72-2, 92128-82-0
potassium sorbate	24634-61-5, 590-00-1, 16577-94-9

Classification of the preparation and its individual components has drawn on official and authoritative sources using available literature references.

The SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

Definitions and abbreviations

PC—TWA: Permissible Concentration-Time Weighted Average

PC—STEL: Permissible Concentration-Short Term Exposure Limit

IARC: International Agency for Research on Cancer

ACGIH: American Conference of Governmental Industrial Hygienists

STEL: Short Term Exposure Limit

TEEL: Temporary Emergency Exposure Limit,

IDLH: Immediately Dangerous to Life or Health Concentrations

ES: Exposure Standard

OSF: Odour Safety Factor

NOAEL :No Observed Adverse Effect Level

LOAEL: Lowest Observed Adverse Effect Level

TLV: Threshold Limit Value

LOD: Limit Of Detection

OTV: Odour Threshold Value

BCF: BioConcentration Factors

BEI: Biological Exposure Index

AIIC: Australian Inventory of Industrial Chemicals

DSL: Domestic Substances List

NDSL: Non-Domestic Substances List

IECSC: Inventory of Existing Chemical Substance in China

EINECS: European INventory of Existing Commercial chemical Substances

ELINCS: European List of Notified Chemical Substances

NLP: No-Longer Polymers

ENCS: Existing and New Chemical Substances Inventory

KECI: Korea Existing Chemicals Inventory

NZIoC: New Zealand Inventory of Chemicals

PICCS: Philippine Inventory of Chemicals and Chemical Substances

TSCA: Toxic Substances Control Act

TCSI: Taiwan Chemical Substance Inventory

INSQ: Inventario Nacional de Sustancias Químicas

NCI: National Chemical Inventory

FBEPH: Russian Register of Potentially Hazardous Chemical and Biological Substances