PETITION FOR LISTING
ON
NATIONAL LIST OF APPROVED AND PROHIBITED
SUBSTANCES
SEC. 2118. [7 U.S.C. 6517] NATIONAL LIST

Petitioner name: Aquaculture Working Group, % George S. Lockwood, Chair
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Date of petition: June 13, 2012

Check applicable:

○ § 205.609 Synthetic substances allowed for use in organic aquatic *plant* production.

○ § 205.610 Nonsynthetic substances prohibited for use in organic aquatic *plant* production

X § 205.611 Synthetic substances allowed for use in organic aquatic *animal* production.

○ § 205.612 Nonsynthetic substances prohibited for use in organic aquatic *animal* production.

Send to: National List Coordinator, National Organic Program,
USDA/AMS/TM/ NOP, Room 4008–So., Ag Stop 0268,
1400 Independence Ave., SW.,
Washington, DC 20250.

Summary of request:

Previous actions by NOSB and NOP allow lignin sulfonate in the organic production of crops under:

"§ 205.601 Synthetic substances allowed for use in organic crop production
(j) As plant or soil amendments
(4) Lignin sulfonate—chelating agent, dust suppressant, floatation agent.

This petition is a request for NOSB and NOP to allow lignin sulfonate in the organic production of aquatic animals in:

§ 205.611 Synthetic substances allowed for use in organic aquatic animal production.
(*x*) As feed additives.

(*y*) Lignin sulfonates – as a feed binder.

Lignin sulfonate is a binder in feeds for livestock and aquatic animals. In aquaculture it is necessary to hold the various ingredients together to prevent disbursement of nutrients into the water before the fish consume feed pellets.

Lignan sulfonate was favorably reviewed initially by a Technical Advisory Panel in 1995 when this substance was found to be compatible with organic production and was first allowed on the National List. It was again reviewed in 2011 when it was recommended for relisting on the National List under crops, as a plant or soil amendment in 205.601 (j) (4). Lignin sulfonates have been allowed in organic production for many years.

1. The substance's chemical or material common names.

Lignin sulfonate,
lignosulfonate
lignosulfuric acid
lignosulfonic acid
LST 7
Ligninsulonic acid
Poly(lignosulfonic acid)
Protectol W
Sulfite lignin
(NLM, 2011a)
There are also various salts of lignin sulfonate listed in the CAS Numbers section.

Trade Names:
Lignosite® – Georgia-Pacific (Georgia-Pacific 20 West, Inc., 2000)
BorrePlex – LignoTech USA, Inc. (OMRI, 2010)
Phyto-Plus® Plant Stimulator – Baicor L.C. 23 (OMRI, 2010)
SHADOW – LignoTech USA, Inc. (OMRI, 2010)
Orzan – ITT Rayonnier (Sugar and Spotts, 1986)

2. The manufacturer's or producer's name, address and telephone number and other contact information of the manufacturer/producer of the substance listed in the petition.

LignoTech USA, Inc.
100 Grand Ave.
Rothschild, WI 54474
Contact: Stu Lebo
Phone: 715-359-6544
http://www.ltus.com

Agconnect
http://www.agconnect-ca.com
js.agconnect@sbcglobal.net
Contact: James Sorenson

Phone: 805-226-8023
Fax: 805-226-8023
PO Box 56
Oakdale, CA 95361

Baicor, L.C.
http://www.baicor.com
mik@baicor.com
Contact: Mike Miller
Phone: 435-752-2475
Fax: 435-752-8336
1895 North 600 West
Logan, UT 84321

Legnochem
http://legnochem.com
northway@cablevision.qc.ca
Contact: Andree Major
Phone: 819-627-1160
Fax: 866-358-8358
1119 Evansville Drive
Sturgeon-Falls, Ontario P2B 2K6
Canada

3. The intended or current use of the substance such as use as a pesticide, animal feed additive, processing aid, nonagricultural ingredient, sanitizer or disinfectant. If the substance is an agricultural ingredient, the petition must provide a list of the types of product(s) (*e.g.*, cereals, salad dressings) for which the substance will be used and a description of the substance's function in the product(s) (*e.g.*, ingredient, flavoring agent, emulsifier, processing aid).

Lignin sulfonate is a product of the wood pulping industry. It aids in pellet binding, reduces fines, and permits the addition of more steam during the manufacture of compressed dry pellets. Lignin sulfonate is added at up to 4% as a pelleting aid in dry, compressed (steam-pelleted) feeds.

4. A list of the crop, livestock or handling activities for which the substance will be used. If used for crops or livestock, the substance's rate and method of application must be described. If used for handling (including processing), the substance's mode of action must be described.

Lignin sulfonates are employed as a feed binder in the manufacture of feed pellets for aquatic animals. They are typically used at 1% to 2% of the total mass of the pellet and can be added up to 4% in order to produce a firm pellet that does not release nutrients into the water.

5. The source of the substance and a detailed description of its manufacturing or processing procedures from the basic component(s) to the final product. Petitioners with

concerns for confidential business information may follow the guidelines in the Instructions for Submitting CBI listed in #13.

Lignin or lignen is a complex chemical compound most commonly derived from wood, and an integral part of the secondary cell walls of plants and some red algae. The following excerpts are from the National Organic Program National List webpage at:

http://www.ams.usda.gov/AMSv1.0/ams.fetchTemplateData.do?template=TemplateJ&page=NOPNationalList Lignin sulfonates, Technical Evaluation Report (2011)((PDF).

Lignin is a constituent of woody plants that functions as a strengthening element. Lignin sulfonate is a derivative of lignin, where the lignin has been sulfonated in a wood pulping process (Zhor and Bremner, 1999). Lignin sulfonate has the chemical formula $C_{20}H_{26}O_{10}S_2$ (NLM, 2011b). However, lignin sulfonate may be composed of a variety of sulfonated aromatic alcohols which make up lignin polymers, including *p*-coumaryl alcohol, sinapyl alcohol, and coniferyl alcohol (FAO, 2008). The lignin molecule is complex and not well understood in spite of its prevalence (Pure Lignin, 2010). The sulfonate complex may be in association with calcium, magnesium, ammonium, or sodium (U.S. EPA, 2010b).

The National List of Allowed and Prohibited Substances (hereafter referred to as the National List) identifies lignin sulfonate as a synthetic substance allowed for use in organic production (7 CFR 205.601). Because the lignin sulfonate molecule is negatively charged, it typically complexes with various cations to form lignin sulfonate salts. Four specific lignin sulfonate salts are included in the Generic Materials List published by the Organic Materials Review Institute (OMRI): sodium lignosulfonate, magnesium lignosulfonate, ammonium lignosulfonate, and calcium lignosulfonate (OMRI, 2010). These salts are not specifically named in the National List.

Lignin sulfonate is currently included on the National List as a synthetic substance allowed for use in organic production (7 CFR 205.601). Lignin sulfonate may be used in organic crop production as a plant or soil amendment (dust suppressant, chelating agent, or floatation agent) or a flotation agent in postharvest handling (see 7 CFR 205.601(j)(4) and 7 CFR 205.601(l)(1)). The OMRI generic materials list includes the following lignin sulfonate salts: sodium lignosulfonate, magnesium lignosulfonate, ammonium lignosulfonate, and calcium lignosulfonate (OMRI, 2010). These lignosulfonate salts are not specifically identified on the National List.

Lignin sulfonate has been investigated for its potential as a chelating agent in the environmental remediation of heavy metals and in the remediation of food processing wastes (Garcia-Valls et al., 2001; USDA, 1969). Lignin sulfonate also has been used as an encapsulating agent for vitamins and other ingredients in food products (Toledo and Kuznesof, 2008).

Lignin sulfonates are produced from the process of sulfite chemical pulping. Sulfite pulping involves cooking softwood chips under pressure in sulfur dioxide-

containing cooking liquors. When the cooking process is complete, sulfonated lignin is collected as a liquid by-product in the spent liquor, while the pulp is used for paper production. The lignin sulfonates that result from the spent liquor of the sulfite pulping process must be further purified to remove excess sugars. This is done by fermentation of the liquor, followed by heating to remove the alcohol generated. The resulting lignin sulfonate polymers can have high molecular weights ranging from less than 1,000 to more than 100,000 daltons (Zhor and Bremner, 1999; Westvaco Corp., 1987).

Lignin sulfonates may also be obtained from the Kraft pulping process; these are referred to as Kraft lignins. Kraft pulping is similar to sulfite pulping, but involves treating the wood at high temperature and pressure in a water solution containing sodium sulfide and sodium hydroxide. This process dissolves lignin into a soluble salt which dissolves in the pulping liquor. The lignin is removed by precipitation from the liquor using carbon dioxide (CO_2). The Kraft lignins must then be sulfonated after extraction by reacting the material with bisulfate or a sulfite compound (Gundersen and Sjoblom, 1999; U.S. EPA, 1990).

A third pulping process, acid sulfite pulping, is similar to Kraft pulping, but different chemicals are used. Sulfurous acid, used in place of sodium hydroxide, is combined with sodium, magnesium, calcium, or ammonium bisulfite. After the cooking is complete, the pulp is separated from the spent liquor, which may then be treated to obtain various chemical materials (U.S. EPA, 1990).

Lignin exists naturally in all woody plants as a structural and strengthening component. Because lignin is integrated into the plant cell wall, there are no natural processes that liberate lignin other than natural decomposition of wood by microorganisms. Lignin sulfonates are produced from the application of pressure and heat to wood in the presence of sulfur dioxide or by the addition of alkali and various acids and sulfates, as described under Evaluation Question #2. These are not naturally-occurring processes. Therefore, lignin sulfonates are synthetic (U.S. EPA, 1990; Gundersen and Sjoblom, 1999).

6. A summary of any available previous reviews by State or private certification programs or other organizations of the petitioned substance. If this information is not available, the petitioner should state so in the petition.

In crops:
§ 205.601 Synthetic substances allowed for use in organic crop production
(j) As plant or soil amendments
(4) Lignin sulfonate—chelating agent, dust suppressant, floatation agent.

Organic Materials Review Institute

Chelates
Status: Allowed
Class: Crop Fertilizers and Soil Amendments, Crop Management Tools and Production Aids
Origin: Nonsynthetic
Description:

Nonsynthetic chelates (including, but not limited to: nonsynthetic amino acids, citric acid, tartaric acid, and other di- and tri- acid chelates) and synthetic lignin sulfonate are allowed. See also AMINO ACIDS – NONSYNTHETIC, the other CHELATES listing, HUMIC ACIDS listings, and LIGNIN SULFONATES. See Glossary for definition of "chelates."
NOP Rule: 205.105

Glossary: chelates – Compounds that bind polyvalent metals at two or more cation exchange sites.

Lignin Sulfonates
Status: Allowed with Restrictions
Class: Crop Management Tools and Production Aids
Origin: Synthetic
Description:
Includes these lignosulfonic acids: ammonium lignosulfonate, calcium lignosulfonate, magnesium lignosulfonate, and sodium lignosulfonate. May be used as a chelating agent, dust suppressant, flotation agent, and some may be used as inert ingredients in pesticide formulations. See also INERTS – LIST 4 and INERTS – LIST 3. Synthetic lignin sulfonates are prohibited for use as fertilizers. For example, ammonium lignosulfonate is prohibited for use as a nitrogen fertilizer. Formulated products with ammonium lignosulfonate are subject to two criteria: (1) no nitrogen claims are made on the label and/or (2) the nitrogen contribution of the ammonium lignosulfonate to the formulated product is less than 1%.
NOP Rule: 205.601(j)(4) & 205.601(l)(1) As plant or soil amendments… Lignin sulfonate—chelating agent, dust suppressant, floatation agent. As floating agents in postharvest handling… Lignin sulfonate.

7. Information regarding EPA, FDA, and State regulatory authority registrations, including registration numbers. If this information does not exist, the petitioner should state so in the petition.

There are few international organizations with organic aquaculture standards, particularly aquatic plant standards. It appears that some await the lead of USDA in placing the 2009 recommendations of NOSB into the Final Rule.

In the United Kingdom, Soil Association Organic Standards June 2011 allow natural binders in feed and prohibit synthetic binders.

In the recent EC standards

8. The Chemical Abstract Service (CAS) number or other product numbers of the substance and labels of products that contains the petitioned substance. If the substance does not have an assigned product number, the petitioner should state so in the petition.

CAS Number : 9009-75-0, 8062-15-5, 8061-51-6
IUPAC Name: (2R)-3-(2-hydroxy
Chemical Formula: $C_{20}H_{26}O_{10}S_2$ or $C_9H_{10}O_2$, $C_{10}H_{12}O_3$, $C_{11}H_{14}O_4$.

Other Codes:
705707 (USEPA PC Code [U.S. EPA 2010b])
160226 (EPA Reference ID)

705705, 705708–705714 (U.S. EPA PC Code [U.S. EPA, 2010b], various lignosulfonate salts)
1522 (CODEX Alimentarius Commission INS Number, calcium lignosulfonate)

Please see Appendix A for a copy of an aquatic animal feed label that includes lignin sulfonate as a binding agent.

9. The substance's physical properties and chemical mode of action including (a) Chemical interactions with other substances, especially substances used in organic production; (b) toxicity and environmental persistence; (c) environmental impacts from its use and/ or manufacture; (d) effects on human health; and, (e) effects on soil organisms, crops, or livestock.

Lignin sulfonates are used as feed binders for aquatic animals. There are no other chemical interactions known.

10. Safety information about the substance including a Material Safety Data Sheet (MSDS) and a substance report from the National Institute of Environmental Health Studies. If this information does not exist, the petitioner should state so in the petition.

MSDA information is available at:
http://www.rtvanderbilt.com/documents/MSDS/US/14004.pdf .

11. Research information about the substance which includes comprehensive substance research reviews and research bibliographies, including reviews and bibliographies which present contrasting positions to those presented by the petitioner in supporting the substance's inclusion on or removal from the National List. For petitions to include non-organic agricultural substances onto the National List, this information item should include research concerning why the substance should be permitted in the production or handling of an organic product, including the availability of organic alternatives. Commercial availability does not depend upon geographic location or local market conditions. If research information does not exist for the petitioned substance, the petitioner should state so in the petition.

Please see: http://aquafind.com/articles/Feed-Additives.php

12. A ''Petition Justification Statement'' which provides justification for any of the following actions requested in the petition:

Various forms of feed pellets for aquatic animals are utilized in aquaculture depending upon a number of circumstances including means of production and desired finished qualities. For example, some feeds are extruded with steam under pressure where high temperatures are produced through mechanical shear action as the pellet is extruded through a die. In this case, starch in one or more feed ingredients is gelatinized to form a pellet. Such ingredients as potato starch, wheat gluten and similar agricultural materials can be effective sources of starch. In aquaculture production, feed pellets for salmon, trout, catfish, tilapia, and other fish are extruded using this high pressure, high temperature, mechanical shear method.

Another form of pellet production is steam pelleting at lower temperatures without high levels of mechanical shear. The California Pellet Mill produces such feed pellets. Lignin sulfonate is employed in this process where the feed material including lignin sulfonate is pressed through a die (like in making spaghetti) at relatively low pressures and temperatures. Various forms of starch are not effective in producing steam pellets whereas lignin sulfonate is an effective binder in this process. Lignin sulfonate is a sticky material.

In aquaculture, most shrimp feeds and some finfish feeds, particularly for smaller fish, are produced with steam pelleting. With shrimp and some other aquatic animals, it is necessary to hold the feed ingredients in the pellet together in water for 24 hours or longer. Therefore steam pelleted shrimp feed using lignin sulfonate are necessary since such feeds hold together in the water much longer than do high pressure extruded pellets. There are no other suitable binders for producing steam pellets that are non-synthetic. In addition, in this process, lignin sulfonate is a lubricant as well as a binder.

A. Inclusion of a Synthetic on the National List, §§ 205.609 and 205.611

• Explain why the synthetic substance is necessary for the production or handling of an organic product.

In the growing of aquatic animals, fish meal and fish oil, vitamins, minerals, trace elements, pigmenting compounds, and other essential nutrients are added together and then extruded as feed pellets. Terrestrial plant protein, such as corn gluten meal, soybean meal, and soy protein concentrate also may be added.

If these materials were loosely connected in pellets without binders, they would rapidly disintegrate when placed in the water for the fish to eat unless these ingredients are firmly bound together. Disintegration of feed pellets in the water wastes valuable nutrients and degrades the water quality in ponds or tanks. Therefore, feed binders are necessary.

There are numerous binder materials, both natural and synthetic, that can be used to maintain the integrity of fish feed pellets during shipping, storing and feeding. Lignin sulfonate is an effective pellet binder that produces pellets with a high degree of water stability.

In addition to lignin sulfonates, other binding materials include carrageenin, chitosan, collagen, guar gum, carboxymethyl cellulose, cornstarch, wheat gluten, and alginates. Lignin sulfonates produce the firmest longest lasting pellets, particularly for high moisture feed mixes.

• Describe any non-synthetic substances, synthetic substances on the National List or alternative cultural methods that could be used in place of the petitioned synthetic substance.

Depending upon the moisture content and method of pellet production, feed pellets can be classified as dry, semi-moist, and moist. Because of a wide range of ingredients in aquatic animal feeds, there are a variety of methods

utilized for producing feed pellets so that the various ingredients remain as a pellet until being consumed by fish rather than disintegrating.

Dry pellets are produced by cooking-extrusion technology or be compression pelleting. Both process involve steam addition to the feed mixture (conditioning), followed by either mechanical compression or extrusion, depending on the process. Pellets are then dried to less than10% moisture to prevent mold growth. In making compressed pellets for aquatic animal feeds, bentonite is commonly added as a binder. Bentonite is a naturally occurring clay consisting mainly of trilayered aluminum silicate. It is available as either sodium bentonite or calcium bentonite. Sodium bentonite has, by definition, more than 1% and less than 2% available ion content, or sodium exchange. It swells when added to water, while calcium bentonite does not.

Both sodium and calcium bentonite may be added to dry, compressed fish feeds at no more than 2% to act as a binding agent and also as a lubricant, increasing pellet mill production rates and pellet mill die life. Some bentonites also bind aflatoxins, carrying them through the gut without harming the fish.

Lignin sulfonates are used in some cases to bind dry and semi-moist pellets.

Hemi-cellulose extract is sometime used as a feed binder. It is a product made by spray-drying the concentrated, soluble byproduct of pressed wood manufacture. However, it is less commonly used than lignin sulfonate.

Moist and semi-moist fish food production can involve the use of both nutritive and non-nutritive binder materials. Nutritive binders include oat groats, vital wheat gluten, finely milled wheat bran, cottonseed meal, gelatin, fish hydrolyzates, and pre-gelatinized starches. Nonnutritive binders include tapioca, carboxymethylcellose, alginates, agar, and various gums. Chitosan, carrageenan, and collagen have been evaluated as binders but are not commonly used.

Semi-moist feeds, containing 25—35% moisture, can often be made into satisfactory pellets by careful selection of feed ingredients that possess binding properties. However, when feed formulations contain ingredients that do not possess suitable binding properties, it is necessary to add ingredients specifically to bind the diet.

Moist feeds, are combinations of wet fish, dry meal, and other feed ingredients, and have moisture contents of 35 to 70%. Such high moisture feeds require the addition of a binder that is appropriate for the particular feed mix. Some moist diets, such as H440, the Oregon Test Diet, and the Guelph semi-purified diet, include gelatin and carboxymethyl cellulose (CMC) as binders. With some mixes, agar may also be an effective binder.

In some high moisture diets, alginates are better binders than gum, carrageenan, chitosan, collagen, carboxymethyl cellulose, and corn starch. These moist diets may contain 0.5—2.0% alginates as binders. With alginates, calcium ions and a sequestrant, such as sodium hexametaphosphate, must be present to control alginate activation.

While this petition is for lignin sulfonates for feed binders, there are other possible binder material that in some, but not all cases, may be preferred. Separate petitions will be filed for other substances where necessary.

For additional information, please see: Please see:
http://aquafind.com/articles/Feed-Additives.php

• Describe the beneficial effects to the environment, human health, or farm ecosystem from use of the synthetic substance that support its use instead of the use of a non-synthetic substance or alternative cultural methods.

We have no information to provide for this question.

13. A "Confidential Business Information Statement" that describes the specific required information contained in the petition that is considered to be confidential business information or confidential commercial information and the basis for that determination.

This petition does not contain any confidential business information.

Conclusions

Previous actions by NOSB and NOP have determined that lignin sulfonates are allowed as plant or soil amendments in crops and are included in the National List for Crops as:

"§ 205.601 Synthetic substances allowed for use in organic crop production
(j) As plant or soil amendments
(4) Lignin sulfonate—chelating agent, dust suppressant, floatation agent."

Lignan sulfonates were favorably reviewed initially by a Technical Advisory Panel in 1995 when this substance was first listed when it was determined to be compatible with organic production. They were again reviewed in 2011 when it was recommended for relisting on the National List in 205.601 (j) (4) "as a chelating agent."

This petition is a request for NOSB and NOP to allow lignin sulfonate in the organic production of aquatic animals in:

§ 205.611 Synthetic substances allowed for use in organic aquatic animal production.
(*x*) As feed additives.
(*y*) Lignin sulfonates – feed binder.

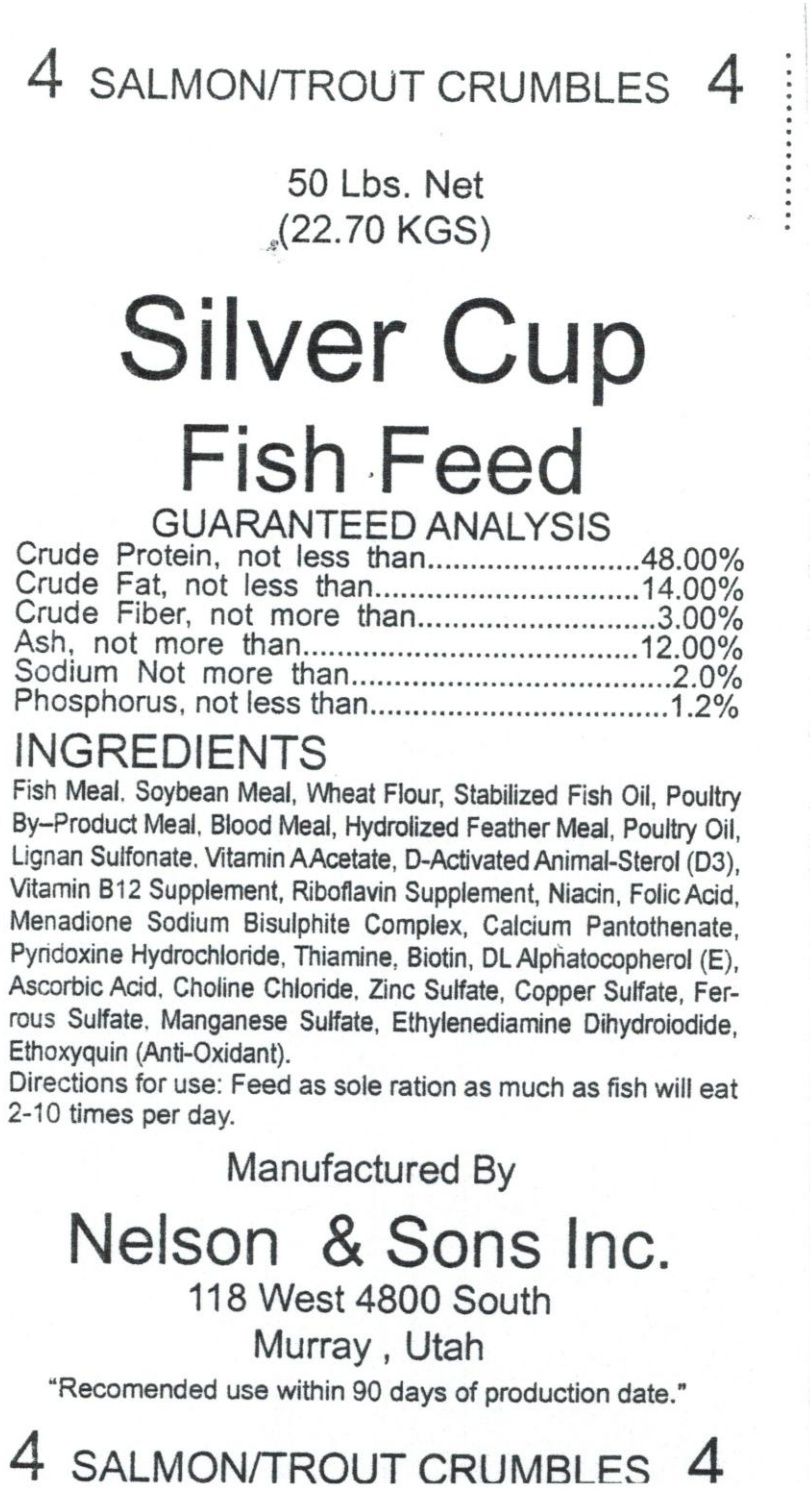
Lignin sulfonates are important feed binders for aquatic animals. They are necessary to hold the various ingredients together to prevent disintegration of the ingredients and their disbursement into the water until the fish consume the feed pellet. Lignin sulfonates have been extensively reviewed since 1995 and have been found to be compatible with organic production.

Aquaculture Working Group
George S. Lockwood, Chair

Appendix A

Product Label Listing Lignin Sulfonate as a

Feed Binder Ingredient



4 SALMON/TROUT CRUMBLES 4

50 Lbs. Net
(22.70 KGS)

Silver Cup
Fish Feed

GUARANTEED ANALYSIS

Crude Protein, not less than.....48.00%
Crude Fat, not less than.....14.00%
Crude Fiber, not more than.....3.00%
Ash, not more than.....12.00%
Sodium Not more than.....2.0%
Phosphorus, not less than.....1.2%

INGREDIENTS

Fish Meal, Soybean Meal, Wheat Flour, Stabilized Fish Oil, Poultry By–Product Meal, Blood Meal, Hydrolized Feather Meal, Poultry Oil, Lignan Sulfonate, Vitamin AAcetate, D-Activated Animal-Sterol (D3), Vitamin B12 Supplement, Riboflavin Supplement, Niacin, Folic Acid, Menadione Sodium Bisulphite Complex, Calcium Pantothenate, Pyridoxine Hydrochloride, Thiamine, Biotin, DL Alphatocopherol (E), Ascorbic Acid, Choline Chloride, Zinc Sulfate, Copper Sulfate, Ferrous Sulfate, Manganese Sulfate, Ethylenediamine Dihydroiodide, Ethoxyquin (Anti-Oxidant).

Directions for use: Feed as sole ration as much as fish will eat 2-10 times per day.

Manufactured By

Nelson & Sons Inc.
118 West 4800 South
Murray , Utah

"Recomended use within 90 days of production date."

4 SALMON/TROUT CRUMBLES 4