

**National Organic Standards Board  
Crops Subcommittee  
Petitioned Material Proposal  
Laminarin**

**+February 26, 2014**

### **Introduction**

The NOSB received a petition for Laminarin, a seaweed extract for disease control that is allowed by EPA for that purpose.

### **Background**

From the Laminarin petition:

#### **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.**

Stage 1: Fresh *Laminaria digitata* seaweed, harvested on the North Brittany coast of France, undergoes extraction in tap water that has a pH adjusted to 2 by addition of sulfuric acid. At this stage sulphuric acid is a processing aid. Laminarin can be extracted at neutral pH or in acidic conditions. The described acidic conditions do not modify the chemical structure of laminarin.

The addition of sulfuric acid avoids the co-extraction of other compounds such as alginates (which occurs at neutral pH). When alginates are extracted, the solution has a higher viscosity; purification and filtration steps for laminarin then become much more difficult. This is the reason why sulphuric acid is used to lower the pH and to facilitate the manufacturing process.

Stage 2: The extract is then filtered using a Seitz filter.

Stage 3: The solution then undergoes tangential filtration (membrane technology – physical process) to remove impurities from the solution. The filtrate containing laminarin is kept for the next purification step and the retentate is removed.

Stage 4: The filtrate (see above) then undergoes a second tangential filtration to remove any remaining impurities (filtrate), thereby resulting in a purified solution of laminarin in water (retentate).

Stage 5: The pH is adjusted between 6 and 7 by adding sodium hydroxide to neutralize the acidic solution, resulting in a solution of laminarin at neutral pH for formulation purposes (i.e., Vacciplant formulation). The addition of dilute sodium hydroxide does not modify the chemical structure of laminarin.

From the note from NOP to Crops Subcommittee, 6/3/13:

In NOP's review of the eligibility of this petitioned substance for the National List, we reviewed the manufacturing process against the draft guidance on classification of materials (NOP 5033). Based on our preliminary review, this substance may be classified as nonsynthetic. We have moved this petition forward for NOSB review and final determination on the classification status for the following reasons:

- o The classification guidance is currently in draft form
- o Other aquatic plant extracts are classified as synthetic for crop production at 205.601(j)(1)
- o At this time, NOP is not aware of any products containing laminarin as an active ingredient that are approved by certifying agents or third-party material review organizations, such as EPA or OMRI

### **Discussion**

The Crops subcommittee also reviewed the manufacturing process against the draft guidance on classification of materials (NOP 5033, section 4.6):

#### **4.6 Extraction of Nonorganic Materials**

Some materials are produced using manufacturing processes that involve separation techniques, such as the steam distillation of oil from plant leaves. Separation and extraction methods may include, but are not limited to, distillation, solvent extraction, acid-base extraction, and physical or mechanical methods (e.g., filtration, crushing, centrifugation, or gravity separation).

For purposes of classification of a material as synthetic or nonsynthetic, a material may be classified as nonsynthetic (natural) if the extraction or separation technique results in a material that meets the following criteria:

- At the end of the extraction process, the material has not been transformed into a different substance via chemical change;
- The material has not been altered into a form that does not occur in nature; and
- Any synthetic materials used to separate, isolate, or extract the substance have been removed from the final substance (e.g., via evaporation, distillation, precipitation, or other means) such that they have no technical or functional effect in the final product.

The majority of the subcommittee has determined that Laminarin is extracted by an acid-base extraction and meets the criteria in section 4.6 above.

In regards to the third bullet point above the subcommittee majority believes that the acid-base reaction itself neutralizes any of the sulfuric acid starting material to the degree that it has no technical or functional effect. The minority opinion tries to draw parallels between laminarin which is extracted and then used to boost the plant's immune defenses against disease with sulfuric acid used to stabilize manure (a petition that was rejected) or acids used to stabilize fish products listed on §205.601. The majority feels these comparisons are not relevant because of the acid being used in substantially greater quantities in manure and fish, and the fact that they are both fertilizers means that the residual sulfates or phosphates would have a functional effect in the fertilizers. Laminarin is used for disease control at a rate of 0.52 - 1.04 fl. oz. per acre (as stated in the petition) which would not provide a functional effect from some parts per million of that rate being sulfate.

Because of a determination that it is non-synthetic, the subcommittee has not filled out a checklist as it does not need to be added to the National List.

#### **Minority Opinion**

A minority of the Subcommittee supported the view that laminarin is synthetic because sulfuric acid is added but not removed. Sodium hydroxide is added to neutralize sulfuric acid, but the sodium sulfate produced by the neutralization reaction (which does not chemically change laminarin) is not removed.

The minority agrees that laminarin does not undergo chemical change in the extraction process. Unfortunately, however, the NOP decision tree is incomplete –it does not cover all of the criteria in the guidance document NOP 5033. The guidance document states, “Some materials may be considered synthetic due to chemical changes which occur during manufacturing, while others substances may be classified as synthetic due to addition of small amounts of synthetic ingredients.”

In the case of laminarin, we need to look at the synthetic ingredients that are added. The section on extraction in the NOP guidance states that in order for a material to be classified as nonsynthetic, “Any synthetic materials used to separate, isolate, or extract the substance have been removed from the final substance (e.g., via evaporation, distillation, precipitation, or other means) such that they have no technical or functional effect in the final product.”

The extraction of laminarin involves the addition of sulfuric acid, as described in the petition. The sulfuric acid is not removed. Sodium hydroxide is added to neutralize the acid, but the sulfate remains. While there is no definition of “technical or functional effect” in the NOP regulations or the guidance, our calculations suggest that the amount of sulfate and sodium added to laminarin in the extraction process is significant.

The minority does not claim that the sulfate in laminarin constitutes a synthetic plant nutrient because it is not used in quantities that would be significant nutritionally to plants. Rather, the claim is that the sulfate is a significant residue within the laminarin that is not removed.

Some relevant points that we considered:

1. Sulfuric acid is added during the extraction of laminarin to reduce the pH to 2. Later, it is neutralized with the addition of the base sodium hydroxide. Although the sulfuric acid is neutralized, it is not removed. We calculate that altogether, 624 parts per million (ppm) sulfate and 299 ppm of sodium are added.<sup>1</sup> Because the kelp provides some (unknown) buffering capacity, the quantities are probably somewhat higher than this calculation indicates.
2. The NOSB has previously found (in 2006 and 2012, for anaerobic digestion of livestock and poultry manure) that the addition of sulfuric acid, even when followed by a step that neutralizes the acid, leaves behind a significant synthetic residue that has a functional effect in the agricultural system.
3. OMRI regards sulfuric acid and sulfate as prohibited, with limited specific exceptions.
4. The listing of liquid fish products is an instructive precedent indicating that when pH is adjusted with a synthetic, the product should be classified as synthetic.

**Subcommittee Action & Vote**

**Classification Motion:**

Motion to classify Laminarin as nonsynthetic

Motion by: Zea Sonnabend

Seconded by: Harold Austin

Yes: 5 No: 2 Absent: 0 Abstain: 0 Recuse: 0

Because laminarin was classified as non-synthetic, no further action by the Crops Subcommittee is necessary.

**Approved by Zea Sonnabend, Subcommittee Chair, to transmit to NOSB February 26, 2014**

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<sup>1</sup> Compare this concentration to the Secondary Maximum Contaminant Level of sulfate in drinking water and the EU standard for drinking water --both 250 ppm.