

National Organic Standards Board
Handling Subcommittee Petitioned Material Proposal
Tamarind Seed Gum
June 5, 2018

Summary of Petition [[Tamarind Seed Gum](#)]:

Tamarind seed gum is being petitioned as a nonorganic agricultural ingredient allowed in or on processed products labeled as “organic,” §205.606. Tamarind seed gum is a water-soluble, high molecular-weight polysaccharide categorized as xyloglucan, with glucose as the main chain and xylose and galactose as side chains. It may be used as a thickener, stabilizer, or gelling agent for various foods and exhibits properties that may be different than other materials currently being used.

Use: As with other gums, the viscosity of tamarind seed gum depends largely on its concentration in solution. The 2018 Technical report (TR) states that at low concentrations, the viscosity of a tamarind seed gum solution is dependent only on temperature whereas at higher concentrations the viscosity of a solution decreases as shear rate increases. The moderate viscosity of tamarind seed gum compared to other typical hydrocolloids allows stability without excess viscosity and a rich pleasant mouth feel rather than the gummy or pasty textures associated with other hydrocolloids. Tamarind seed gum also has less stringiness, which gives improved handling when subdividing and filling liquid products. The 2018 TR notes that temperature affects the viscosity of tamarind seed gum solutions, over a range of concentrations. Tamarind seed gum has been cited as being relatively heat resistant, but the TR cites research that indicates that as temperature increases, viscosity decreases. This property allows a solution to be mixed and processed easily as opposed to some polysaccharides, including xanthan gum, which maintain constant viscosity regardless of temperature.

While all hydrocolloids thicken aqueous dispersions, comparatively few gums form gels. Tamarind seed gum does not form a gel in isolation, but does gel in the presence of alcohol and sugars, and exhibits sol to gel transition at certain temperatures (TR, 2018). These gels show low syneresis, meaning they do not tend to separate or weep liquid.

According to the 2018 TR, tamarind seed gum can be used as a thickening and gelling agent to improve the viscosity of certain foods, modify the texture of foods, and emulsify and stabilize foods. It may be used in place of pectin in jams and jellies. It can also be used to replace gluten as a dough-binding agent in gluten-free food products. Added to foods, tamarind seed gum can enhance characteristics such as maintenance of viscosity over a wide range of shear rates, water-holding, and a food’s resistance to heat, salt, and pH treatments used during processing.

Manufacture: Tamarind seed gum is obtained from the endosperm of the seeds of the tamarind tree. Through mechanical processes the endosperm is separated from the other parts of the seed and made into a powder. This tamarind kernel powder is stirred into a solution of food-grade methyl alcohol. After stirring, food-grade sodium hydroxide is added and the mixture is again stirred at a controlled temperature. The polysaccharide is separated from other parts of the endosperm such as the protein, lipid, and minerals by centrifugation and food-grade citric acid is added as needed to adjust the pH to the desired level. The polysaccharide is dried, pulverized, and sieved through a screen.

International Acceptance (from the TR, 2018):

Canadian General Standards Board Permitted Substances List

Tamarind seed gum is not permitted as an ingredient on Table 6.3 of the Permitted Substances List. The listing for Gums on this table states that “[t]he following gums are permitted: arabic gum, carob bean gum (locust bean gum), gellan gum, guar gum, karaya gum, tragacanth gum, and xanthan gum.”

However, non-organic agricultural ingredients are permitted as a processing aid if organic forms are not commercially available (see CAN/CGSB 32.310 section 9.2.1(d) and 9.2.2(d)).

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (GL 32-1999)

Under the CODEX Alimentarius Guidelines, carob bean gum, guar gum, tragacanth gum, gum arabic, xanthan gum and karaya gum are all permitted with certain restrictions at GL 32-1999 Table 3

“Ingredients of non-agricultural origin referred to in section 3 of these guidelines.” Tamarind seed gum, however, does not appear on this table.

Section 3.4 of the guidelines states: “Certain ingredients of agricultural origin not satisfying the requirement in paragraph [3.3b, which requires agricultural ingredients to be produced organically] may be used, within the limit of maximum level of 5 percent (m/m) of the total ingredients excluding salt and water in the final product, in the preparation of products as referred to in paragraph 1.1(b); where such ingredients of agricultural origin are not available, or in sufficient quantity, in accordance with the requirements of Section 4 [organic production practices] of these guidelines.” As such, agricultural forms of tamarind seed gum could be permitted under this section.

European Economic Community (EEC) Council Regulation, EC No. 834/2007 and 889/2008

Article 28 states that non-organic agricultural ingredients listed in Annex IX to this Regulation can be used in the processing of organic food, however, tamarind seed gum is not included in on this list.

Tamarind seed gum is also not listed under “Food Additives, Including Carriers” in Annex VIII, Section A of EC No. 889/2008. Other gums including carob bean gum, guar gum, Arabic gum, and xanthan gum are listed in this section.

Article 29 describes the authorization of non-organic food ingredients of agricultural origin by member states for agricultural ingredients not appearing in Annex IX. Such non-organic agricultural ingredients may be used according to the conditions laid out in Article 29, which include requirements for evidence of lack of commercial organic supply and notification, among others. Tamarind seed gum could be approved under this provision.

Japan Agricultural Standard (JAS) for Organic Production

Tamarind seed gum is not listed in Table 1 “Additives” of the Japanese Agricultural Standard for Organic Processed Foods Notification No. 1606, partially revised March 27, 2017. Other gums—including carob bean gum, guar gum, tragacanth gum, Arabian gum, xanthan gum and karaya gum—do appear in Table 1.

Article 4 describes provisions for lack of commercial organic supply: “In case of difficulty to obtain organic plants, organic livestock products or organic processed foods with the same categories of those used for ingredients, those prescribed in items 2 or 4 may be used.” Items 2 and 4 describe plants and livestock products that are not in the same categories as organic ingredients, and have not undergone ionizing radiation or recombinant DNA technology. Tamarind seed gum, if not considered in the same category as other listed gums, could be allowed under this provision.

IFOAM – Organic International

Appendix 4 Table 1, “List of Approved Additives and Processing/Post-Harvest Handling Aids,” lists locust bean gum, guar gum, tragacanth gum, Arabic gum, and xanthan gum. Tamarind seed gum is not included.

Section 7.2.1 states: “All ingredients used in an organic processed product shall be organically produced except for those additives and processing aids that appear in Appendix 4. In cases where an ingredient of organic origin is commercially unavailable in sufficient quality or quantity, operators may use non-organic raw materials, provided that:

- a. they are not genetically engineered or contain nanomaterials, and
- b. the current lack of availability in that region is officially recognized¹ or prior permission from the control body is obtained.
- c. the requirements in section 8.1.3 [requirements for percentages of organic ingredients] shall be met.”

Tamarind seed gum could be permitted under the above provision.

Environmental Issues: No toxicity, environmental persistence, or detrimental health effects on humans, soil organisms, crops, or livestock are expected as xyloglucan is ubiquitous in plant cell walls of all vegetation. It is, therefore, a naturally occurring fiber which adds viscosity in the small intestine and is fermented by symbiotic bacteria in the colon part of human and livestock diets. The structure of tamarind seed gum xyloglucan is the same as that of cellulose and is easily degraded by cellulase enzymes. Soil bacterium existing in the natural environment have cellulase enzymes. As tamarind seed gum can be degraded by such bacterium it has low impact if it is discarded into the environment.

Tamarind seeds are collected from native-grown trees. The multiple layers of the supply chain have meant to date that there are no organically certified tamarind seeds or tamarind kernel powder available.

Summary of Review:

While the National List already contains other gums that may have similar properties to tamarind seed gum, tamarind seed gum does have several properties that makes its use in particular products superior to currently listed products.

Traditional substances which are not hydrocolloids, such as starches and gelatin, can be used. The choice of gum for a particular food application is dictated by the functionalities required, but is strongly influenced by price and security of supply. Therefore, starches, which are very economic, are the most commonly used thickening agents, and corn starch, tapioca, wheat arrowroot, and rice starches are all available in organic forms. However, starches do not provide the same function as the hydrocolloid gums. For example, tamarind seed gum imparts a viscosity similar to that of starch, however, its viscosity does not deteriorate in the presence of acids, bases, salts and heat like starch does (TR, 2018).

Other hydrocolloids may be used in products however, they have different textures and mouthfeels. As has been noted with other approved gums, each has its own area of use where one gum may be more appropriate than another. Tamarind seed gum has similar solution properties to locust bean gum and

¹ This may be by inclusion on a government or certification body list of permitted non-organic agricultural ingredients.

guar gum. However, guar gum is superior to tamarind seed gum in dispersion and suspension: it is readily soluble in cold water, whereas tamarind seed gum takes longer to achieve full viscosity. On the other hand, tamarind seed gum has better thermal stability than guar gum and also tolerates higher pH conditions. Tamarind gum was compared with guar gum and xanthan gum and found to be at least as effective in maintaining viscosity. Data for some of the tests measuring acid resistance and freeze-thaw resistance showed that tamarind gum could be more effective (TR, 2018). The 2018 TR goes into much greater details on various comparisons, however, it becomes clear that each gum may have a specific use in which it is better than the alternatives.

Table 1. Comparison of properties between tamarind seed gum and other gums on §205.605-606 (from TR, 2018).

Property	Tamarind seed gum	Gum arabic	Tragacanth gum	Guar gum	Locust (Carob) bean gum	Gellan gum	Xanthan gum
Low Viscosity (only becomes viscous at concentrations greater than 50%)	Moderate viscosity	X					
High Viscosity at 1 % concentration			X				
High Viscosity at low concentrations (but above 1%)						X	X
Viscosity remains unchanged over time at low shear rates	X		X				
Viscosity decreases over time at low shear rates				X			
Forms thermo-reversible gels						X	
Thermally reversible						X	X
Thermally irreversible			X		X		
Insoluble in ethanol	X	X	X	X	X	X	X
Stable under acid conditions	X		X	X	X		X
Controls syneresis (weeping)	X			X	X		X

Category 1: Classification

1. Substance is for: **Handling** **Livestock**
2. For HANDLING and LIVESTOCK use:
 - a. Is the substance **Agricultural** or **Non-Agricultural**?
Describe reasoning for this decision using NOP 5033-2 as a guide:

The substance is originally harvested from tamarind trees. The seeds are separated from the pulp and then further processed. While extracts are used to separate the gum from other seed materials, the extracts do not chemically change the gum. The solvents are removed such that they do not have a technical functional effect in the final product. Thus, according to NOP 5033-2, the material is agricultural.

Non-acid-hydrolyzed tamarind seed gum may be classified as a non-synthetic agricultural material based on NOP Guidance 5033. However, acid-hydrolyzed forms and/or forms that include synthetic additives would render the final product synthetic. Thus, for the material to be specified as agricultural, non-synthetic, an annotation would need to be added limiting uses to non-acid hydrolyzed forms.

- b. If the substance is **Non-agricultural**, is the substance **Non-synthetic** or **Synthetic**?
Is the substance formulated or manufactured by a process that chemically changes a substance extracted from naturally occurring plant, animal, or mineral sources? [OFPA §6502(21)] If so, describe, using NOP 5033-1 as a guide: **N/A**
3. For **LIVESTOCK**: Reference to appropriate OFPA category
Is the substance used in production, and does it contain an active synthetic ingredient in the following categories: [§6517(c)(1)(B)(i)]; copper and sulfur compounds; toxins derived from bacteria; pheromones, soaps, horticultural oils, fish emulsions, treated seed, vitamins and minerals; livestock parasiticides and medicines and production aids including netting, tree wraps and seals, insect traps, sticky barriers, row covers, and equipment cleansers; or (ii) is used in production and contains synthetic inert ingredients that are not classified by the Administrator of the Environmental Protection Agency as inerts of toxicological concern? **N/A**

Category 2: Adverse Impacts

1. What is the potential for the substance to have detrimental chemical interactions with other materials used in organic farming systems? [§6518(m)(1)]
N/A
2. What is the toxicity and mode of action of the substance and of its breakdown products or any contaminants, and their persistence and areas of concentration in the environment? [§6518(m)(2)]

The structure of tamarind seed gum is the same as that of cellulose and is easily degraded by cellulase enzymes. Soil bacterium existing in the natural environment have cellulase enzymes, thus tamarind gum can be degraded by such bacterium and it has a low impact if it is discarded

into the environment.

3. Describe the probability of environmental contamination during manufacture, use, misuse or disposal of such substance? [§6518(m)(3)]

The 2018 TR states that “no sources reviewed for this report discuss any environmental pollution resulting from the processing of tamarind seeds into the purified polysaccharide.” The product itself is likely of low concern given that it can be broken down by naturally occurring cellulase enzymes in bacteria. The manufacturing processes described should not result in any detrimental environmental releases.

4. Discuss the effect of the substance on human health. [§6517 (c)(1)(A)(i); §6517 (c)(2)(A)(i); §6518(m)(4)].

There are no toxicologically significant effects documented. The substance is non-mutagenic and non-carcinogenic. Tamarind seed gum, under the chemical name Tamarind Seed Polysaccharide, is Generally Recognized as Safe (GRAS) under GRAS Notice No. 503 (JHeimbach LLC, 2014). The GRAS notice covers the use of tamarind seed polysaccharide as a thickener, stabilizer, emulsifier and gelling agent in 12 food categories: ice cream, sauces and condiments, dressings and mayonnaise, fruit preserves, desserts, beverages, pickles, tsukudani, spreads and fillings, flour products, soup and all other food categories at levels ranging from 0.2–1.5 percent of product composition (TR, 2018). Tamarind seed gum’s xyloglucan polysaccharide has the same molecular skeleton as cellulose, and like cellulose, is not readily digested by enzymes found in the human digestive tract. It therefore serves as dietary fiber.

5. Discuss any effects the substance may have on biological and chemical interactions in the agroecosystem, including the physiological effects of the substance on soil organisms (including the salt index and solubility of the soil), crops and livestock. [§6518(m)(5)]

N/A

6. Are there any adverse impacts on biodiversity? (§205.200)

N/A

Category 3: Alternatives/Compatibility

Are there alternatives to using the substance? Evaluate alternative practices as well as non-synthetic and synthetic available materials. [§6518(m)(6)]

1. Traditional substances which are not hydrocolloids, such as starches and gelatin, can be used. The choice of gum for a particular food application is dictated by the functionalities required, but strongly influence by price and security of supply. Therefore, starches, which are very economic, are the most commonly used thickening agents, and corn starch, tapioca, wheat arrowroot and rice starches are all available in organic forms. However, starches do not provide the same function as the hydrocolloid gums. For example, tamarind seed gum imparts a viscosity similar to that of starch, however, its viscosity does not deteriorate in the presence of acids, bases, salts and heat like starch does (TR, 2018).

Other hydrocolloids may be used in products however, they have different textures and mouthfeels. As has been noted with other approved gums, each has its own area of use where one gum may be more appropriate than another. Tamarind seed gum has similar solution properties to locust bean gum and guar gum. However, guar gum is superior to tamarind seed gum in dispersion and suspension: it is readily soluble in cold water, whereas tamarind seed gum takes longer to achieve full viscosity. On the other hand, tamarind seed gum has better thermal stability than guar gum and also tolerates higher pH conditions. Tamarind gum was compared with guar gum and xanthan gum and found to be at least as effective in maintaining viscosity. Data for some of the tests measuring acid resistance and freeze-thaw resistance showed that tamarind gum could be more effective (TR, 2018). The 2018 TR goes into much greater details on various comparisons, however, it becomes clear that each gum may have a specific use in which it is better than the alternatives.

2. **For Livestock substances, and Nonsynthetic substances used in handling:** In balancing the responses to the criteria above, is the substance compatible with a system of sustainable agriculture? [§6518(m)(7)]

Tamarind trees are leguminous and can be an integral part of many agricultural and wild ecosystems. The 2018 TR and the petitioner both note that tamarind trees are widely cultivated in the tropics worldwide and can be certified organic. At the time of the TR, there were nine sources of organic tamarind (fruit) and one source of tamarind powder listed in the NOP Organic Integrity Database (NOP 2017). The petitioner notes that since tamarind kernels do not currently have other organic uses, organic supply chains do not exist for their collection and processing. These could be developed, but will take time to implement. Due to multiple steps and handlers, certifying organic integrity through each step of the supply chain is not currently viable. Thus, it seems that this system could be compatible with a sustainable agricultural system and that there is the potential in the future to source this material organically.

Category 4: Additional criteria for synthetic substances used in Handling (does not apply to nonsynthetic or agricultural substances used in organic handling):

Describe how the petitioned substance meets or fails to meet each numbered criterion.

1. The substance cannot be produced from a natural source and there are no organic substitutes; (§205.600(b)(1))
2. The substance's manufacture, use, and disposal do not have adverse effects on the environment and are done in a manner compatible with organic handling; (§205.600(b)(2))
3. The nutritional quality of the food is maintained when the substance is used, and the substance, itself, or its breakdown products do not have an adverse effect on human health as defined by applicable Federal regulations; (§205.600(b)(3))
4. The substance's primary use is not as a preservative or to recreate or improve flavors, colors, textures, or nutritive value lost during processing, except where the replacement of nutrients is required by law; (§205.600(b)(4))

5. The substance is listed as generally recognized as safe (GRAS) by the Food and Drug Administration (FDA) when used in accordance with FDA's good manufacturing practices (GMP) and contains no residues of heavy metals or other contaminants in excess of tolerances set by FDA; (§205.600(b)(5))
6. The substance is essential for the handling of organically produced agricultural products. (§205.600(b)(6))
7. In balancing the responses to the criteria in Categories 2, 3 and 4, is the substance compatible with a system of sustainable agriculture [§6518(m)(7)] and compatible with organic handling? (see NOSB Recommendation, [Compatibility with Organic Production and Handling, April 2004](#))

Category 5: Additional criteria for agricultural substances used in handling (review of commercial unavailability of organic sources):

1. Is the comparative description as to why the non-organic form of the material /substance is necessary for use in organic handling provided?

The petitioner states that there is no organic tamarind seed available for processing. The current system for accumulating tamarind seeds does not segregate organic and conventional and organic supplies may not be adequate for the potential need.

2. Does the current and historical industry information, research, or evidence provided explain how or why the material /substance cannot be obtained organically in the appropriate **form** to fulfill an essential function in a system of organic handling?

The petitioner states that seeds are available from native-grown trees and that due to multiple supply chain layers, the product is not available organically. It is not clear whether organic production could be developed or encouraged in the future, but it seems likely that this could be a stepping stone to creating a supply chain that could be organically certified.

3. Does the current and historical industry information, research, or evidence provided explain how or why the material /substance cannot be obtained organically in the appropriate **quality** to fulfill an essential function in a system of organic handling?

N/A

4. Does the current and historical industry information, research, or evidence provided explain how or why the material /substance cannot be obtained organically in the appropriate **quantity** to fulfill an essential function in a system of organic handling?

See #2 above

5. Does the industry information about unavailability include (but is not limited to) the following?:
Regions of production (including factors such as climate and number of regions);
 - a. Number of suppliers and amount produced;

No sources of organic tamarind seed gum or organic TSP are identified in the NOP Organic Integrity Database. Tamarind trees are widely cultivated in the tropics worldwide and can be certified organic. At the time of this report, there are nine sources of organic tamarind

(fruit) and one source of tamarind powder listed in the NOP Organic Integrity Database (NOP 2017). The petitioner notes that tamarinds may be grown in a number of areas and that India and Thailand are the main source regions.

- b. Current and historical supplies related to weather events such as hurricanes, floods, and droughts that may temporarily halt production or destroy crops or supplies;
N/A
- c. Trade-related issues such as evidence of hoarding, war, trade barriers, or civil unrest that may temporarily restrict supplies; or
N/A
- d. Other issues which may present a challenge to a consistent supply?

Wild harvesting and dispersed plantings may create issues with consistent supply.

- 6. In balancing the responses to the criteria in Categories 2, 3 and 5, is the substance compatible with a system of sustainable agriculture [§6518(m)(7)] and compatible with organic handling? (see NOSB Recommendation, [Compatibility with Organic Production and Handling, April 2004](#))

Tamarind seed gum meets the criteria to be compatible with a system of sustainable agriculture and is compatible with organic handling. Since many tamarind trees are wild grown or minimally cultivated, and are inherently resistant to many insects and diseases, they fit a sustainable agriculture system. Furthermore, organic tamarind is being grown, and it is possible that in the future organic supplies of tamarind seed gum might become available.

Classification Motion:

Motion to classify tamarind seed gum as agricultural, non-synthetic.

Motion by: Steve Ela

Seconded by: Lisa de Lima

Yes: 6 No: 0 Abstain: 0 Absent: 1 Recuse: 0

National List Motion:

Motion to add tamarind seed gum, limited to non-acid-hydrolyzed forms at \$205.606

Motion by: Steve Ela

Seconded by: Lisa de Lima

Yes: 6 No: 0 Abstain: 0 Absent: 1 Recuse: 0

Approved by Lisa de Lima, Subcommittee Chair, to transmit to NOSB, August 24, 2018