

Pectin

Handling/Processing

Identification of Substance

Chemical Names:

Pectin, high-methoxy pectin, low-methoxy pectin (non-amidated forms)

Summary of Use

This is a limited scope technical report to summarize the use of ancillary substances¹ in combination with pectin and any information related to the environmental, ecosystem, and human health effects of those ancillary substances. Accordingly, only a subset of the Evaluation Questions is addressed below.

Pectin appears on the National List at §205.606 as a nonorganically produced agricultural product allowed as an ingredient in or on processed products labeled as “organic,” with an annotation that allows non-amidated forms only. Pectin is primarily used as a gelling agent, thickener and stabilizer in jams, jellies, baked products, dairy products, beverages, sherberts and margarine, and in non-food applications such as cosmetics and pharmaceuticals. Both high-methoxy and low-methoxy forms are allowed if not commercially available in organic form, and as long as they are non-amidated.

Characterization of the Substance

Combinations of the Substance:

According to the FAO JECFA Monographs (Joint FAO/WHO Expert Committee on Food Additives 2009), pectin is normally diluted with sugars for standardization purposes. Pectin may also be combined with food grade buffer salts required for pH control and specific setting characteristics. Finally, according to JECFA (2009), sulfur dioxide may be added as a preservative. Following in Table 1 is a list of known ancillary substances gathered from various sources, including product data sheets of commercial pectins.

Table 1: Ancillary substances in combination with pectin (CP Kelco 2005, Joint FAO/WHO Expert Committee on Food Additives 2009, Sufferling 2009, Cream Supplies 2015, Bronson and Jacobs Pty Ltd 2012)

Standardizing Agents	Sugar (sucrose), dextrose
Salt Buffers	Sodium citrate*, calcium citrate*, potassium citrate*, sodium potassium tartrate, calcium phosphate*, calcium phosphates dibasic*, sodium polyphosphate**, calcium orthophosphate, calcium phosphate, dibasic*, potassium phosphate**
Preservatives	Sulfur dioxide**

*Appears on the National List at §205.605 without annotation;

¹ The NOP issued a memorandum to the National Organic Standards Board on February 3, 2014 which describes ancillary substances as those that are intentionally added to a formulated product (specifically, to a substance on the National List at 205.605) but not considered part of the manufacturing process that is already reviewed by the NOSB. These substances are not removed and are not considered ingredients. Such substances fall into categories including, but not limited to, carriers, stabilizers and preservatives.

33 **Appears on the National List at §205.605 with annotation. Sodium phosphates – for use only in dairy
34 foods; Potassium phosphate – for use only in agricultural products labeled “made with organic (specific
35 ingredients or food group(s)),” prohibited in agricultural products labeled “organic”.

36
37 Sugars such as dextrose and sucrose are added to standardize any given pectin such that a certain portion
38 of pectin can gel a certain portion of sugar. Standard gel strength of 150° SAG (standard acid in glass) is
39 defined as 1 gram of 150° SAG pectin that can gel 150 grams of sugar under specific conditions. Depending
40 on the quality of the raw material (apple and citrus pomace), or the end use (pharmaceutical and
41 cosmetics), standardization with sugars may not be needed, although it is part of the usual practice (May
42 1990). This is confirmed by several product data sheets with pectin listed as the only ingredient (Pharmco
43 Products, Inc. 13, Bio Basic Inc. 2007, Sigma-Aldrich 2011, parchem 2015). Buffer salts are added to
44 standardize setting temperature of the pectin, to avoid high viscosity during depositing, and to avoid short
45 gelation reactions. Certain salt types affect acidity and texture, while calcium ions allow low-methoxy
46 pectins to set in the absence of sugar (Sufferling 2009). Sulfur dioxide (or equivalent sulfites) do not appear
47 as an ingredient on any product specification sheets reviewed for this report. According to FDA
48 regulations under 21 CFR §130.9, standardized foods that contain detectable levels of sulfites (10 ppm)
49 must declare that on the label. Therefore, it appears that sulfur dioxide is not a common ingredient in
50 pectin.

51
52 Pectin is often used in combination with other gums or thickeners appearing on the National List at
53 §§205.605 and 205.606, although they are typically not formulated together and sold in combination.
54 Rather, carrageenan, starch, gelatin and agar are separately combined with pectin to make confectionaries
55 such as Turkish delights, jelly beans and other jelly candies (Sufferling 2009).

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Evaluation Questions for Substances to be used in Organic Handling

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61 **Evaluation Question #5: Describe whether the primary technical function or purpose of the substance**
62 **is a preservative. If so, provide a detailed description of its mechanism as a preservative (7 CFR §**
63 **205.600 (b)(4)).**

64
65 As discussed under “Combinations of Substances” the JECFA (2009) monograph for pectin states that
66 sulfur dioxide may be added as a preservative. There is no literature to suggest whether the addition of
67 pectin with sulfur dioxide will exert a preservative function in the final organic product in which the pectin
68 is used. However, FDA regulations at 21 CFR §130.9 stipulate that “[ingredients] containing an indirectly
69 added sulfiting agent that has no functional effect in the food and that would, in the absence of
70 §101.100(a)(4)², be considered to be an incidental additive for purposes of §130.8³, conforms to the
71 applicable definition and standard of identity if the presence of the sulfiting agent is declared on the label
72 of the food.” Therefore, if a pectin containing sulfur dioxide is incorporated into a final food product, and

² 21 CFR §101.100(a)(4) For the purposes of paragraph (a)(3) of this section, any sulfiting agent (sulfur dioxide, sodium sulfite, sodium bisulfite, potassium bisulfite, sodium metabisulfite, and potassium metabisulfite) that has been added to any food or to any ingredient in any food and that has no technical effect in that food will be considered to be present in an insignificant amount only if no detectable amount of the agent is present in the finished food. A detectable amount of sulfiting agent is 10 parts per million or more of the sulfite in the finished food.

³ 21 CFR §130.8: Conformity to definitions and standards of identity.

In the following conditions, among others, a food does not conform to the definition and standard of identity therefor:
(a) If it contains an ingredient for which no provision is made in such definition and standard, unless such ingredient is an incidental additive introduced at a nonfunctional and insignificant level as a result of its deliberate and purposeful addition to another ingredient permitted by the terms of the applicable standard and the presence of such incidental additive in unstandardized foods has been exempted from label declaration as provided in §101.100 of this chapter.
(b) If it fails to contain any one or more ingredients required by such definition and standard;
(c) If the quantity of any ingredient or component fails to conform to the limitation, if any, prescribed therefor by such definition and standard.

73 the sulfite level exceeds 10 ppm, that sulfiting agent must appear on the ingredient label of the final food.
74 After exceeding 10 ppm, the sulfiting agent would not be considered an “incidental additive” and therefore
75 may exert some technical function in the final product, including a preservative effect. Again, no
76 specification sheets reviewed for this report indicated the presence of sulfur dioxide as an ingredient in
77 pectin.

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79 **Evaluation Question #6: Describe whether the petitioned substance will be used primarily to recreate**
80 **or improve flavors, colors, textures, or nutritive values lost in processing (except when required by law)**
81 **and how the substance recreates or improves any of these food/feed characteristics (7 CFR § 205.600**
82 **(b)(4)).**

83

84 The ancillary substances added to pectin in some cases are primarily added to improve textures that the
85 pectin facilitates (e.g., gelling). Sugars such as dextrose and sucrose are added to standardize pectin such
86 that a certain portion of pectin can gel a certain portion of sugar. In this way, these standardizing agents
87 help to improve and normalize textures that the pectin creates when used in a final product. However, the
88 literature does not suggest that the sugar standardizing agents have any technical effect in the final organic
89 product. Buffer salts affect texture by standardizing the setting temperature of the pectin, avoiding high
90 viscosity during mixing as well as short gelation kinetics (reactions). Certain salt types affect acidity and
91 texture, while calcium ions allow low-methoxy pectins to set in the absence of sugar (Sufferling 2009). The
92 calcium ions react with a section of two ester-free pectin chains and hold them together, creating a gel (May
93 1990). According to the literature, calcium salts are necessary for low-methoxyl pectins to function in low
94 or no-sugar applications.

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96 **Evaluation Question #7: Describe any effect or potential effect on the nutritional quality of the food or**
97 **feed when the substance is used (7 CFR § 205.600 (b)(3)).**

98

99 Although calcium salts are often added in combination with pectin, they do not affect the nutritional
100 quality of the pectin or the final organic product to which the pectin is added. Rather, they are added to
101 affect the texture and setting times, especially in low-methoxy pectins (Sufferling 2009, May 1990). See
102 Question #6 for more information.

103

104 **Evaluation Question #9: Discuss and summarize findings on whether the manufacture and use of the**
105 **substance may be harmful to the environment or biodiversity (7 U.S.C. § 6517 (c) (1) (A) (i) and 7 U.S.C. §**
106 **6517 (c) (2) (A) (i)).**

107

108 There is no literature to suggest that the manufacture of pectin with ancillary substances such as sucrose
109 and calcium salts is harmful to the environment or biodiversity. When taken individually, the manufacture
110 of the ancillary substances themselves may have some negative effects. Sucrose, for example, is produced
111 from sugarcane or sugar beets, both of which may be detrimental to the environment. According to the
112 World Wildlife Fund (2015), some of the most biodiverse regions on earth have been cleared for sugarcane
113 production. Sugar plantations and mills create pollution from eroded soils and synthetic fertilizers,
114 wastewater, emissions from flue gases, soot and ash (World Wildlife Fund 2015). Sugar may also be
115 manufactured from genetically modified (GMO) (e.g., Roundup Ready) sugar beets. Herbicide-resistant
116 GMO crops are thought to lead to increased use of pesticides such as glyphosphate as the weeds develop
117 resistance (Benbrook 2009).

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119 **Evaluation Question #10: Describe and summarize any reported effects upon human health from use of**
120 **the substance (7 U.S.C. § 6517 (c) (1) (A) (i), 7 U.S.C. § 6517 (c) (2) (A) (i) and 7 U.S.C. § 6518 (m) (4)).**

121

122 There is very little literature to suggest that pectin with ancillary substances has an effect on human health,
123 either positive or negative. As discussed in ‘Combinations of the Substance’, pectin may contain sulfur
124 dioxide, an ingredient to which a small portion of the population may have a sensitivity. The FDA
125 estimates that 1% of the U.S. population is sulfite-sensitive (Grotheer, Marshall and Simonne 2005).
126 Symptoms of sulfite sensitivity include hives and itchiness, vomiting, asthmatic attacks and dizziness
127 (Grotheer, Marshall and Simonne 2005). As discussed earlier in Question #5, FDA regulations require that

128 sulfiting agents appear on the final food label when detectable levels exceed 10 ppm. Therefore, a
129 consumer could avoid consuming sulfites exceeding 10 ppm by reading the final food label.

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131 **Evaluation Question #11: Describe any alternative practices that would make the use of the substance**
132 **unnecessary (7 U.S.C. § 6518 (m) (6)).**

133

134 There is no literature to suggest alternative practices exist to using standardizing agents and salt buffers
135 when the quality or form of the pectin is such that they are required to meet certain specifications (e.g.,
136 gelling power). Although it is common to make non-standardized pectin from high quality raw sources
137 (citrus or apple pomace), as a processed substance, pectin is commercialized in such a way that certain
138 specifications must be met in order to meet quality parameters (Sufferling 2009), and so relying exclusively
139 on sourcing high quality raw materials is not realistic (May 1990) For this reason there do not appear to be
140 viable alternative practices described in the literature to using such ancillary substances. As mentioned
141 previously, although sulfur dioxide is permitted as a preservative in pectin, no commercial sources were
142 found that listed it as an ingredient. As such, it appears that the main alternative to sulfur dioxide use is to
143 omit it altogether.

144

145 **Evaluation Question #12: Describe all natural (non-synthetic) substances or products which may be**
146 **used in place of a substance (7 U.S.C. § 6517 (c) (1) (A) (ii)). Provide a list of allowed substances that may**
147 **be used in place of the substance (7 U.S.C. § 6518 (m) (6)).**

148

149 Dextrose is commercially available in both synthetic and nonsynthetic forms. Dextrose is typically formed
150 through chemical, heat, pressure or enzyme hydrolysis (OMRI 2015). When formed via heat, pressure or
151 enzyme hydrolysis it is considered nonsynthetic. Most of the buffer salts listed in Table 1 are synthetic and
152 do not have nonsynthetic sources or alternatives. It is unclear from the literature whether certain salts may
153 be used for certain types or quality of pectin, so it cannot be concluded that nonsynthetic calcium sources
154 would serve as complete alternatives to any of the salt buffers listed in Table 1.

155

156 **Evaluation Information #13: Provide a list of organic agricultural products that could be alternatives for**
157 **the substance (7 CFR § 205.600 (b) (1)).**

158

159 The most common ancillary substance used with pectin is sucrose, or table sugar. Sugar is widely available
160 in organic form. Dextrose is also available in organic form (NOP 2013). A thorough review of pectin
161 specification sheets indicated that there are no sources of pectin with organic sugar or organic dextrose,
162 however.

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References

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166 Agricultural Marketing Service (AMS). *Sunset Review (2012) FR Vol. 77, No. 109*. Washington DC, June 6, 2012.

167 Benbrook, C. *Impacts of genetically engineered crops on pesticide use in the United States: The first thirteen years.*
168 Critical Issue Report, The Organic Center, 2009.

169 Bio Basic Inc. *Material Safety Data Sheet: Genu Pectin L 200*. Markham, Canada, 08 7, 2007.

170 Bronson and Jacobs Pty Ltd. *Safety Data Sheet: Pectin*. Australia, 11 13, 2012.

171 CP Kelco. *Product Data Sheet: Genu pectin type YM-115-L*. Grossenbrode, Germany, 08 11, 2005.

172 Cream Supplies. *Food Product Information Data Sheet: Pomona's Universal Citrus Pectin (low methoxyl) - 28g.*
173 United Kingdom, 01 14, 2015.

174 Grotheer, P., M. Marshall, and A. Simonne. *Sulfites: Separating fact from fiction*. Publication #FCS8787, Gainesville:
175 University of Florida Extension, 2005.

176 Joint FAO/WHO Expert Committee on Food Additives. "Pectins." *FAO JECFA Monographs 7*, 2009.

177 May, C.D. "Industrial Pectins: Sources, Production, and Applications." *Carbohydrate Polymers 12* (1990): 79-99.

178 National Organic Program. *2013 List of Certified Entities*. Washington D.C., 2013.

179 National Organic Standards Board. "Pectin, low-methoxy non-amidated." NOSB Committee Recommendation, 2008.

180 Organic Materials Review Institute (OMRI). *OMRI Products Database*. Eugene, OR, 2015.

181 parchem. *Apple pectin (slow set)*. New Rochelle, NY, 2015.

182 Pharmco Products, Inc. *Material Safety Data Sheet: Pectin, Citrus*. Shelbyville, KY, 12 16, 13.

183 Sigma-Aldrich. *Product Specification: Pectin*. Saint Louis, MO, 03 30, 2011.

184 Sufferling, K. "Pectin." *National Confectioners Association*. 2009. <http://nca.files.cms->
185 [plus.com/ResidentCourse/Week1/ResCourseWk1CH7B2Pectin.pdf](http://nca.files.cms-plus.com/ResidentCourse/Week1/ResCourseWk1CH7B2Pectin.pdf) (accessed January 28, 2015).
186 World Wildlife Fund. *Sustainable Agriculture: Sugarcane*. 2015. <http://www.worldwildlife.org/industries/sugarcane>
187 (accessed 01 29, 2015).
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