The Amendment of Standards for Specification, Scope, Application and Limitation of Food Additives

MOHW Food No. 1071301483, 19 June, 2018

Appendix 2: Standards for Specification of Food Additives

12. Pasting Agent

§ 12008

Food Starches, Modified

Synonyms

Acid treated starch: INS No. 1401
Alkaline treated starch: INS No. 1402
Bleached starch: INS No. 1403
Oxidized starch: INS No. 1404
Monostarch phosphate: INS No. 1410
Distarch phosphate: INS No. 1412
Phosphated distarch phosphate: INS No. 1413
Acetylated distarch phosphate: INS No. 1414
Starch acetate: INS No. 1420
Acetylated distarch adipate: INS No. 1422
Hydroxypropyl starch: INS No. 1440
Hydroxypropyl distarch phosphate: INS No. 1442
Starch sodium octenylsuccinate: INS No. 1450

Definition

Food starches which have one or more of their original characteristics altered by treatment in accordance with good manufacturing practice by one of the procedures listed in Table 1. In the case of starches treated with heat in the presence of acid or with alkali, the alteration is a minor fragmentation. When the starch is bleached, the change is essentially in the color only. Oxidation involves the deliberate production of carboxyl groups. Acetylation results in substitution of hydroxyl groups with acetyl esters. Treatment with reagents such as orthophosphoric
acid results in partial substitution in the 2, 3- or 6- position of the anhydroglucose unit unless the 6-position is occupied for branching. In cases of cross-linking, where a polyfunctional substituting agent, such as phosphorus oxychloride, connects two chains, the structure can be represented by: Starch-O-R-O-Starch, where R = cross-linking group and Starch refers to the linear and/or branched structure.

C.A.S. number
Starch acetate: 9045-28-7
Acetylated distarch adipate: 68130-14-3
Hydroxypropyl starch: 9049-76-7
Hydroxypropyl distarch phosphate: 53124-00-8
Starch sodium octenylsuccinate: 66829-29-6

Description
Most modified starches are white or off-white, odourless powders. According to the drying method these powders can consist of whole granules having the appearance of the original native starch, or aggregates consisting of a number of granules (pearl starch, starch-grits) or, if pre-gelatinized, of flakes, amorphous powder or coarse particles.

Characteristics
Identification
Solubility
Insoluble in cold water (if not pre-gelatinized); forming typical colloidal solutions with viscous properties in hot water; insoluble in ethanol.

Microscopy
Passes test
Modified starches which have not been pre-gelatinized retain their granular structure and can be identified as starches by microscopic observation. Shape, size and sometimes striations are characteristics of the botanical
origin. In polarized light under cross nicol prisms the
typical polarization cross will be observed.

**Iodine stain**
Passes test
Add a few drops of 0.1 N potassium tri-iodide to an
aqueous suspension of the sample. These starches stain with
iodine in the same way as native starches. The colour can
range from dark blue to red.

**Copper reduction**
Passes test
Place about 2.5 g of the sample previously washed with
water, in a boiling flask, add 10 ml of dilute hydrochloric
acid (3%) and 70 ml of water, mix, reflux for about three
hours and cool. Add 0.5 ml of the resulting solution to 5 ml
of hot alkaline cupric tartrate TS. A copious red precipitate
is produced.

**Differentiation test**
Passes test for type of starch
1. Hypochlorite oxidized starch
2. Specific reaction for acetyl groups
3. Positive test for ester groups

**Purity**

**Sulfur dioxide**
Not more than 50 mg/kg for modified cereal starches
Not more than 10 mg/kg for other modified starches unless
otherwise specified in Table 1

**Lead**
Not more than 2 mg/kg

**Additional purity specifications for individual chemically modified starches**
See Table 1

**Category**
Food additives category (12)
**Functional uses**  Pasting Agents

Table 1. Additional purity specifications for individual chemically modified starches (All percentages calculated on dry substance)

<table>
<thead>
<tr>
<th>Modification</th>
<th>Process limitations</th>
<th>End-product specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acid treated starch</td>
<td>Treatment with hydrochloric acid or ortho-phosphoric acid or sulfuric acid</td>
<td>Final pH 4.8 – 7.0</td>
</tr>
<tr>
<td>Alkaline treated starch</td>
<td>Treatment with sodium hydroxide or potassium hydroxide</td>
<td>Final pH 5.0 – 7.5</td>
</tr>
<tr>
<td>Bleached starch</td>
<td>Treatment with peracetic acid and/or hydrogen peroxide, or sodium hypochlorite or sodium hypochlorite, or alternative permitted forms of sulfites, or potassium permanganate or ammonium persulfate</td>
<td>Added carbonyl group not more than 0.1% No residual reagent Residual sulfur dioxide not more than 50 mg/kg Residual manganese not more than 50 mg/kg</td>
</tr>
<tr>
<td>Oxidized starch</td>
<td>Treatment with sodium hypochlorite</td>
<td>Carboxyl groups not more than 1.1% Residual sulfur dioxide not more than 50 mg/kg</td>
</tr>
<tr>
<td>Monostarch phosphate</td>
<td>Esterification with orthophosphoric acid, or sodium or potassium ortho-phosphate, or sodium tripolyphosphate</td>
<td>Phosphate calculated as phosphorus not more than 0.5% for potato or wheat, and not more than 0.4% for other</td>
</tr>
<tr>
<td>Starches</td>
<td>Method of Preparation</td>
<td></td>
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</tr>
<tr>
<td>Distarch phosphate</td>
<td>Esterification with sodium trimetaphosphate or phosphorus oxychloride</td>
<td></td>
</tr>
<tr>
<td>Phosphated distarch phosphate</td>
<td>Combination of treatments for Monostarch phosphate and Distarch phosphate</td>
<td></td>
</tr>
<tr>
<td>Acetylated distarch phosphate</td>
<td>Esterification with sodium trimetaphosphate or phosphorus oxychloride combined with esterification with acetic anhydride or vinyl acetate</td>
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</tr>
<tr>
<td>Starch acetate</td>
<td>Esterification with acetic anhydride or vinyl acetate</td>
<td></td>
</tr>
<tr>
<td>Acetylated distarch adipate</td>
<td>Esterification with acetic anhydride and adipic anhydride</td>
<td></td>
</tr>
<tr>
<td>Hydroxypropyl starch</td>
<td>Etherification with propylene oxide</td>
<td></td>
</tr>
</tbody>
</table>

Phosphate calculated as phosphorus not more than 0.5% for potato and wheat, and not more than 0.4% for other starches.

Acetyl groups not more than 2.5%; phosphate calculated as phosphorus not more than 0.14% for potato and wheat, and 0.04% for other starches; and vinyl acetate not more than 0.1 mg/kg.

Acetyl groups not more than 2.5%.

Acetyl groups not more than 2.5% and adipate groups not more than 0.135%.

Hydroxypropyl groups not more than 7.0%; propylene chlorohydrin.
<table>
<thead>
<tr>
<th>Product Name</th>
<th>Description</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydroxypropyl distarch phosphate</td>
<td>Esterification with sodium trimetaphosphate or phosphorus oxychloride combined with etherification by propylene oxide</td>
<td>Hydroxypropyl groups not more than 7.0%; propylene chlorohydrin not more than 1 mg/kg; and residual phosphate calculated as phosphorus not more than 0.14% for potato and wheat, and not more than 0.04% for other starches</td>
</tr>
<tr>
<td>Starch sodium octenylsuccinate</td>
<td>Esterification with octenylsuccinic anhydride</td>
<td>Octenylsuccinyl groups not more than 3%; and residual octenylsuccinic acid not more than 0.3%</td>
</tr>
<tr>
<td>Oxidized Hydroxypropyl Starch</td>
<td>Chlorine, as sodium hypochlorite, not to exceed 5.5% of dry starch; active oxygen obtained from hydrogen peroxide, not to exceed 0.45%; and propylene oxide, not to exceed 25%</td>
<td>Propylene chlorohydrin not more than 1 mg/kg</td>
</tr>
<tr>
<td>Starch Aluminum Octenyl Succinate</td>
<td>Octenyl succinic anhydride, not to exceed 2%, and aluminium sulfate, not to exceed 2%</td>
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<tr>
<td>Starch Sodium Succinate</td>
<td>Succinic anhydride, not to exceed 4%</td>
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<tr>
<td>Distarchoxy Propanol</td>
<td>Acrolein not to exceed</td>
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