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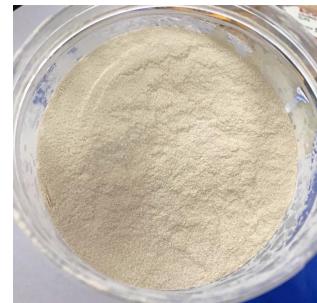
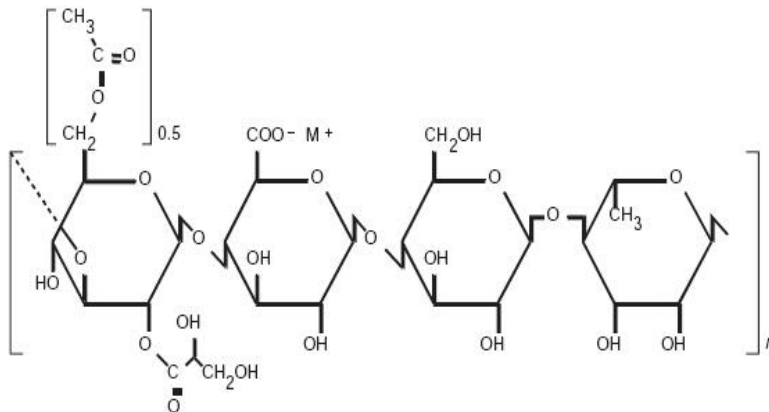
## Product Technical Specification Gellan Gum (Feeder Culture: Pea Protein)

### What is Gellan Gum?

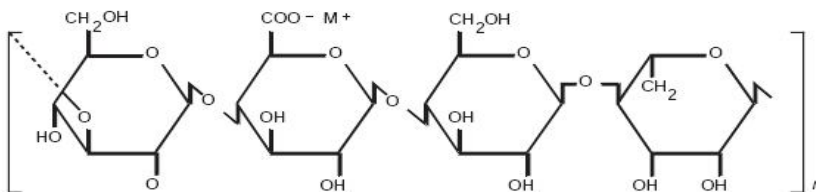
Gellan Gum is a natural food additive numbered with E418, usually applied as stabilizer, gelling agent and thickener. The main raw materials for Gellan Gum processing are: Sugar or Edible Glucose Powder Derived from corn/maize; Pea Protein and Yeast Extract. Gellan gum is a hydrocolloid produced by the microorganism *Sphingomonas elodea* under carefully controlled fermentation procedure from a carbohydrate source (glucose), nitrogen source and a number of inorganic salts. Gellan gum is available in two grades: high acyl and low acyl content. High Acyl Gellan Gum forms soft, very elastic, non-brittle gels while Low Acyl Gellan Gum forms hard, non-elastic, transparent brittle gels.

### Gellan Gum Structure

#### High Acyl Gellan Gum



#### Low Acyl Gellan Gum



Gellan Gum/Gelling Agent



Gellan gum is based on a linear structure of repeating, glucose, rhamnose and glucuronic acid units. In high acyl Gellan gum two acyl side chains, acetate and glycerate are present. Both substituents are present on the same glucose molecule and on average there is one glycerate per repeating unit and one acetate every two repeating units. In low acyl Gellan gum the acyl groups are removed. The properties of the two forms are considerably different. High acyl products form soft elastic gels while low acyl Gellan gum produces firm, non elastic, transparent brittle gels.

## Specifications of Gellan Gum

Low Acyl Gellan Gum:

Items	Standard
Appearance	White Fine Powder
Gellan Gum Content	85.0%-108.0%
*Assay (as CO <sub>2</sub> content on dry basis)	3.3%-6.8%
*Identification	PASS
*Suspension Test	PASS
*Isopropyl Alcohol	≤0.075%
Transparency	≥85%
Gel Strength	≥900g/cm <sup>2</sup>
Loss on drying	≤15.0%
Particle Size	60 Mesh ≥95%
Ash	≤15%
pH (0.5% Solution)	5.0—7.0
Lead	≤2.0mg/kg
Total Bacterium Account	≤10000CFU/g
Coliforms	≤30MPN/100g
Yeast and Maould	≤400CFU/g
Salmonella	0/25g

High Acyl Gellan Gum:

Appearance	Yellowish or White Fine Powder
Gellan Gum Content	85.0%-108.0%
*Assay (as CO <sub>2</sub> content on dry basis)	3.3%-6.8%
*Identification	PASS
*Suspension Test	PASS
*Isopropyl Alcohol	≤0.075%
*Gel strength	/
*Viscosity (0.1%) :	/
*Viscosity (0.5%):	/
Loss on drying	≤15.0%
Particle Size	60 Mesh ≥95%
Ash	≤15%
pH (0.5% Solution)	5.0—7.0
Lead	≤2.0mg/kg
Total Bacterium Account	≤10000CFU/g
Coliforms	≤30MPN/100g
Yeast and Maould	≤400CFU/g
Salmonella	0/25g

## Some Advantages of Gellan Gum

### 1. Heat Irreversible:

By adding divalent ions such as Ca<sup>+</sup> or Mg<sup>+</sup> at proper level, the gelling and suspending system formed by Gellan Gum LAG is heat stable. That means, when heating again, the gelling and suspending system can't be damaged. P.S.: if heat reversible gels needed, add monatomic ions such as Na<sup>+</sup> or K<sup>+</sup>, heat reversable gels can be formed to

meet different kinds of requirements.

## 2.Low Dosage:

The dosage of gellan gum is of 1/3-1/2 of K-Carrageenan or 1/5 of Agar Agar.

For instance, for gels, dosage of gellan gum is 0.05%-0.4%. By controlling the dosage of gellan gum in a lower lever, for example 0.01%-0.04%, it may help to form very weak gels, also called pre-gels. So the very low dosage gellan gum solution can be of good stabilizing and suspending agent. Especially for large grains in solution, the ONLY suspension agent is gellan gum.

## 3.Excellent Acid Stability:

Gellan gum can help to form gels under pH from 3.5-7.5 and the gels are very stable. This is better than Carrageenan which can only be used in neutral solution, while pectins can only be used under acid solution. For suspending beverages, gellan gum could keep stable under pH3.5-4.8 which allows insoluble particles in fruit juices.

## 4.Adjustable Gel Elasticity and Rigidity:

By using gellan gum only, various kinds of gels can be formed(for example, elastic gels and brittle gels) to meet the requirements of different products. This is different from carrageenan , agar or pectins who can form only one kind of gel.

## 5. Clear/ Transparent Gels and Solutions:

Low Acyl Gellan Gum can form clear/transparent gels;When dissolved in water, the solution made by low acyl gellan gum is also very clear and transparent.

### Charactoristics & Functions of Gellan Gum

Charactoristics	Functions
1.High quality gel can be formed in very low concentration (approx 0.05%-0.4%) and 0.005%-0.04% for suspension solution.	Gellan gum is a very good gelling agent,thickening agent and stabilizing agent.
2.Quite stable when heating or in low pH circumstance (specially when pH4.0-7.5).	A. High Temperature Fertilization affect quite little on gel; B. Acid gel enjoys longer shelf life.
3.Potassium and Sodium Ions formed gel can be recovered (heat reversible); but magnesium and calcium salt formed gel can't (heat irreversible).	Can be produced to thermally reversible type or thermally irreversible type gel. Widely applied in layered jellies.
4.Be compatible with outhere gum such as starch, xanthan gum, locust bean gum, carrageenan and their mixtures.	The structure can be changed from crisp type to flexible type easily.
5.Good compatibility with other ingredients.	Can be widely used in various formula.
6.Gel can be easily formed between pH3.5-pH7.0.	From acidic food to neutral food formula, good quality gel and gel strength can be achieved.
7.Anti-aging characteristic.	Restrain the aging process and viscosity increasing in starch paste and other familiar products.
8.Hard to cause enzymolysis.	Provide good flexibility for food processing industry. Good performance in the cultivation of microbiological and plant tissue.
9.Good Heat Stability.	High Temp., sterilization and stewing has small effect on the gels formed by gellan gum.
10. High Transparency: Low Acyl Gellan Gum is of very high transparency.	Make the products more attractive if applied Gellan Gum as gelling and suspending agent.
11. High Acyl Gellan Gum has the characteristic of low concentration but high viscosity.	Can be used as very good thickening agent.

12. Gellan Gum solution is net structure.	Can be as perfect stabilizing agent.
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### Typical Procedure of Gellan Gum Application:

1. Make gellan gum dispersed in cool deionised water by stirring;
2. Heat solution 1. to 90°C for 10-20 minutes waiting for thoroughly dissolving of gellan gum;
3. Add cations into solution 2.;
4. Cool down the solution 3. to certain temperatures (23°C recommended), gelling or suspending functions available.

### Solution Preparation:

Low acyl Gellan gum is only partially soluble in cool water. The divalent ions present in materials or water will inhibit the dissolution of low acyl gellan gum into the water. Gellan gum can be completely dissolved when the temperature of solution is above 75 Celsius Degree. While this can be improved by the use of sequestrants.

High acyl Gellan gum swells in deionised water to a starch like consistency. The presence of sodium ions can reduce this swelling behaviour and is useful to aid the dispersion of the product and reducing the viscosity of the solution. Heat is required to fully hydrate high acyl Gellan gum and it fully hydrates between 70 to 80 degrees C.

Both forms of Gellan gum can be dispersed in milk and hydrated on heating. The products will only hydrate successfully at a pH above 4.0

### Dispersion:

To disperse the product without lumps:

- ⊙ Premix the powder with the other dry ingredients, and pour the preparation into the liquid under efficient stirring. Continue stirring to obtain a complete dispersion.
- ⊙ or, disperse it in a non-solvent medium (oil or others).

### Dissolution:

The dissolution of the product depends on the medium and the process: it is improved by heat treatment (time, temperature), shear stress (stirrer, homogenizer). A complete dissolution can be rapidly obtained by boiling for 5-10 min or at around 85-95°C for 20-30 min with sequestrants.

### Gel Formation:

Gellan gum forms gels on cooling. The setting temperature in deionised water is 23°C for the low acyl product and 65°C for the high acyl product. The addition of cations with appropriate level to the solutions increases the setting temperature of both products. The setting temperature of low acyl Gellan increases to 30-50°C and the high acyl product to 70°C.

### Gellan Gum Applications

As a kind of multi-functional hydrocolloid, gellan gum can be used at low levels in a wide variety of products that require gelling, texturizing, stabilizing, suspending, film-forming and structuring.

Gellan gum is extremely effective in forming "fluid gels" with monovalent and divalent cations. Gellan gum provides gelation, suspension or stabilisation to food products. It is very economic in use as it is effective at low concentrations. Gellan gum can be used alone or in combination with other hydrocolloids to produce the required texture in the final product.

Low Acyl Gellan Gum form hard, non-elastic, brittle gels, whereas High Acyl Gellan Gum forms soft, very elastic, non-brittle gels. Varying the ratios of the two forms of gellan produces a wide variety of textures.

Shearing during cooling disrupts the normal gelation of gellan gum (both high acyl and low acyl forms) and results in a smooth, homogenous, pourable structured liquid or 'fluid gel'. This type of system is extremely pseudoplastic and highly efficient at suspending a wide variety of solids and liquids, including emulsified oil droplets, herbs, fruit pulp and cocoa.

Fluid gel formation is also employed in the production of dairy products, spreads, dressings and sauces using scraped

fluid gel formation is also employed in the production of dairy products, spreads, dressings and sauces using scraped surface heat exchangers or during HTST/UHT processing. Gentle agitation of a weak gellan gum gel, after it is set, is also sufficient to form a smooth, pourable gel. This means that fluid gels can be formed using standard filling operations.

With so many advantages, gellan gum is widely applied in food, beverage, daily chemicals, plant tissue culture, food packaging, and oil drilling industry.

#### Transparent Suspending Beverages:

- © Dosage: 0.012%-0.05%;
- © Gellan Gum Applied: GELLAN GUM LAS.
- © Typical Drinks: Brasil Seeds/Chia Seeds Beverages; Aloe Vera Beverage; Yellow Peach Pulp Drinks; Pineapple Pulp Drinks; Coconut Cubes Drinks; and other transparent/clear beverages which need cubes suspending.
- © Advantages: 1. Wide pH range: 3.5-8.0, acid and neutral beverage applicable; 2. Once pulps suspended, sterilization with heating won't damage the suspension system.



#### Tofu Snacks:

GELLAN GUM HAF is also recommended to be applied with 0.15%-0.3% to Tofu Snacks to improve the elasticity of the products. It is always combined with Carrageenan and Konjac Gum. With approx 1000g/cm<sup>2</sup> gel strength and more than 10000cp viscosity, gellan gum HAF would give Tofu products a perfect taste feel.

#### Jellies:

- © Dosage: 0.06%-0.5%;
- © Gellan Gum Applied: GELLAN GUM LAG.
- © Gellan Gum can help to form Elastic and Brittle Gels in production of jellies. Gellan Gum can be used under pH condition from 3.5-7.5. With 0.3% Gellan Gum and 0.2% Xanthan Gum together, a colorful rainbow jelly is available. Gellan Gum LAG could be premixed with salts such as Calcium Lactate for easier production of jellies.



#### Confectionery and Confectionery Jellies

GELLAN GUM LAG is recommended with dosage: 0.05%-0.8%; Confectionery jellies can be made with a wide variety of gelling agents such as starch, gelatine and pectin. In the case of pectin and gelatine jellies Gellan gum is added to the product to provide increased temperature stability even in hot conditions. When the products are supplied in large containers they get hot and can melt if pectin and gelatine are used alone. But this won't happen if use gellan gum.

#### Fruit Jams / Chilli Sauces:

- © Dosage: 0.2%;
  - © Gellan Gum Applied: GELLAN GUM LAG/LAS.
  - © Applied to keep garlic/ginger/chilli big particles suspending in sauces;
- When the dry solid in fruit jam is 38%, by adding 0.2% gellan gum, we can get very good less dry solid fruit jam. While if pectins is applied the dosage is 0.8% and 1.0% for carrageenan.



#### Meat Products:

Dosage: 0.1%-0.15%; GELLAN GUM LAG is recommended to replace Carrageenan to apply in meat products to improve the mouth feel or to produce meat-like gels in elbow sausages.

#### Acid Fruit Juices (pH 4.2):

- © Dosage: 0.025%-0.04%;
- © Gellan Gum Applied: GELLAN GUM HAF.



© Typical Drinks: Fresh Fruit/Vegetable Concentration Juice; Acid Beverages needs stabilizing or suspending pulps in beverage.

© Advantages: 1. Wide pH range: 3.5-8.0, acid beverage applicable; 2. High viscosity improves mouth feel.



#### Dairy Beverages:

© Dosage: 0.025%-0.03%;

© Gellan Gum Applied: GELLAN GUM HAM.

© Typical Drinks: Soybean Milk / Coffee Milk / Chocolate Milk/ RTD Milk Beverages.

© Advantages: 1. Middle Viscosity; 2. Weak Fluid Gels available; 3. Keep milk beverage stabilizing and suspending.



#### Plant Tissue Culture Medium:

GELLAN GUM LAT is specially produced to use at Plant Tissue / Microorganism culture medium as replacement of Agar Agar. It's of high transparency and high gel strength. Heat and Acid Stability.

#### Plant Protein Neutral Beverages:

© Dosage: 0.025%-0.03%;

© Gellan Gum Applied: GELLAN GUM HAP.

© Advantages: 1. Low Reaction to protein; avoid water-out problem; 2. Viscosity enhances mouth feel; 3. Keep insoluble particles in beverage stabilizing and suspending.



#### Solid Air Freshener:

As a perfect gelling agent, GELLAN GUM LAG is widely applied in production of solid air freshener due to its good moisture retaining ability.

#### Ice Cream

Dosage: 0.1%-0.2%; Function: Stabilizing Agent; Good Moisture Retaining; Good Shape Retention; Some Typical Application: Gellan Gum compounded with other gums, can be used to produce Sorbet, Pudding Ice Cream, Premier Ice Cream, Chocolate Sherbet, Fruit Flavor Shakes and so on.



#### Packaging, Storage and Shelf Life

The product is packed in 25Kg/Drum with a PE bag inner. Store away from heat and moisture, preferably at a cool and dry place. The product, when stored in these conditions and in its original unopened packaging, will maintain its initial properties for 24 months.

#### For further information please contact:

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