Galactomannans

- Stability / water binding
- Gel / Synergy
- Viscosity
- Body / Mouth feeling
- Syneresis prevention

July 2020, rk
Galactomannans

<table>
<thead>
<tr>
<th>Raw Material</th>
<th>Tara Gum</th>
<th>Locust Bean Gum</th>
<th>Guar Gum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Peru, Bolivia)</td>
<td>(Mediterranean area)</td>
<td>(India, Pakistan)</td>
</tr>
</tbody>
</table>

The cultivation of the plants is usually by an ecological dry-field system, which helps preserve the often meagre water resources.

UNIPEKTIN buys the raw material direct from local producers and processors. The imported raw material is examined by certified quality control parameter and classified for the further processing.
<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIDOGUM L®</td>
<td>Locust Bean Gum</td>
</tr>
<tr>
<td>VIDOGUM L/C500®</td>
<td>Cold Soluble Locust Bean Gum</td>
</tr>
<tr>
<td>VIDOGUM SP®</td>
<td>Tara Gum</td>
</tr>
<tr>
<td>VIDOGUM SP-SYN®</td>
<td>Low viscosity Tara Gum</td>
</tr>
<tr>
<td>VIDOGUM G®</td>
<td>Native Guar Gum</td>
</tr>
<tr>
<td>VIDOGUM GH®</td>
<td>Neutral flavour Guar Gum, Swiss made</td>
</tr>
<tr>
<td>VIDOCREM®</td>
<td>Viscosity reduced Guar Gum</td>
</tr>
<tr>
<td>VIDOFIX®</td>
<td>Specific low viscous Guar</td>
</tr>
</tbody>
</table>
Galactomannan Specialities

VIDOGUM GH Neutral flavour guar gum
VIDOCREM viscosity reduced guar gum
VIDOGUM SP-SYN viscosity reduced tara gum

the perfect solution for:
- texture
- creaminess
- mouthfeel

improved solubility in high Brix applications
excellent syneresis prevention
Galactomannan Specialities

VIDOGUM GH

High Quality Guar Gum, produced in Switzerland
Without the typical taste and flavor of guar gum

The perfect solution for all flavour sensitive applications
Galactomannans

Viscosity and Flow Behavior

Solubility

Interactions with other hydrocolloids

Freeze and Thaw Stability
Molecular Structure

**Locust Bean Gum**
(Carubin)
Mannose/Galactose 4:1

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**Tara Gum**
(Tara-Galactomannan)
Mannose/Galactose 3:1

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**Guar Gum**
(Guaran)
Mannose/Galactose 2:1
Molecular weight influences the characteristics of the hydrocolloid

Guar Gum (Guaran)  
**VIDOGUM GH**

Ratio Mannose to Galactose 2 : 1

Guar Gum  
**VIDOCREM**

Ratio Mannose to Galactose 2 : 1
Flow Behaviour

The differences of the molecular structure of the galactomannans as well as the difference of the molecular weight are responsible for variations of the flow behaviour.

These variations can be detected by sensory tests.
Viscosity reduced guar gum

Flow behaviour of Vidogum SP-SYN

- SP 175
- SP-SYN

shear rate [s⁻¹]

Viscosity in %

- VB
- L200
- SP200
- GH200
Sensory effects

Sensoric Effects of Galactomannans in Stewed Fruit

- Adhesiveness
- Mouthfeeling
- Flavour Release
- Acidity Release

VIDOGUM L
VIDOGUM SP
VIDOGUM GH
VIDOCR EM E
VIDOCR EM B
**Viscosity at higher temperature**

<table>
<thead>
<tr>
<th>Substance</th>
<th>Viscosity at 25° C</th>
<th>Viscosity at 75° C</th>
<th>in % of the hot viscosity</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIDOGUM L 175</td>
<td>2,380</td>
<td>700</td>
<td>29.4</td>
</tr>
<tr>
<td>VIDOGUM SP 175</td>
<td>3,890</td>
<td>1,300</td>
<td>33.4</td>
</tr>
<tr>
<td>VIDOGUM GH 175</td>
<td>4,300</td>
<td>2,800</td>
<td>65.1</td>
</tr>
<tr>
<td>VIDOCREM A</td>
<td>60</td>
<td>25</td>
<td>41.6</td>
</tr>
</tbody>
</table>

(all values in mPa.s)
Homogenisation effect

![Chart showing the homogenisation effect for different ingredients. The chart includes lines for different materials: VIDOCREM A, VIDOGRUM L 200, and VIDOGRUM GH 200. The y-axis represents [%] and the x-axis represents [bar]. The graph illustrates the decrease in percentage with increasing pressure.]
Chocolate Milk ‘light’

Galactomannans increase the texture and the stability of chocolate milk compared to a stabilisation with κ-Carrageenan alone.

**Ingredients**

- Skimmed Milk: 93.30%
- Saccharose: 3.50 %
- Cacao Powder: 3.00 %
- κ-Carrageenan: 0.02 %
- VIDOCREM: 0,10 - 0,20 %

_The low viscosity Guar Gum VIDOCREM produces a creamy, smooth and pleasant texture._
Galactomannans

Viscosity and Flow Behavior

Solubility

Interactions with other hydrocolloids

Freeze and Thaw Stability
Solubility at 20°C

UNIPEKTIN Ingredients AG Switzerland
Instant Solubility

Viskositätsbereich im Handel befindlicher Instant Frucht-Produkte

0,9% VIDOCREM F + 1,8% Stärke
0,9% VIDOGUM GH 200 + 1,8% Stärke
0,9% VIDOCREM D + 1,8% Stärke
0,9% VIDOCREM B + 1,8% Stärke
1,4% VIDOCREM B + 1,8% Stärke
1,8% VIDOCREM B + 1,8% Stärke
4,5% Distärkephosphat
Crème Desserts

Galactomannans create the pleasant texture these desserts are known for, and particularly VIDOCREM A is used in ‘instant’ powder mixes for ‘Creme Desserts’.

**Ingredients**
Sucrose
Tapioca starch (modified)
VIDOCREM A
Carrageenan
Flavours, colours

The low viscosity Guar Gum VIDOCREM produces a creamy, smooth and pleasant texture.
Viscosity Development

Brabender Amylograph

25% Guar / 75% Locust Bean Gum

Locust Bean Gum

native Guar Gum
Brioche

Brioche is made with a lot of butter and many eggs, like all “Viennoiserie” products. They are very popular in France but also more and more in other countries.

VIDOGUM L 200 (LBG) improves and preserves the pleasant texture during shelf life of 4 weeks.

The recommended dosage is 1% of flour. For specific products (e.g. frozen), the recommended dosage is higher.
Gluten-free

The trend for gluten free products and the market for gluten free bakery products and pasta grows strongly.

Ingredients
VIDOGUM and VIDOFIBRES replace the missing properties of the gluten and create tasty products.

UNIPEKTIN has served this market segment for decades and holds a strong position in Europe.
Solubility at high Brix

1. water
2. galactomannan (1%)
3. saccharose

Locust Bean Gum

Tara Gum

Native Guar Gum

VIDOCREM
Fruit Preparations

In Europe, the major part of the fruit preparations has approx. 45° brix. A smaller part has approx. 55-60° brix.

Recipe “Fruit preparation 45°Bx”

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruits, Water</td>
<td>~55 %</td>
</tr>
<tr>
<td>Sugars</td>
<td>~42 %</td>
</tr>
<tr>
<td>modified Starch</td>
<td>2.50 %</td>
</tr>
<tr>
<td>Pectin</td>
<td>0.25 %</td>
</tr>
<tr>
<td>VIDOGUM SP-SYN / VIDOCREM</td>
<td>0.25 %</td>
</tr>
<tr>
<td>Flavours, colours, etc.</td>
<td></td>
</tr>
</tbody>
</table>

Recipe “Fruit preparation 60°Bx”

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruits, Water</td>
<td>~42 %</td>
</tr>
<tr>
<td>Sugars</td>
<td>~55 %</td>
</tr>
<tr>
<td>modified Starch</td>
<td>2.00 %</td>
</tr>
<tr>
<td>Pectin</td>
<td>0.20 %</td>
</tr>
<tr>
<td>VIDOGUM SP-SYN / VIDOCREM</td>
<td>0.20 %</td>
</tr>
<tr>
<td>Flavours, colours, etc.</td>
<td></td>
</tr>
</tbody>
</table>

The rheological properties of low viscosity Guar and Tara gum offer:
- pleasant texture with creaminess and mouthfeel
- improved solubility in high Brix applications
- excellent syneresis prevention
Galactomannans

Viscosity and Flow Behavior

Solubility

Interactions with other hydrocolloids

Freeze and Thaw Stability
Synergy with Agar & Carrageenan

A = Agar Agar / Carrageenan / Xanthan Gum
B = Locust Bean Gum / Tara Gum
C = Helix-Bond Associations
Cream Cheese ‘Light’

This recipe shows a full bodied, creamy and smooth Cream Cheese Light with a natural appearance.

Recipe:

- Curd cheese (0.2% fat) 45.50 %
- Cream Cheese with 30% fat 54.00 %
- Salt 0.20 %
- VIDOGUM SP-SYN 0.20 %
- k-Carrageenan 0.10 %

Preparation:
1. Mix the cheese in the Stephan cutter and heat to 40°C whilst stirring at 1,500 rpm.
2. Add the premixed dry components.
3. Heat to a maximum of 92°C and keep at this temperature for 10 min.
4. Homogenise at 200 bar.
5. Pack directly (hot filling over 70°C).
Canned meat

Locust Bean Gum shows a strong and brilliant interaction with carrageenan.

While carrageenan is widely used in processed meat products for its gelling properties, VIDOGUM L 175 improves the gelled texture of any kind of meat products such as ham, sausages, structured meat as well as canned meat.

VIDOGUM L 175 or in combination with Agar Agar.
Interaction with Starches

A separation into two phases is responsible for an increase in viscosity.

→ Liquid – Liquid phase separation

If the galactomannans are only present in a part of the solution, the concentration of it is increased in that part. Based on the fact that the viscosity in relation of the concentration is progressive, the galactomannans will show a higher viscosity. The same explanation applies for the modified starches.
Interaction with Starches

<table>
<thead>
<tr>
<th></th>
<th>VISCOSITY</th>
<th>viscosity increase</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1% Solution mPa.s</td>
<td>1% mod. starch mPa.s</td>
</tr>
<tr>
<td>modified starch</td>
<td>10</td>
<td>-</td>
</tr>
<tr>
<td>VIDOGUM GH 200</td>
<td>4,200</td>
<td>6,080</td>
</tr>
<tr>
<td>VIDOGUM SP 175</td>
<td>3,550</td>
<td>6,790</td>
</tr>
<tr>
<td>VIDOGUM L 175</td>
<td>2,610</td>
<td>5,830</td>
</tr>
<tr>
<td>VIDOCREM C</td>
<td>462</td>
<td>1,490</td>
</tr>
</tbody>
</table>
Interaction with Starches

Starch & Galactomannans
BEFORE HEATING

Starch & Galactomannans
AFTER HEATING

STABILIZER CONCENTRATION
Panna Cotta

Panna cotta is a cream-based Italian dessert. The combination of Locust Bean Gum VIDOGUM L 175 HQ and carrageenan forms the required delicately-melting gel structure and lends the product a harmonious texture, even with low fat content.

Recipe “Panna Cotta”
Skimmed Milk ~56 %
Cream (35% fat) 32 %
Sugar ~9 %
Starch 0,90 %
k-Carrageenan 0.40 %
VIDOGUM L 175 HQ 0,30 %
A recent new Cream Cheese creation in Europe is the “Chocolate” type, texturized with locust bean gum in combination with carrageenan.

This new type is also promoted as ingredient for American style ‘Cheese-Cake’.
Galactomannans

Viscosity and Flow Behavior

Solubility

Interactions with other hydrocolloids

Freeze and Thaw Stability
Freeze & Thaw Behaviour

Initial solution

1. freezing/thawing step

2. freezing/thawing step

3. freezing/thawing step

After new heating step

Guar Gum  Tara Gum  LBG  Low viscosity Guar

[pH = 4.5]
Freezing Steps - Model

- **Guar Gum**
- **Locust Bean Gum**
- **hydrated water cover**
- **freezing step (ice crystals)**
- **junction zones**
## Ice Cream

Standard recipe of a dairy Ice Cream with a pleasant and smooth texture and good stability over shelf life.

### Recipe Ice Cream 8% Milk Fat

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>65.00 %</td>
</tr>
<tr>
<td>Skimmed Milk Powder</td>
<td>12.50 %</td>
</tr>
<tr>
<td>Butter</td>
<td>9.60 %</td>
</tr>
<tr>
<td>Saccharose</td>
<td>10.00 %</td>
</tr>
<tr>
<td>Glucose Syrup</td>
<td>2.40 %</td>
</tr>
<tr>
<td>Vanilla Flavour</td>
<td>0.10 %</td>
</tr>
<tr>
<td>Riboflavin (E 101)</td>
<td>0.002 %</td>
</tr>
<tr>
<td>Emulsifier (E 471)</td>
<td>0.30 %</td>
</tr>
<tr>
<td>kappa Carrageenan</td>
<td>0.02 %</td>
</tr>
<tr>
<td>Galactomannan</td>
<td>0.15 %</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.07 %</strong></td>
</tr>
</tbody>
</table>
Heat shock stability of different systems

- Only k-Carrageenan
- with VIDOGUM L 175 (Locust Bean Gum)
- with VIDOGUM SP 175 (Tara Gum)

Syneresis:
- After 15 Minutes:
  - Only k-Carrageenan: 14 ml
  - with VIDOGUM L 175: 13 ml
  - with VIDOGUM SP 175: 7 ml
- After 30 Minutes:
  - Only k-Carrageenan: 13 ml
  - with VIDOGUM L 175: 12 ml
  - with VIDOGUM SP 175: 6 ml
- After 60 Minutes:
  - Only k-Carrageenan: 7 ml
  - with VIDOGUM L 175: 5 ml
  - with VIDOGUM SP 175: 3 ml
Heat shock stability of different systems

- with VIDOGUM GH (Guar Gum)
  - after 15 Minutes: Syneresis: 9 ml
  - after 30 Minutes: Syneresis: 8 ml
  - after 60 Minutes: Syneresis: 4 ml

- with VIDOCREM A (thermally degraded Guar)
  - after 15 Minutes: Syneresis: 8 ml
  - after 30 Minutes: Syneresis: 8 ml
  - after 60 Minutes: Syneresis: 4 ml

- with 0.35% VIDOCREM A (thermally degraded Guar)
  - after 15 Minutes: Syneresis: 8 ml
  - after 30 Minutes: Syneresis: 8 ml
  - after 60 Minutes: Syneresis: 4 ml
## Content

Technical properties

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<tr>
<th>1</th>
<th>Texture / Consistency / Incorporation</th>
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<tbody>
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<td>2</td>
<td>Flow Behaviour</td>
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<tr>
<td>3</td>
<td>Viscosity</td>
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<tr>
<td>4</td>
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<tr>
<td>5</td>
<td>Water Formation Ability</td>
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<tr>
<td>6</td>
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<td>Interaction with modified Starch</td>
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<td>Gel Formation with Seaweed Polysaccharides</td>
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<td>14</td>
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