

## Agar-agar (E406)

### Culinary data

Agar -agar is a gelling agent used preferably at the rate of 1g for 100g of final preparation or less.

It enables:

- to gel preparations (foamy or not) in the cold or at elevated temperature ( $T^{\circ}\text{C} < 80^{\circ}\text{C}$ ),
- to gel preparations that gelatine can not gel.



### Technological data

#### Dissolution

The preparation of an agar-agar gel starts with the dissolution of the agar-agar powder in water. This is obtained only if water comes to the boil. To achieve a better dissolution, it is also recommended to allow the agar-agar to soak into water before boiling the whole. The amount usually used is ranging from 0.5 to 2g of agar-agar for 100g of final preparation.

#### Gel setting

The gel is setting when the preparation is cooled down to temperatures close to  $35^{\circ}\text{C}$ . The slower the temperature decrease, the firmer the gel obtained. The gels formed are able to withstand temperatures below  $80^{\circ}\text{C}$ . The gels set again as the temperature is decreased again to temperatures close to  $35^{\circ}\text{C}$ .

#### Sensory characteristics

Gels made of agar-agar are opaque, brittle, and have a neutral taste. Sugar, up to 60% improves the strength and the elasticity of the gel.

#### Keeping

The gels made of agar-agar loose water, for example through evaporation at their surface. Be careful to their storage, the gels made of agar-agar are sensitive to freezing, causing them to lose water.

#### Effect of the acidity

the solution's pH control is very important. It should be preferably neutral. The polymeric chains constituting the agar-agar are degraded at acidic pH and elevated temperature. This is the reason why it is advised to add the acidic ingredients after heating.

#### Storage

maximal temperature  $25^{\circ}\text{C}$   
air moisture  $< 60\%$

### Toxicological data

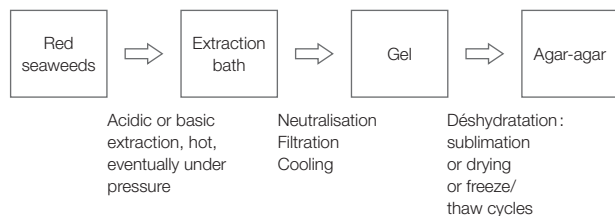
- No acceptable daily intake level.
- No known side effects in the concentrations used to obtain the desired effect.
- May cause flatulence at high doses.

## Scientific data

Agar-agar is a natural product extracted from red seaweed displaying gelling properties.

### Origin

Agar-agar can be extracted from various red seaweed sorts. They are commonly from the genus *Gelidium* (particularly *Gelidium amansii*), *Pterocladia* (particularly *Pterocladia tenuis*) and since the middle of the XX<sup>th</sup> century *Gracilaria* (particularly *Gracilaria verucosa*).



*Agar-agar's extraction from red seaweeds*

### History

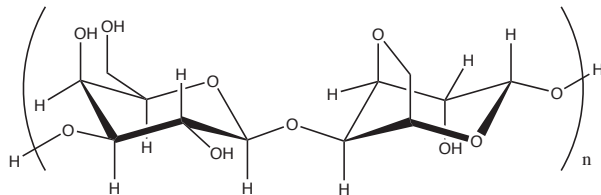
The discovery of agar-agar's the gelling properties is attributed to an inn-keeper named Tarozaemon Minoya who lived in Kyoto in the middle of the XVII<sup>th</sup> century. He observed that the remains of a dish made from boiled seaweed left to freeze and thaw several times formed a substance presenting gelling ability. The plain taste and the texture of agar-agar made it very popular among the Zen sect Buddhists. Agar-agar is named in Japan « kanten » after Buddhist priest named Ingen who lived at the time of the discovery. The agar-agar consumption, be it sweet or salted, remains very common in Japan. It was long the only agar-agar producing country and remains the major one.

Informations from Matsushashi T., *Food Gels* (ed. P. Harris), Elsevier 1990.

The traditional methods give the agar-agar as bar-style agar-agar or stringy agar-agar (whose authenticity is much appreciated in Japan), whereas the modern methods produce granulates or powders, of easier use.

### Chemical composition

Agar-agar is constituted of two types of polymers (long molecules made by attaching one after the other a large number from one or several small molecules) made of carbohydrates (i.e. various sorts of sugars in chemistry's words, with a meaning not restricted to table sugar). One of them is agarose, a polymer bearing no charges. The other type of polymer is agaropectine, having a more complex, partly charged structure.



*Structure the agarose:  
repetition of (1-> 3)- $\beta$ -D-galactopyranose (left)  
and of (1-> 4)-(3,6)-anhydro- $\alpha$ -L-galactopyranose (right).*

Agar-agar forms gels when the polymers they are made of wrap one around the other. A tri-dimensional network is formed that traps a very large amount of water.