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qCooking and Science Workshops: The “Soft of the World”, Gelling Agents

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Cooking and Science Workshops: The “Soft of the World”,
Gelling Agents

Pere Castells
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The creative revolution undergone in the last decades by cooking and the worldwide diffusion of gastronomical knowledge have been key to the development of modern cooking. This blossoming in the field of gastronomy has contributed to making cooking a driving force for economic growth and territorial development.

Using culinary practice as a teaching tool to explain science is the primary objective of this activity. This workshop is presented as an investigation game. The aim is to make the participants manipulate gelling agents and gels.

The objectives of the activity are to:

- observe the changes produced in the liquids when gelling agents are dispersed;
- learn about different kinds of gelling agents;
- learn about the application techniques;
- study gelling agents’ properties concerning heat, salts, etc.

Gelling Agents: Agar-Agar and Gelatine

As a first part of the educational activity, definitions are given (Alícia Foundation and elBullitaller, 2010):

Gelling agents are products that form gels when added to liquids. Many of them belong to the hydrocolloid family.

Gelatine: a mixture formed by proteins that are soluble in water that is traditionally used as a gelling agent. It has the properties of a hydrocolloid. It is obtained by physicochemical separation of bone or skin collagen, mainly from pork but also from veal and fish.

Agar-agar: a fibrous polysaccharide that is used as a gelling agent. It has the properties of a hydrocolloid. It forms thermo-reversible gels. It is extracted by physicochemical treatments from red algae Gelidium and Gracilaria.

Hydrocolloid: a protein or polysaccharide that has the capacity to attract water, causing the formation of gels, or to thicken a blended product or a liquid.

Then, the participants are invited to perform activities along with answering questions.

ACTIVITY 1. MAKING JELLIFIED PRODUCTS AND APPLICATION OF HEAT

Recipes to prepare:

**Agar-Agar**

200 g water or fruit juice + 2 g agar-agar

Mix both products and bring them to boil. Remove from the heat and allow to cool.

**Gelatine**

200 g water or fruit juice + 2 gelatine sheets (2 g for unit)

Firstly, dip the gelatine sheets in cold water. When the gelatine sheets are hydrated, dry them and add them to the water or fruit juice. Bring to the boil, remove from the heat and allow to cool.

Once both preparations have jellified, apply some heat, around 70 ºC.

**Question**

Describe the differences that you observe between the two products.

ACTIVITY 2. JELLIFIED PRODUCTS SOFT/HARD

Recipes to prepare:

**Agar-Agar**

500 g water + 13 g agar-agar

Mix the ingredients together and bring to boil. Remove from the heat and allow to cool.
Here, the main objectives are:

- creativity in the kitchen;
- observe and learn about new gelling agents;
- learn about the application techniques;
- learn the “spherification” technique.

Here again, definitions are given first:

**Sodium alginate**: an organic salt derived from fibrous polysaccharide used as a gelling and thickening agent and as a stabilizer. It has the properties of a hydrocolloid. It is extracted by physicochemical treatments of brown algae (Macrocystis, Fucus, Laminaria, Ascophyllum, etc.), which are found in cold-water seas and oceans.

**Calcium chloride**: calcium salt extracted from mineral products.

**Calcium lactate**: calcium salt extracted from milk.

**Spherification technique**: a culinary technique consisting of the controlled gelification of a liquid, which, when submerged in a bath, forms blobs. There are two kinds of spherification process: in the “direct” one, a liquid in which sodium alginate is dissolved is dipped in a bath containing calcium ions; in the reverse process, the liquid containing calcium ions is dipped in an aqueous solution of sodium alginate. These techniques can obtain spheres of different sizes, resembling caviar, salmon eggs, gnocchi and ravioli.

The process is then explained to the workshop participants before they move on to the practical activities.

### ACTIVITY 1. DIRECT SPHERIFICATION

**Fruit or Vegetable Spheres**

**Ingredients**

- 200 g fruit or vegetable juice
- 5 g sodium alginate
- 6.5 g calcium chloride in 1 litre of water (for the bath)

**Method**

Mix the sodium alginate with the fruit or vegetable juice. It can be left to disperse slowly, or you can use a stick blender. If left to disperse, the natural dispersion process takes at least 24 hours. If you use a stick blender, dispersion is immediate, but residual air will be produced, which can then be removed with a vacuum machine or left to rest for a minimum of 4 hours.

Wait until the dispersion has stabilized and then apply the spherification technique via immersion into the calcium chloride bath.

Wait until a gelatinous texture has been achieved.

### ACTIVITY 3. APPLICATIONS OF AGAR-agar

**Cabbage Jelly**

**Ingredients**

- 200 g red cabbage juice
- 2 g agar-agar

**Method**

Crush 50 g of red cabbage with 200 g of water and strain. Mix the red cabbage juice and agar-agar with a stick blender. Start boiling and place into moulds.

**Purée of peach**

**Ingredients**

- 200 g peach juice
- 3 g agar-agar

**Method**

Mix peach juice and agar-agar. Bring to boil. Leave in the refrigerator to gel. Blend it until you get a soft purée.

### More Gelling Agents: Sodium Alginate

After this first series of activities has been performed, more experiments are proposed, using gelling agents that have been used in the retail food industry for a long time.
These workshops help the participants to understand the relationship between science and cooking. Gels have been selected to represent one of the most important research fields in modern cooking.

More about all these projects can be found in Kopppmann (2009), Rowat et al. (2013), and Vega and Ubbink (2008).

**REFERENCES**


### ACTIVITY 2. REVERSE SPHERIFICATION

#### Ravioli Yoghurt

**Ingredients**

Yoghurt
5 g sodium alginate for each litre of water (for the bath)

**Method**

As yoghurt is rich in calcium, no calcium lactate is required.

Prepare the sodium alginate bath.

Apply the spherification technique by immersion into the sodium alginate bath.

**Questions**

What do you observe?

Why is it called spherification?

Why do you think they are called ravioli?