GUM SWEETS

PRACTICAL ACTION
Technology challenging poverty

technical brief

1. Introduction

Gum Sweets include any confectionary containing an animal or vegetable collagen agent. This agent gives the sweets a uniquely springy, gummy texture, whereby they immediately regain their shape after being squeezed between finger and thumb.

The gums should be transparent and stable, meaning that their moistness should be well balanced. This of course depends on their surroundings and how they are stored.
They are generally very stable sweets, with a relative humidity balance of 75–85%.

A wide variety of gelling agents can be used, although the most common are: *gum arabic, gelatine, agar-agar, pectin,* and *modified starches* known as *penetroses*.

Table 1 (below) outlines the characteristics of different gelling agents, and their sensitivity to atmospheric heat and acidity.
As shown in the table, most gelling agents are heat-sensitive. They must therefore be added lastly, in order that their gelling capacity is not compromised by hydrolysis or heat damage.

Exposure to direct flame must be avoided at all costs, due to the products' tendency to stick to the walls of the mixing container and burn or caramelise.

Table 1 : Characteristics of gelling agents

Gelling agent	Amount used (as a percentage of total solids)	Resulting influence upon the nature of the sweet	Sensitivity	
			To heat	To acidity
Gelatine	8 - 12%	Gummy (springy)	+++	++
Pectin	1 - 2.5%	Small and tender	+++	Very strict pH
Agar-agar	1.5 - 2.5%	Small	+++	+++
Gum arabic	50 - 60%	Hard	+++	++
Penetrose	8 - 12%	Various influences	+	++

2. Gelatine-based gums

For these products the gelling agent used is gelatine extracted from animal bones, cartilage and tendons, available nowadays in pure form.

The moisture content for commercial gelatine is approximately 10%. It is made up of amino acids, the constituent of all proteins.

Practical Action, The Schumacher Centre, Bourton on Dunsmore, Rugby, Warwickshire, CV23 9QZ, UK
T +44 (0)1926 634400 | **F** +44 (0)1926 634401 | **E** infoserv@practicalaction.org.uk | **W** www.practicalaction.org

Gelatine has two main uses in the production of confectionery: as a whipping agent, or as a gelling agent in itself. It is very common for both properties to apply to a single gelatine; thus one type of gelatine is often suitable in assisting the incorporation of air into the mixture, whilst another type may be relevant for its stronger gelling capacity.

Bloom gradings are often referred to when comparing the relative gelling strengths of different samples. Readings are taken using the Bloom gelometer, which measures the strength of gels at a predetermined concentration (6.66% in weight), at a fixed temperature (10°C). The apparatus is designed in a way that, by successively adding more product, a depression exactly 4mm deep forms in the surface of the gelatine gel. The combined weight of the apparatus, including the piston, is the same as the total weight needed to produce the surface depression, and thus the reading in grams translates to Bloom degrees:

Bloom Degrees	Amount in grams
50	160
90	120
130	100
170	85
210	80

In the manufacture of confectionary, gelatine is widely used as :

- an emulsifier;
- a fat dispersant;
- a whipping agent in the production of aerated sweets;
- a gelling agent in the manufacture of gums.

In general 110-120° Bloom degrees are used (in Peru). It is worth remembering that gelatine is highly sensitive to temperature, and must not therefore be exposed to prolonged heating during the production process.

To allow the gelatine to dissolve effectively, it should first be soaked: 1 part gelatine to 2 parts water, placed in bain-maries until fully dissolved.

Table 2 : Common problems

Problem	Explanation	Solution
Syneresis, or 'sweating'	Excessive inversion	Use liquid glucose rather than simply relying upon the inversion caused by cream of tartar. A 50:50 sugar-glucose ratio is sufficient.
	Excess of reductive sugars.	If you are not using inverted sugar, reduce the amount of glucose.
Granulation	Insufficient reductive sugars	Increase the amount of glucose, or prolong boiling time, adding more water along with the cream of tartar.
	Insufficient gelatine	Increase the amount: it can inhibit crystalisation.
	Low quantity of total solids	They should range from 78 and 82%.

	Gum ageing	If receiving customer complaints, check production dates. Ageing occurs due to the evaporation of moisture.
Unpleasant appearance	Cold moulding starch Highly moist starch Insufficient frosting Gum ageing	The starch should be at 32 - 34°C. It should have a 6-9% moisture level. Check the frosting process. Ascertain the production date.
Varying shape of gums	Faulty oven Boards placed at the hot air inlet. Insufficiently mixed.	Monitor airflow within the oven. Move the boards away from the hot air inlet. Lengthen the mixing time.
Sour or unpleasant taste	Lack of hygiene Poor quality gelatine Loss of flavour Starch is contaminated with alien flavours.	Wash all equipment very thoroughly. Use better quality gelatine. Buy a sufficient quantity of flavourings to last at least 3 months. Store in caramel bottles and place in cupboards in a dry place. Ensure that lids are firmly closed, and once opened use within 24 hours. Change the starch.
Gums lack body and shape.	Add acid to a hot gelatine solution. The gelatine is curling up The syrup has a high temperature The gelatine has little strength Variations in pH level	Delay the addition of the acid until the last possible moment, ensuring that it is thoroughly mixed in. Slowly add the gelatine to water at 88°C, stirring slowly. Cool the syrup to 100°C before adding the gelatine mix. Check the temperature. Monitor the amounts of acid being added. Use acid only to achieve pH 3.8 – 4.0. Add 0.2% of a pH-regulating salt (eg. sodium citrate) to avoid fluctuations in pH levels.
Lumps of gelatin	Slow-dissolving gelatine. Insufficient soaking of the gelatine.	Change gelatine type, or supplier. Soak in water for at least 20 minutes.

technical brief

Tails or strings formed	Strainer malfunction Damaged spouts. Problems with operation.	Adjust the piston stroke. Change them as necessary. Check that everything is working properly.
Temperamental output.	Damaged spouts. Problem with operation.	Change them as necessary. Check that everything is working properly.

3. ITINTEC Regulations

Gum sweets are made from a mixture of natural gums, gelatines, starch, sugar, and other authorised substances and additives.

According to the regulations of ITINTEC *(El Instituto de Investigacion Tecnologica Industrial y de Normas Tecnicas)*. Peru's Technical Research on Industrial Standards, gums must be free from all contaminants and from any non-permitted substances.
Use of authorised preservatives such as sorbic acid, or its alkaline sorbates, is permitted, in dosages of no more than 0.1%.

Another of the product requirements is a maximum content of 68% sucrose and gelling agents. The maximum moisture level for gums must be 15% mass.

Source:
Practical Action – ITDG. *Production Systems and Access to Markets Programme*. ***Marshmallows and Gums Technical Course, 1997***.

See also *Snack Foods* a selection of Practical Action Technical Briefs

Further Information:
Technical Information Service
info@solucionespracticas.org.pe
www.solucionespracticas.org.pe

Practical Action
The Schumacher Centre
Bourton-on-Dunsmore
Rugby, Warwickshire, CV23 9QZ
United Kingdom
Tel: +44 (0)1926 634400
Fax: +44 (0)1926 634401
E-mail: inforserv@practicalaction.org.uk
Website: http://practicalaction.org/practicalanswers/

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