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# Marshmallow Production: Technology and Techniques

## THE NATURE OF MARSHMALLOWS

This class of confections may range from very light, moist frappés to firm, chewy marshmallows to dry, crisp candies or to inclusions in breakfast cereals.

As a class, marshmallows differ from most other candies in that their density has been significantly reduced by the incorporation of air. Marshmallows may be “non-grained” or “grained.” If non-grained, then all of the sugars remain in solution, and a chewy texture is produced. If grained, then part of the sugar is deliberately caused to crystallize, in a controlled

manner, and a more short texture results.

In every case, the objective is to incorporate a controlled proportion of air. This will have the effect of changing the texture, and usually the appearance. It may also increase the apparent value by increasing the physical volume.

Marshmallows are stabilized foams. It is possible to incorporate air into many candy products, but unless an aerating agent is used, the aeration will largely dissipate in subsequent processing. Aerating agents help in the rapid formation of air bubbles, in the control of the size of the bubbles and in stabilization, so that entrapped air bubbles do not coalesce or dissipate.

## AERATING AGENTS

The most common aerating agents are colloidal materials which form an elastic film around the air bubbles, to stabilize the foam. Colloids are usually large-molecule proteins or polysaccharides having foam stabilization properties. They may also have gelling properties. These particular colloids are lyophilic, collecting at the interface between syrup and air bubbles. This

property stabilizes what is a two-phase system, with syrup as the continuous phase and air the dispersed phase.

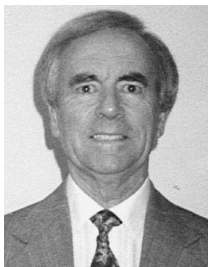
The most common colloidal aerating agents are:

- Albumen—dried egg whites or soy protein or milk (lactalbumen)
- Gelatin—animal collagen
- Gums—principally gum arabic (acacia)
- Starches—modified gelatinized starches
- Agar—derivative of seaweed
- Algins—derivatives of seaweed

Albumens aerate very readily at a concentration of 1.0 percent to 1.5 percent in a syrup, and produce a soft, short texture. Gelatin may be used at 2–5 percent and gives an elastic texture. Gum arabic is usually used at a level of 20–30 percent and makes a tough, chewy texture. Modified starches are used at about 11 percent in a formula and result in a firm, chewy texture. Agar, at about 1–2 percent concentration, makes a light, soft texture, while algins, at levels of 0.5 percent to 1.0 percent, produce tough textures (Figure 1).

The aerating agents may be used in combination; the proportions may be varied to produce the desired behavioral characteristics in processing and the desired final texture. Cost may also be a factor in the choice of aerating agents.

All of the available aerating agents must be hydrated before use. They may be ineffective unless the correct proportion of water is used and an adequate period of time for hydration is allowed (Figure 2). The quantity of water required varies from agent to agent. The amount used in any specific formulation will also be dependent upon the desired final moisture content of the product. Most of the aerating agents are not easy to hydrate. They require substantial quantities of water, good agitation for dispersion and usually



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