

### 1.2.1 Preparation of cocoa nib – flavour development

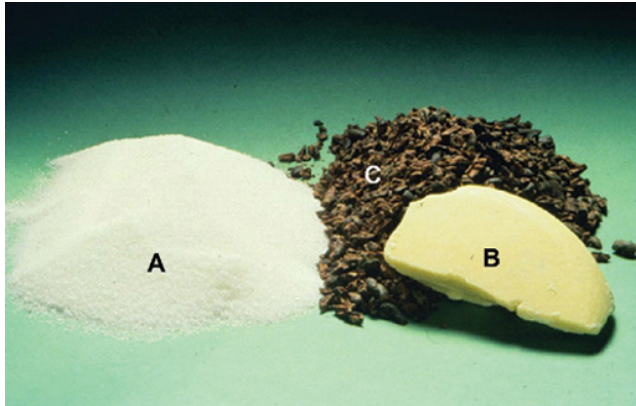
The cocoa tree produces pods containing a pulp and the raw beans. The outer pod is removed together with some of the pulp and the beans are fermented. This enables chemical compounds to develop inside the beans, which are the precursors of the flavour in the final chocolate. Failure to carry out this stage properly cannot be rectified by processing at a later date. This is also true of the subsequent stage, when the fermented beans are dried. Poor control here can give rise to moulds, which give a very unpleasant-flavoured product, even if the fermentation has been carried out correctly. Similarly where beans are accidentally contaminated with smoke from a faulty drier, the resulting cocoa will be unusable. In addition, correct transport conditions are required when the beans are moved from the country of growing to that of chocolate manufacture.

On arrival in the processing factory, it is necessary to clean the beans to remove metal and stones and other extraneous material that might contaminate the product. Further flavour development is subsequently obtained by roasting the beans. This also loosens the shell round the outside of the bean and enables them to break more easily. (Some chocolate manufacturers prefer to heat the surface of the beans, to facilitate shell removal and to carry out the full roasting of the cocoa bean centres, either as whole pieces or as a liquid following grinding. This is described more fully in Chapter 3.) The beans are then broken and the relatively lighter shell particles removed by a winnowing action. The presence of shell in the final chocolate is undesirable as it will impair the flavour, as well as causing excessive wear to the subsequent grinding machine. It should also be noted that the shell content of chocolate is legally restricted in some markets. In some countries the shell itself has found a use in horticulture.

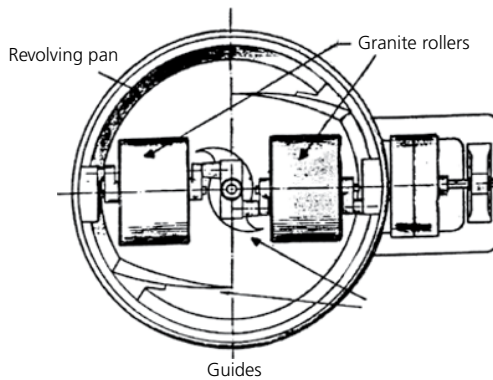
### 1.2.2 Grinding – particle size reduction

Up to this stage the cocoa is in discrete pieces, several millimetres in diameter. Subsequent processing may take several forms, but all require the solid cocoa particles, sugar and any milk solids to be broken so that they are small enough not to be detected on the tongue. The actual size depends upon the type of chocolate and the market in which it is sold, but in general the vast majority of particles must be smaller than 40 microns (0.0015 inch). The unground ingredients used to make dark chocolate are shown in Figure 1.3.

The most common method of achieving this is by the use of roll refiners. In order to enable the chocolate ingredients to pass through the refiner, however, it is necessary to get them into a paste form. This may be done in a variety of ways. One of the most common is to grind the nib to form cocoa mass, which is a liquid at temperatures above the melting point of cocoa butter, 35 °C (95 °F). This usually involves hammer mills, disc mills, ball mills, three-roll refiners or a combination of the four. The sugar can then be added in a granulated or milled form and the two mixed with extra fat (and milk powder if milk chocolate is being manufactured). The mixing may include some grinding, and traditionally a melangeur



**Figure 1.3** A picture of the unmilled ingredients used to make dark chocolate. A is sugar, B is cocoa butter and C is cocoa nibs.



**Figure 1.4** Diagram of melangeur pan.

pan was employed for the purpose. This machine has a rotating pan, often with a granite bed, on which two granite rollers rotate. Scrapers ensure mixing by directing the material under the rollers (Figure 1.4). The modern requirement for continuous higher throughput methods has often lead to the mixing and grinding being carried out separately. Probably the most widely used, is to mix the initial ingredients into a paste and then grind this on a two-roll refiner. This gives a sufficient amount of crushing and mixing to provide a particle size and consistency suitable for feeding to the five-roll refiner (see Chapter 9).

Where chocolate crumb is used, this dehydrated mixture of condensed milk and cocoa mass is normally preground to a maximum size of 2 mm (0.1 inch). This is then crushed and mixed with fat in order to provide a suitable paste for processing in a refiner.

The most widely used alternative method is to mill the solid ingredients (i.e. sugar, milk powder and/or crumb) separately and then mix with the liquid components (cocoa mass, cocoa and cow's butter and lecithin) in the conche.