

## Cocoa Beans

### Cocoa beans are the seeds of the cocoa tree

#### Main growing areas are Indonesia, West Africa and South America

The cocoa beans are exported worldwide. The most important products which we as consumers come in contact with are cocoa beverages and chocolate. The most important characteristic trait for us is the taste.

But before they become chocolate, the cocoa beans have to be roasted, peeled and cracked open. Hereby the broken pieces of the cocoa cores evolve the so-called nibs. These nibs are then ground to a semi-fluid cocoa mass. For the production of cocoa powder, the mass is pressed and the pressed patty ground. The accrued cocoa butter is processed along with the cocoa mass into chocolate.

The comminution of the nibs was already replicated several times in the laboratory. For this, up until now the **Mortar Grinder PULVERISETTE 2** and the **Planetary-Ball Mill PULVERISETTE 6 classic line** were utilized. Hereby, the in the cells embedded fat, the cocoa butter, discharges and joins the broken pieces, depending on the temperature and application of energy to a dark brown mass.



Fig. 1: Initial sample of cocoa

#### Proven for sensory testing's is the comminution with a Mortar Grinder

For the production of chocolate mostly industrial roller plants are utilized. The Mortar Grinder PULVERISETTE 2 passes the energy with pressure and friction to the material to be milled. The applied energy per time unit is much less as than with a planetary ball mill, which is optimized to the maximum impact energy. Therefore, the mortar grinder does not correspond any longer with the large-scale technical process.



Fig. 2: Sensory testing

#### Aspects of the sensory testing

The sample remains in the mortar grinder with surrounding temperature. The fat is only partially squeezed from the grain and a clod shaped mass evolves. For sensory testing's have to be beside the shape of the mechanical strains also the consistency of the sample be imitated. Here you must work with higher temperatures.

For this we would recommend a zirconium oxide mortar bowl and pestle. The mortar bowl and also the pestle are to be warmed inside the heating cabinet to 50 °C. The retained energy is sufficient to produce in the 10-minute process period a homogenous mass capable of flowing. Then distinguished palates decide in regards to the quality of the supplied cocoa beans the further use.

**Milling with the PULVERISETTE 6 classic line**

Is the task to examine the sample in regards to pesticides from cultivation, mycotoxins from the first steps of production or the improper transport, respectively storage or heavy metals, then the Planetary-Ball Mill PULVERISETTE 6 *classic line* is the solution. With this instrument, in an extremely short amount of time, an absolute homogenous mass can be obtained.

In the example the 250 ml zirconium oxide grinding set equipped with 20 mm balls was used. 50 g weighed-in-quantity is after 2 minutes the most beautiful chocolate. The first look inside the opened grinding set leaves nothing to be desired in regards to the fineness and homogeneity. The high application of energy does influence the sensory testing though.

**Grinding amounts of 2 kg**

The request was to grind the nibs down to a preferably fine pourable powder. The two first mentioned mills can be eliminated based on the desired final product. Therefore the **Variable-Speed-Rotor Mill PULVERISETTE 14 classic line** was chosen for this task. 100 g nibs were comminuted in less than a minute. Utilized was a 2 mm sieve. A glance into the open grinding chamber shows, that there is still enough room for additional material. In order to obtain the required amount of 2 kg either you have to work batch wise or the instrument has to be equipped with the conversion-kit for the comminution of large quantities.



Fig. 3: Cocoa after grinding for 2 minutes



Fig. 4: Cocoa ground down for 2 mm

**The task was met**

The obtained fineness is sufficient enough though. The material becomes even finer, when sieved through a 2 mm sieve. A comminution by using the 1 mm sieve is unsuccessful.

Tests to additionally increase the fineness by mixing with dry ice were not carried out. This would be a promising approach though to obtain an even finer, pourable powder in this manner.



Fig. 5: 100 g cocoa after 1-minute grinding

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