



**SNS COLLEGE OF TECHNOLOGY  
(An Autonomous Institution)  
Coimbatore.**

**UNIT IV – TOPIC 1**

**Need for pulse milling -unit operations of pulse milling-domestic and commercial scale pulse milling methods**

**Introduction**

Pulses are the edible seeds of pod bearing plants are widely grown throughout the world. Pulses have a high protein content ranging from 20-30% and this makes them important in human food from the point of view of nutrition. Because of this high protein content, they are also known as “poor man’s meat”. An alternative name for pulses is “legumes”, which is common in many parts of the world. In India, the term “gram” is commonly used for dry legume seeds with husk, while split decorticated grains are called “dhal”. Like many leguminous crops, pulses play a key role in crop rotation due to their ability for fix nitrogen. Green gram, red gram, bengal gram, horse gram, cluster bean, field bean, cow pea are some of the common types of pulses. In general, their protein content is high and is commonly more than twice that of cereal grains, usually constituting about 20 per cent of the dry weight of seeds. Pulse seeds are also sources of other nutritionally important materials, such as vitamins and minerals. Milling of pulses is removal of outer husk/hulls and splitting the grain into two equal halves. The husk/hull is more tightly held by the kernel of some pulses poses problems. The alternate wetting and drying method is used to facilitate de-husking and splitting of pulses. The traditional method of milling yields only 65-70 % as compared to 82-85 % potential yield. Also, traditional methods results in high losses in the form of powder and broken. Therefore, it is necessary to improve the traditional methods of pulse milling to increase the total yield of de-husked and split pulses and reduce losses.

**Pulse milling process**

Basic processes in dhal milling are cleaning, de-husking, splitting, separation and bagging. Major variation is involved with de-husking process only. Dhals like Aarahar, urad, moong and lentil are difficult to de-husk as a result repeated operations by de-husking rollers are required. Rewetting and drying is done to loosen portions of husk sticking after repeated rolling. Linseed oil is used to impart shine or better appeal to the milled dhal.

The removal of the outer husk and splitting the grain into two equal halves is known as milling of pulses. To facilitate de-husking and splitting of pulses alternate wetting and drying method is used. In India trading



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milling methods produce de-husked split pulses. Loosening of husk by conditioning is insufficient in traditional methods. To obtain complete de-husking of the grains a large number of abrasive forces is applied in this case as a result high losses occur in the form of broken and powder.

In India, there are two conventional pulses milling methods; wet milling method and dry milling method. The latter is more popular and used in commercial mills. The dry milling quality is found to be good and on an average 70-72 % dhal recovery is reported. Wet milled dhal is of better taste than dry milled dhal, but takes longer cooking time.

There is no common processing method for all types of pulses. However, some general operations of dry milling method such as cleaning and grading, rolling or pitting, oiling, moistening, drying and milling have been described here.

**Cleaning and grading:** Pulses are cleaned from dust, chaff, grits, etc., and graded according to size by a reel type or rotating sieve type cleaner.

**Pitting:** The clean pulses are passed through an emery roller machine. Husk is cracked and scratched in this operation. This is to facilitate the subsequent oil penetration process for the loosening of husk. The clearance between the emery roller and cage (housing) gradually narrows from inlet to outlet. As the material is passed through the narrowing clearance mainly cracking and scratching of husk takes place by friction between pulses and emery. Some of the pulses are dehusked and split during this operations which are then separated by sieving.

**Pretreatments with oil:** The scratched or pitted pulses are passed through a screw conveyor and mixed with some edible oil like linseed oil (1.5 to 2.5 kg/tonne of pulses). Then they are kept for about 12 hours for diffusion of the oil.

**Conditioning of pulses:** Conditioning of pulses is done by alternate wetting and drying. After sun drying for a certain period, 3-5 % moisture is added to the pulse and tempered for about eight hours and again dried in the sun. Addition of moisture to the pulses can be accomplished by allowing water to drop from an overhead tank on the pulses being passed through a screw conveyor. The whole process of alternate wetting and drying is continued for two to four days until all pulses are sufficiently conditioned. Pulses are finally dried to about 10 to 12 % moisture content.



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**De-husking and Splitting:** Emery rollers, known as Gota machine are used for the de-husking of conditioned pulses About 50 % pulses are de-husked in a single operation (in one pass). De-husked pulses are split into two parts also, the husk is aspirated off and de-husked split pulses are separated by sieving. The tail pulses and unsplit de-husked pulses are again conditioned and milled. The whole process is repeated two to three times until the remaining- pulses are de-husked and split.

**Polishing:** Polish is given to the de-husked and split pulses by treating them with a small quantity of oil and/or water.

### **1. Home scale milling**

Home scale milling involves mixing of grains with water. The grains are sun dried followed by pounding for dehusking. Dehusking is carried out by using a mortar and pestle and drying in the sun for few hours. Sun-drying after water application helps to loosen the husk from the cotyledons. In mortars, dehusking is achieved due to shearing action between pestle and grains, and abrasive effect between the grains. Once the pounding is done for several minutes, the husk gets detached from the grains. Winnowing separates husk and split cotyledons. Cotyledons are separated from the whole dehusked and unhusked grains by manual sieving. The whole grains are again pounded for further dehusking and splitting (**Figure 2**). This technique of dehusking is adopted when small quantity (upto 5kg) of pulses is to be dehusked. Dal yield by this process is quite low (50-60%). Breakage and chipping of the edges of cotyledons will be more.

### **2. Commercial scale milling**

Commercial scale milling involves processing large quantities of pulses in plants of bigger capacities. The basic milling procedure is similar. Dehusking methods vary widely from one dal mill to another dal mill and region to region.

Two methods for large scale processing of pulses are in practice.

- i. **Traditional method milling**, most commonly followed by dal millers. It is almost similar to cottage level treatment in principles.
- ii. **Modern method** milling has been developed at Central Food Technological Research Institute (CFTRI) which is independent of weather conditions.