Frequently asked questions

1. Define milling.

Ans: The process of removal of husk from the cotyledons is called dehusking. The entire process of dehusking and subsequent splitting of cotyledons, its cleaning, polishing and grading is known as milling.

2. Explain difficult-to-mill and easy-to-mill pulses.

Ans: Pulses are mostly consumed in the form of dehusked splits, commonly known as dal. The outer layer of the grain (husk) is attached to the protein and starch bearing cotyledons of the pulse grains. In some grains bonding will be very strong. The strongness is due to the presence of a layer of gums in between the husk and the cotyledons. These types of pulses are known as difficult-to-mill pulses (urdbean, mungbean and pigeonpea). In other grains, this bonding is comparatively weaker. These grains can be milled easily and are categorized as easy-to-mill pulses. (chickpea, pea, lathyrus).

3. What is the Home scale milling?

Ans: 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.

4. What is the Cottage scale milling?

Ans: Traditionally, villagers use the hand operated wooden or stone chakki/sheller when comparatively large quantities of pulses are to be dehusked. The technique is similar to those of the home-scale methods. Prior to milling pre-conditioning of grains is carried out. Pre-conditioning is done by two ways. (i) By prolonged sun drying until the hulls are loosened. (ii) Through application of water followed by several hours of sun drying and tempering. The

heating of the grains in pan with or without sand along with vigorous stirring is also in practice. The duration of treatment depends upon the variety of pulses to be milled. There are no standard dehusking techniques at the cottage level.

5. Discuss about the effect of milling on Nutritional quality

Ans: From a nutritional point of view using pulses with or without milling, have several advantages and disadvantages. Separation of husk decreases nutrients but improves digestibility and/or bioaccessibility. The extent of the losses depends upon the degree of milling and the distribution pattern of nutrients in the grain. During milling the nutrient losses-particularly vitamins and minerals is very large. Therefore, it can be observed that milling has mutual effects on nutritional quality.

6. How pulses are cleaned and graded during the milling process?

Ans: Pulses received at the mill needs to be cleaned and size graded for yielding good quality dal with higher recovery. Even during dehusking operation, pulses are subjected to sieving. This separates out husk, brokens, splits, gota (dehusked pulse) and whole (unhusked) pulses. Usually two, types of cleaners are used: reciprocating air-screen cleaners and reel screen cleaners. In reciprocating air screen cleaners air is blown through two screens (sieves). This separates lighter material such as dust, stalk, dried leaves, husk etc.

7. What is meant by pre-milling treatment?

Ans: The treatment is given for loosening of husk from cotyledons, which is attached through a gum layer called pre-milling treatment. Mostly pre-milling treatments are developed for difficult-to-mill pulses. Commonly adopted Pre-milling treatments are (a) water soaking, (b) oil and water application, (c) mixing of sodium bi-carbonate solution and (d) thermal applications.

8. How are grains dried in the milling process?

Ans: In most of the mills in India, sun drying method is commonly practiced. Grains are spread in thin layer on pucca floor under the sun and stirred frequently with rake/feet for even

drying. This operation makes process of dal milling a very lengthy requiring (2-3days). In this case, sun-dried grains require more passes and consumes more energy.

The drying time with the use of dryers ranges between 2-3hrs, which results in tremendous time saving. Dryers are used in few mills that too in rainy seasons for drying of treated grains.

9. How is dehusking and splitting of grains is carried out in the milling process?

Ans: Dal mills by and large use emery rollers for dehusking and splitting. In case of difficult-to-mill pulses, more than 3 passes are required for complete milling. Easy-to-mill pulses take one or two passes in emery mill in order to achieve maximum milling.

The physical, chemical and structural strength of grain coupled with the functional and mechanical characteristics of processing units jointly play an important role. Grain properties such as hardness, load deformation behaviour, shape, size density and variety of grain etc. have considerable effect on dal yield. The machine parameters such as roller speed, clearance, emery size etc. have vital role to play on dal recovery. As a result of milling, unhusked and dehusked whole grains, split cotyledons, broken, husk and powder are obtained. Whole grains are passed again for further dehusking and/or splitting after water treatment. Husk and powder produced during milling is generally separated with the help of aspirator.

10.Why grains are polished?

Ans: Polishing is done to increase consumers appeal and is a form of value addition. Dal is polished in different ways, such as nylon polish, oil/water polish, leather and makhmal polish. Generally, polishing is done using soap stone, oil or water. Polishing gives uniform look and shine to each grain.

11. List the modern technologies in milling of pulses

Ans: Different methods of modern technologies in milling of pulses are:

- i. Pantnagar process (Chemical treatment)
- ii. Pantnagar process (Enzymatic treatment)
- iii. Central Institute of Agricultural Engineering (CIAE) Process
- iv. CFTRI Process

12. Discuss about Chemical treatment process for milling of pulses.

Ans: In Chemical treatment process, cleaned and graded difficult-to-mill grains are treated with 10 percent sodium bicarbonate solution mixed in the ratio of 30:1. These grains are then heaped for 5hours at 30°C followed by drying under the sun. The tempered and dried grains are passed through rollers. The milled product is cleaned and graded with a blower, cyclone separator and grader. The husk, broken and powder are removed separately. The gota (dehusked whole grain) obtained is mixed with 2-2.5% water and kept for 4 hours for tempering. These grains are passed through splitter for dal making.

13. Discuss about Enzymatic treatment for milling of pulses.

Ans: Milling, will be carried out on enzyme treated difficult-to-mill grains at different combination of pre-treatment parameters. The parameters considered are, moisture content of seed, incubation period and temperature. Enzymatic pre-treatment has positive effect on hulling efficiency. Hulling efficiency of untreated grains will be around 60.82%. When compared with just water treatment (73.90%), enzyme (89.68%) treated grains efficiency will be more. The enzyme treatment not only increases the hulling efficiency but also reduces the amount of powder formed. Enzyme treatment improves digestibility of dal protein and reduces cooking time.

14. Discuss about CIAE process for milling of pulses.

Ans: Cleaned and graded difficult-to-mill grains are fed in a roller mill for scratching. Once the scratching is over, then grains are cleaned to separate the husk and split grains. Whole and split grains are soaked in water at ambient temperature for 25-30 minutes to produce moisture content of about 35 (% wt) and then dried to 10% moisture content. The dried grains are milled in a cylindrical abrasive mill to produce dehusked split dal. Split dal is separated from other constituents with an air-screen grain cleaner.

15. Discuss about CFTRI process for milling of pulses.

Ans: The technology developed at CFTRI overcomes the major problems of weather dependent nature of pulse milling industry and gives high dal yield in lesser time. The loosening of husk is achieved by heating of grains in hot air current followed by tempering. Removal of

husk and splitting of grains is achieved by improved processing machines. This conditioning technique through heat treatment and moisture adjustment of the cleaned, size-graded grains loosens the husk, while making it fragile and brittle besides hardening the kernels. The process involves two passes in a drier with 160°C hot air, followed by tempering for 6 hours. The operation is continuous, replaces sun drying and carried out indoors.