

**POST HARVEST ENGINEERING
OF CEREALS , PULSES AND
OILSEEDS BTAP2204 3(2+1**

PULSE MILLING

TYPES OF PULSES



INTRODUCTION

- **Pulses** are the dry, edible seeds of plants in the legume family, including chickpeas, lentils, dry peas and beans.
- Pulses are rich in protein and consumed in the form of dehusked split pulses.
- Madhya Pradesh is **India's largest pulse producing state**, which accounts for 23% of total **pulse production** in the country.
- India is the **largest producer**, consumer and importer of **pulses** in the **world**.

- **Major pulses** grown in India are chickpeas (gram), pigeon pea (tur or arhar), moong beans, urd dal, masur (lentil), peas and various kinds of beans.
- Pigeon pea is the 2nd important pulse crop after the Chick pea.
- The average % of husk in Arhar is 15% and endosperm is 85%.
- Chick pea husk content is 10-12%.

MILLING OF PULSES

- Milling of pulse means removal of outer covering or husk and splitting the grain into equal halves.
 - The husk is tightly held by kernel so dehusking becomes difficult.
 - Therefore the method of alternate wetting and drying is used to facilitate dehusking and splitting.
 - **Methods are milling :**
 1. Wet Milling
 2. Dry milling
 3. Jabalpur method
 4. CFTRI method
 5. Pantnagar method
 6. CIAE method
- Dry milling is more popular and used in commercial mills.

DRY MILLING

➤ The steps are as follows: (It require 3-4 days)

1. Cleaning
2. Pitting
3. Pretreatment with oil
4. Conditioning
5. Dehusking and splitting
6. Polishing

➤ It results in 75% of dhal recovery

➤ **Cleaning:** is done by a reel type or rotating sieve type cleaner.

➤ **Pitting :**

- It is the process which results in cracking and scratching of husk that facilitate oil penetration and loosening of husk.
- For this, clean pulses are passed through emery roller machine. The machine consists of roller and cage(housing).
- The clearance between the roller and cage gradually narrows towards the outlet and due to this friction occurs between the pulse and emery .
- Thus results in cracking and and scratching of pulse.

➤ **Pretreatment with oil:**

- The scratched pulses are passed through a screw conveyor and mixed with edible oil like linseed oil @ 1.5-2.5kg/tonne of pulse.
- Then they are kept for diffusion for 12 hours.

➤ **Conditioning :**

- It is done by alternate wetting and drying.
- After sun drying for certain period, moisture is added and tempering is done for 8 h.
- This process is done for 2-4 days till they are sufficiently conditioned.
- Then drying is done to reduce the MC to 10-12%.

➤ **Dehusking and splitting:**

- Gota machine is used for dehusking.
- About 50% pulses are dehusked in one pass and then dehusked pulses are split.
- Generally two-three pass results in complete dehusking.

➤ **Polishing :**

- Small quantity of oil or water is added .

➤ **Grading of dal:** Done using sieve.

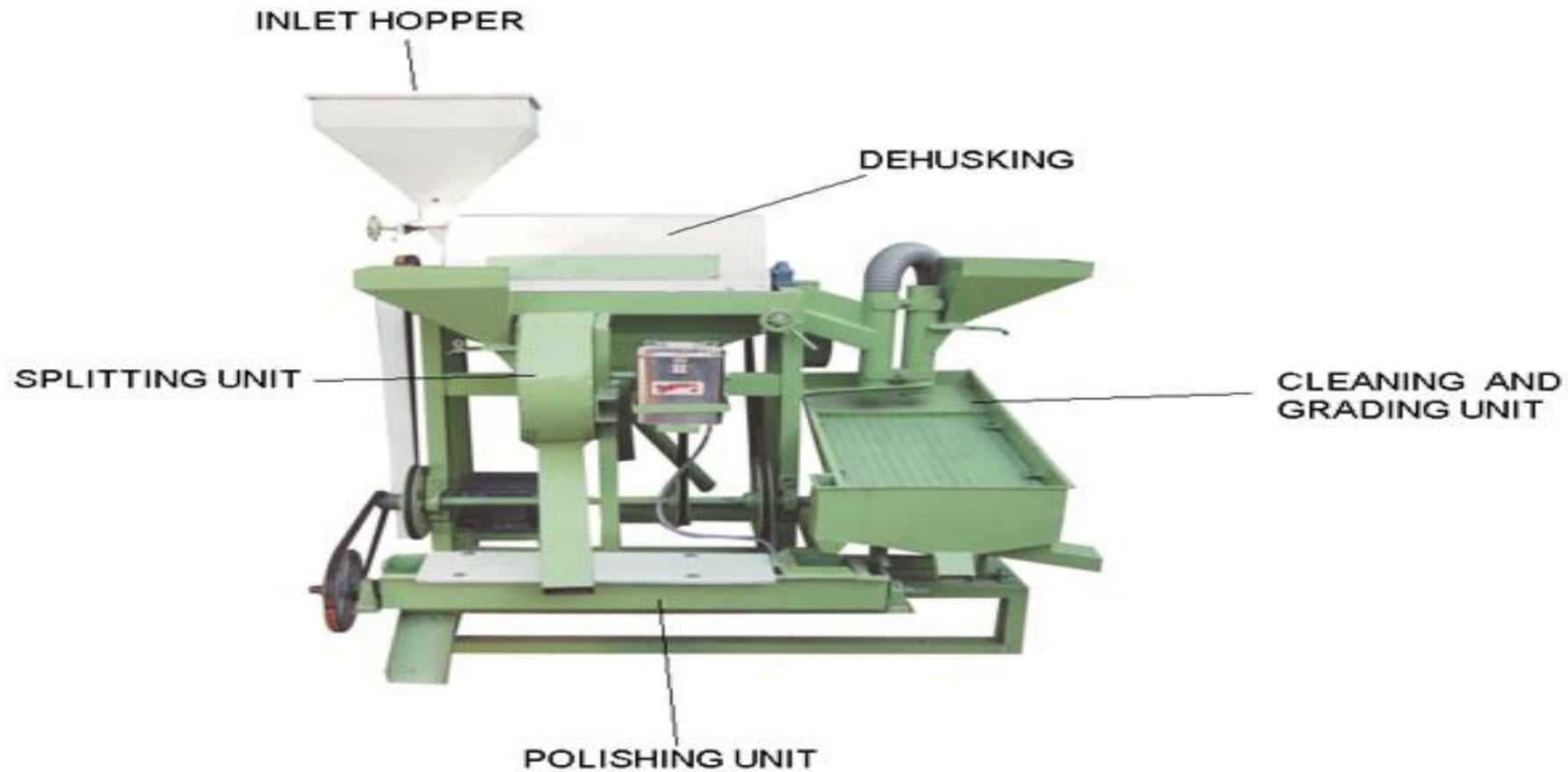
WET MILLING

➤ Steps are as follow: (It requires 4-5 days)

1. Cleaning
2. Soaking- It is done for 3-12 h
3. Mixing the soaked pulses with 3-5% red earth and heaped for 12 h
4. Sun Drying and tempering for 2-4 days
5. Separation of red earth: by sieving
6. Dehusking and splitting- 95-98 % are dehusked
7. Grading

➤ It results in 72% of dhal recovery

DAL MILLING MACHINE





Milling efficiency

The overall efficiency of the pulse milling system can be estimated with the help of the following equations.

$$1. \quad E = \left(1 - \frac{M_{uh}}{M_t}\right) \left(1 - \frac{M_b}{M_t}\right) \times H_I \times 100$$

where, $H_I = \frac{H_a}{M_t H_t}$

E = milling efficiency

M_{uh} = mass of unhulled grains

M_t = mass of grains fed to the system

M_b = mass of brokens

H_a = actual mass of husk removed during milling

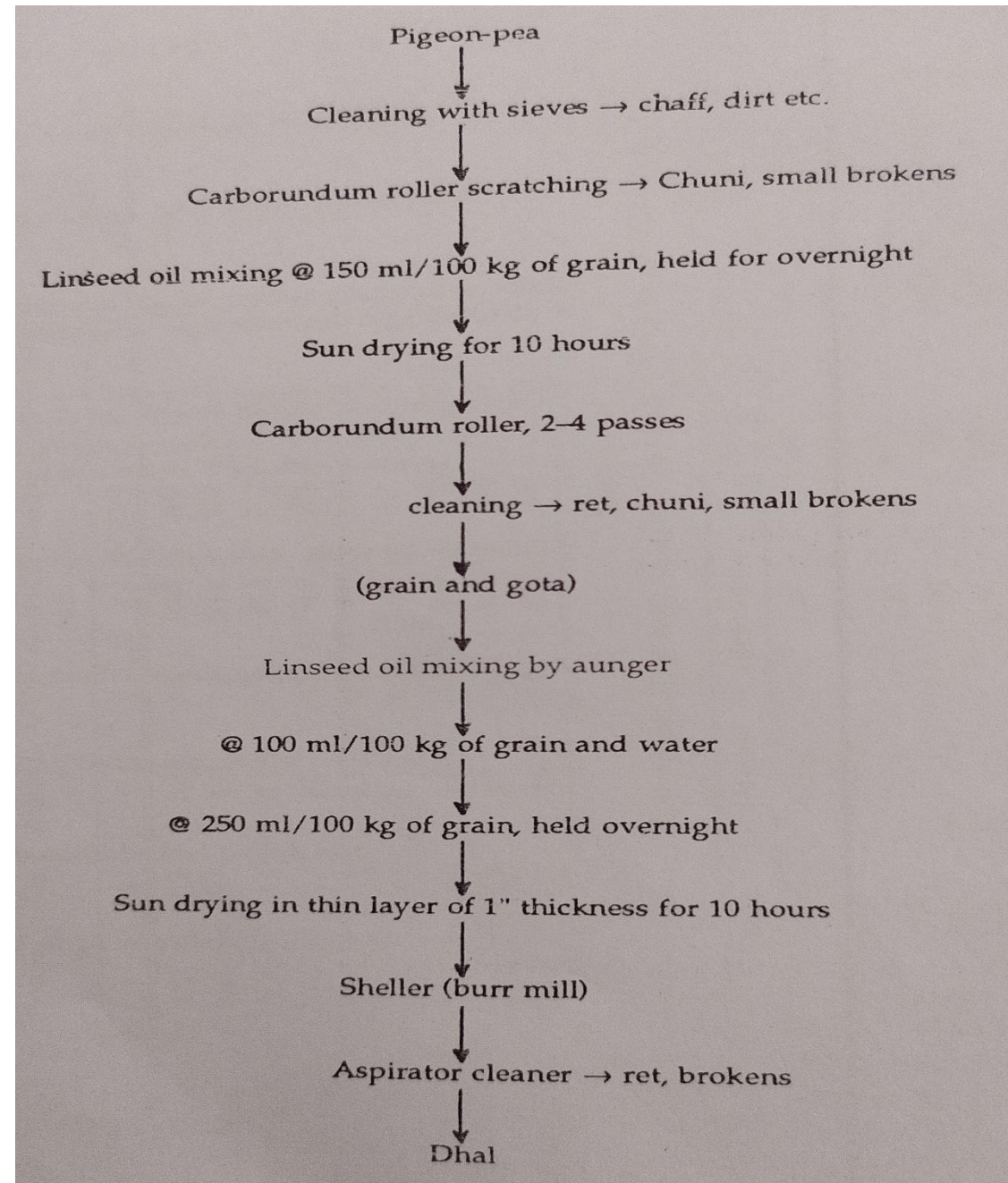
H_t = theoretical husk content of the grain

The theoretical husk content of common Indian legumes are given in Table 5.12

Table 5.12
Husk content of Indian legumes

<i>Grain</i>	<i>Husk Content, %</i>
pigeon pea	13.0–15.0
green gram	12.0
black gram	12.0
lentil	11.5
Bengal gram (chick pea)	11.5–13.0

Milling of pulses in M.P.(JABALPUR method)



CFTRI method of pulse milling

- This method eliminates mixing of oil and water for loosening of husk.
- Clean and graded grains are conditioned by dry heat treatment in 2 passes in LSU dryer with 120°C hot air.
- Grains are tempered for 6 h after completing each pass. The flowchart of CFTRI method is given:

