3. Infrared pre-treatment system for pulse milling

Removal of husk from the cotyledon is the foremost requirement to utilize any legume in the form of *dal*. The husk is tightly bound with cotyledon via natural gums and polysaccharides. Therefore, it is required to give proper pre-treatment to loosening of biological bonds prior to milling. Hydro-thermal treatment is commonly, commercially used treatment for pigeon pea but it is time, labour and energy consuming, expensive and poses some other quality and safety issues. Therefore, an effort has been made to develop controlled Infrared radiation based pre-treatment technology to reduce time, drudgery and cost of operation.

An infrared treatment system prototype consists of feed hopper, infrared heating module, metallic reflector, material conveying deck, and vibratory motor. The heating module has five Mid-Infrared range heaters of 2000 W each. Heat flux is maintained using a concave shaped mirror-polished metallic reflector. The material is conveyed in single layer beneath the heaters on a material conveying deck driven by vibration motor. The exposure time of the grains under infrared is controlled in the range of 1 to 3 min by controlling vibrations of conveying deck with the help of VFD driven vibratory motor. The system is suitable to adjust spacing in the range of 45 mm to 120 mm. The machine has output capacity of about 200-250 kg/h.

The treatment parameters are optimized for pigeon pea (cultivar *ICPL-87119*) keeping in view of maximum dehulling efficiency and dal recovery with minimization of broken loss. At the optimum operating condition i.e. 10% moisture content, 120 mm of heater to grain surface distance and 1 min of exposure time. The treatment is given to the pre-scratched pigeon pea grains in two passes. Present treatment yields the 85.92 % of dehulling efficiency, 91.08% degree of dehulling, 78.01 % dal recovery with 2.03% broken and 17.39 % mealy waste losses. The treatment cost for this treatment for pigeon pea is about Rs. 600 per tonne.

Salient features of the technology over existing technology:

- This treatment considerably saves treatment time, labour and space required in conventional practice.
- The pre-treatment operation is generally carried out for 1-2 days, which gets reduced to few minutes.
- It is possible to operate dal mill in continuous mode if integrated properly using suitable material handling aids.
- Since open sun drying, normally practiced in the conventional method, is avoided, the dal milling process can be carried out in any season.

Infrared Treatment Unit