

Minimizing postharvest losses in pulses

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Pulses have always been in deficit to match the large domestic demand of vegetarian population of India. Combination diet of cereals and pulses on daily basis across the country makes pulses a staple food. After green revolution, the production of wheat and paddy increased several manifolds. But the similar growth could not be attained in case of pulses, where pulse production remained stagnant for several decades. Pulses are mostly grown in rain-fed areas by resource poor small and marginal farmers. Unlike wheat and paddy, pulses are less responsive to inputs like nutrients and fertilizers. Concerted efforts were made through AICRPs on pulses involving NARS resulted into development of climate resilient and disease resistant improved varieties. Policy interventions such as increased availability of quality seeds, enhanced minimum support prices, procurement for buffer stock, encouraged farmers to include pulses in crop cycle. Outcome of these interventions led to the all-time high production of pulses. But still there is need for import to meet inhouse requirements. It has also been observed that significant amount of pulses is lost in various postharvest handling and operations. Minimizing these losses will make more pulse proteins available for human consumption.

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INDIA, a nation with a substantial vegetarian population, mainly relies on pulses for its protein requirements. Certain amino acids are not synthesized by the human body and must therefore be obtained from external sources. Since animals can synthesize these proteins, therefore, non-veg is often considered as source of complete proteins. Traditionally, Indian diets have been built around a blend of pulses and cereals throughout the country. These combination foods provide all the essential amino acids in a balanced fashion, and the combination is at par with animal proteins. Probably this is the main reason that wheat and pulses are staple foods of the country. Pulses being rich source of proteins start attracting insects from the field itself. The insect activity increases during storage under favourable environmental conditions. Since

gunny bags and PP woven bags are quite prevalent in India, pulses are prone to infestation in godowns. Also pulses are consumed mostly in form of dehusked splits, i.e., dal after milling. Among all the postharvest stages, storage and milling contribute maximum to the losses. Though efforts are being made to increase production and productivity enhancement through improved varieties and management practices, but by minimizing post-production losses, availability scenario of pulses can further be improved.

Value chain in pulses

Value chain of pulses, like any other commodity, comprises of all stakeholders involved from production till consumption. Once the crop is mature in the field, it goes through various processes, viz. harvesting, threshing, cleaning,

grading, drying, storage, milling, packaging, wholesale and retail distribution, processing etc., before ultimately reaching to consumer's plate. Basically, it starts from seed production and seed chain too, prior to production. Every chain stakeholder's profitability is guaranteed in a successful value chain. Often it is believed that by doubling the production, farmers income can be doubled, but what happens is just opposite. This can easily be realized for perishable crops, like fruits and vegetables. Pulses being rich in proteins are also vulnerable to deteriorations caused by insects. In the entire postharvest value chain of pulses, farmer is the weakest link, who takes all the challenges and risk to grow pulses over more assured crops. Increasing production frequently results in losses for the farmers. Presently in entire value chain, farmers is

supplier of cheap agricultural produce whereas whole value chain is located out of rural areas. Since still majority population of the country lives in rural areas, thought must be given to decentralize the storage and processing facilities in production catchments to reduce transportation and handling losses and costs. This will also help in strengthening the rural economy by extending income and employment opportunities. In order to make farming viable, a new way of thinking about the full value chain of production is required, in which all key players, including farmers, have a win-win situation.

Postharvest losses

Though India is the world's greatest producer of pulses, but still has to import pulses to cater need of domestic demand. The country's per capita availability of pulses is far less than the 80 g recommended amount by the World Health Organization and FAO. The ICMR has reduced per capita requirement of pulse to 47 g/day/person considering alternative protein sources, but pulse availability is still lower than that. Though pulses production is reaching sustainable newer heights, but demand is also increasing with the growing population. Imports are being used to cover this shortfall. It has been stated that postharvest losses, including milling (15%) and storage (10%), total more than 25%. In addition, 5% of the grain is retained for seeds. As a result, about 25% of the entire production is out of the food chain which significantly lowers availability of pulses. There are two ways to reduce the gap between supply and demand, either by increasing production or lowering the huge postharvest losses. It is equally vital to use both of these strategies to increase the per capita availability of pulses.

Primary processing

Farm level primary processing, after threshing will help farmers to fetch better prices at mandi level. Every procurement agency has stringent quality norms at the time of collection. Presence of impurities and high crop moisture,

adversely affects the grain quality during storage. Grains stored at high moisture are prone to fungal growth and facilitate infestation. At every stage of value chain, there is income and employment potential. Pulse millers also need the uniform quality of grains with least impurities in order to produce quality dal. Even for the farm level storage, it is necessary to clean, grade and dry the grains before storage. Development of rural level primary processing facilities will ensure quality grain supplied to storage agencies or millers. This will also help in decentralized storage facilities for the local requirement of production catchments. This will also empower farmers to release grain to the mandi or market as per their financial requirements.

Cottage scale pulse milling

Various research organizations have developed small capacity mini dal mills, to cater the milling requirements of rural population. Mini dal mills developed by IIPR, Kanpur; PKV, Akola; CIAE, Bhopal; and CFTRI, Mysore are commercially available. These mini dal mills, with potential to improve employment and economic prospects, can be established within the production catchments. Higher milling recoveries are obtained from the cottage scale pulse milling as even dal with some husk cover and broken can also be consumed as dal. Broken part of cotyledons, can either be consumed directly or by converting it into pulse flour. It is easy to reduce losses at small scale processing. This also makes dal available to rural people at cheaper rates by reducing to and fro transportation cost and pilferages at each handling stage. Most of the dal mills use abrasive surfaces for dehushing of grains. Despite pre-milling treatment, significant scouring of cotyledon takes place in multiple passes and the powder gets mixed with outer seed coat to produce milling byproduct. A bit compromise on husk removal will make more fibre and protein rich dal available for edible use. IIPR Mini Dal Mill uses emery roller for

scratching of whole grain before pre-milling treatment. After treatment, soft dehushing and splitting is performed with vertical rubber-steel disk chakki mechanism. This prevents scouring of cotyledons and no powdering takes place. This also increases dal recovery while leaving a 5–10% husk cover on the dal surface. This unpolished dal can be consumed after cooking. It will be even better to consume whole pulses to altogether eliminating pulse milling, as most of the pulses except pigeonpea are consumed as whole grain. Processes for secondary and tertiary processed products from whole grain powder (flour) need to be developed with advantage of wholesome grains.



IIPR Mini Dal Mill

Value added products of pulses and milling byproduct

Traditionally, in India, pulses are consumed in many different forms such as dehusked splits, flour, home recipes, snacks, sweets, combined with cereals, roasted, puffed etc. Immature pulse grains are also consumed as raw, roasted, boiling, fried, crushed, or cooked. It can be eaten as dried grain, soaked, sprouted, boiled, steamed, fried, or prepared as dal after reaching maturity. Dal or sambar is cooked from dehusked cotyledons on regular basis at every household throughout the country. Additionally, dehusked splits are converted into flour to make a huge range of Indian delicacies. Processes like as soaking, heating, roasting, puffing, extrusion, germination, fermentation, and so forth are crucial in the creation of various dishes using pulses. Pulses can also be used for preparation of secondary

CONCLUSION

Pulses are an integral part of Indian dietary system. For the vegetarian population, requirement of all the essential amino-acids are met through combination diet of cereals and pulses. Despite India being the largest producer of pulses, we are the largest consumer too and depend upon imports to meet our domestic requirements. To make country self-sufficient in pulses, all the efforts are being made to increase production and productivity of pulses. Reduction in postharvest losses at various stages of handling can make more pulse available. Storage and milling are the major areas which contributes maximum to the postharvest losses. Decentralized storage and milling facilities will certainly help in reducing these losses. In commercial pulse mills, abrasive rollers are used for dehusking of grains. These units cause huge milling loss in terms of grain weight. Studies on biochemical aspects of milling byproduct and its fractions indicated that it is rich in nutritional compounds, including proteins and can be used for human consumption. The milling byproduct generated in these mills can be utilized for edible purposes, provided the byproduct is clean and hygienic. Installation of grain washing systems and sifters at milling units will make more pulse protein available for the vegetarian population of the nation.

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Value added products from pulses milling byproduct

and tertiary ready-to-cook or eat kind processed of products viz. idli, dosa, vada, papad, sev, soup. Usually these products are made from broken pulse obtained from milling of pulses. About 25-30% of grain weight is lost in form of pulses milling byproduct in abrasive dehusking methods, commonly adopted in commercial mills. The byproduct is mostly utilized as an ingredient to cattle or animal feed. In a Ministry of Food Processing Funded Project, food value of milling byproduct obtained from milling of different pulses were evaluated. It was observed that the pulses milling byproduct are rich in proteins, phenols, antioxidants and fibres (water soluble and insoluble). These biochemical parameters were studied for whole grain, dehusked splits, byproducts and fractions of byproduct viz., husk and powder.

Husk and powder fractions can be separated using sifters with suitable sieve size. Protein content of powder fraction was observed to be higher than that of dehusked dal, indicating location of proteins in peripheral region of cotyledons. Thus, milling byproduct of pulses can find potential edible usages. Various ready to cook or eat value added products, such as biscuits, cakes, buns, noodles, nachos, soup, instant dal etc., were developed from pulses milling byproducts. Powder fraction separated from the byproduct can be utilized as flour of dal (besan) and can be used for making traditional home recipes. Due to presence of fine husk particles in the powder fraction, the edible products prepared from it will certainly be dark in colour but in no way with lesser proteins, for which pulses are usually consumed.

Water

- Even though households are relatively low consumers of water, population growth and expanded water use have outweighed the effect of water saving technology and behavior.
- Less than 3% of the world's water is fresh (drinkable), of which 2.5% is frozen in the Antarctica, Arctic and glaciers. Humanity must therefore rely on 0.5% for all of man's ecosystem's and fresh water needs.
- Man is polluting water faster than nature can recycle and purify water in rivers and lakes. More than one billion people still do not have access to fresh water.
- Excessive use of water contributes to the global water stress. Water is free from nature but the infrastructure needed to deliver it is expensive.

- See more at: <http://www.unep.org/wed/theme/water.asp#sthash.ki5vg3IB.dpuf>

Courtesy: United Nations Environment Programme website - <http://www.unep.org/wed>