

Value addition of pulse products in India

Abbreviations: FAO, food and agriculture organization; IYP, international year of pulses; ANF, anti nutritional factors

Opinion

Nutritional arena of pulses can make the marked difference in their utilization and reduction in rampant malnutrition around the globe. Food and Agriculture Organization (FAO) and United Nations have declared 2016 as “International Year of Pulses” (IYP) and seeds as “nutritious seeds for sustainable future. Indian Pulse and Grain Association has also portrayed pulses the future ingredient to commensurate the nutritional and health benefits on India Food Security Portal¹ by virtue of their richness in plant protein, energy, dietary fiber, a wide variety of micronutrients and bioactive compounds.

Pulses and legumes terms are often used interchangeably. However, Codex Alimentarius Commission of FAO/WHO Food Standard programme^{2,3} has given clear distinction for pulses and legumes, on the basis of their fat content. Pulses are dry seeds of leguminous plants and legumes include oil seeds such as soybean and peanut. The crops which are harvested green are used as vegetables (green beans, peas and sprouts). There are about 11 primary pulses, i.e. (1) dry beans (2) dry broad beans, (3) cow pea, (4) chickpea, (5) pigeon pea, (6) lentil, (7) bambara beans (8) vetches, (9) lupins (10) (11) minor pulses. These seeds are dicotyledonous hence they can be used as whole, decorticated, or dehusked (called as dal).

Since the time of Purans and Mahabharata pulses have been an integral part of Indian Diet as dal- chawal, dal roti and in popular snacks like sattu, besan ke laddo, besan sev etc. All these are regularly consumed in wide variety of cuisines in different part of the country. Sattu is considered an ‘Instant’ food made by preparing flour from roasted chickpea and barley or wheat since the time of the Rig veda (8000BC) and often used by common people living in adverse conditions. Papads are traditional and very popular snack food primarily made from black gram flour with salt, oil and spices. Papads are now experimented for value addition by adding different cereal flours, green leafy vegetables. Hummus is another popular product using chickpea which has been found to reduce the postprandial glucose responses 4times less than that of white bread.

Pulses are source of constant supply of nutrition round the year and nutritional value of pulses per 100 gram is much higher than any other vegetarian food. Recently Indian Institute of Pulses Research, Kanpur, India, suggested that the pulses have tremendous scope to be popularized as ‘Health Food’ or ‘Nutri-Rich Food’. Presence of anti nutritional factors (ANF) limits the utilization of pulses but the same ones also act as bioactive substances exhibiting significant favourable effects on health in reducing the risks for coronary heart disease, diabetes and obesity. Hence food technologists are trying to explore them as functional foods and nutraceuticals. Inherent capacity to fix atmospheric nitrogen and the ability to increase the soil fertility and decrease the use of expensive chemical nitrogenous fertilizers make cultivation of pulses a good fortune for farmers also. Enhanced

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pulses production can also create opportunities for local value-added processing, stimulate domestic demand, and provide off-farm employment and sources of income for rural poor especially women and youth.

Value addition in pulses can be more fruitful in the market. Motivated by the consumer demand there is a need for development of short cooking time, microbial safety and high quality foods. Pulses being cheaper source of plant protein than nuts, milk, cheese, meat and fish can be used in bakery products like pasta, bread, snacks etc. Pulses provide ample opportunities to be used in processed foods like bread, pasta as well as an ingredient for designer foods for the snacks, baby foods and sport foods.⁴⁻¹⁴ They can fortify breakfast cereals, microwaveable or partly prepared pulse based meal in order to fulfil consumer demand of convenient meal solution. Food service sector also prefer quick cooking pulse products.

Pulses are not consumed raw hence processed to improve the eating quality, digestibility and nutritional and health significance. Dehusking, soaking, germination, cooking, roasting, germination and fermentation are commonly used processing techniques to make them edible. Soaking and germination help to eliminate the trypsin inhibitor activity, proteolytic enzymes inhibitors, phytates and tannins and increases the protein digestibility, bioavailability of mineral (iron and zinc). Conventional cooking, high pressure steaming, microwave cooking, autoclaving, splitting, significantly decreased the resistant starch and increased the carbohydrates, fat, tocopherols, level of bioactive compounds and antioxidant activity. Soaking in solution (1.5% sodium bi carbonate +0.5% sodium carbonate+0.75% citric acid) reduces the cooking time and improve protein quality and soaking dry beans in 0.5% sodium bi carbonate solution 18hr and/or pressure cooking at 121o C, 15psi for 30min also reduces flatulence producing oligosaccharides i.e. raffinose and stachyose contents in them. Soaking is very crucial in removing the neurotoxin β -ODAP from *Lathyrus sativus* seeds. Soaking them particularly in boiled water, alkaline or tamarind solutions is quite effective. Dose and duration need standardization in processing techniques.¹⁵⁻¹⁹

Germination of pulses is simple and popular technique to enhance the palatability, digestibility and nutritive value of seeds. Increase in vitamin B and C; utilization of available proteins and carbohydrates and decrease in antinutritional factors and flatulence factors are useful outcome of germination. Malting, roasting and fermentation are other preferred methods for developing many local food products in different parts of the world.

Several traditional, fermented, deep fried, sweetened, puffed products and popular Indian snack items like idli, dosa, besan sev, dhokla, cheela, pakodas, and sweets like laddoo and burfi contain one of the ingredients from pulse variety. Incorporation of chickpea flour or besan increases the mineral and fiber content of pasta and reduces the glycemic response and supports development of low GI pasta and spaghetti. Addition of chickpea and lentil flours in bread, snacks, and chips not only increased the bioavailability of nutrient but also improved the sensory and textural properties of the product and thus consumer acceptability. Though chickpea flour has poor shelf life and keeping qualities due to high fat content but this fat content is advantageous to improve binding of structure; flavour retention and mouth feel of the food products. Favourable nutritional and functional properties of cowpea and horse gram flours could also be exploited in the development of bakery products, soups, extruded products and ready-to-eat snacks.

Functional properties such as solubility, water and fat binding capacity and foaming are influenced by genetic makeup of the legumes and amino acid type, water oil absorption and protein solubility which determine their utility in the development of bakery products, soups, and extruded products and ready to eat snacks. Ratio of amylase to amylopectin also determines the functional properties of pulse starch such as in texture, rheological, swelling properties that are important in food application. High amylase starch retrogrades to greater extent than high amylopectin starches, resulting in higher degree of crystalline, syneresis and gel firmness.²⁰⁻²⁶ Technological processing may evoke positive effects like protein coagulation, starch swelling and gelatinization, texture softening and formation of aroma components. Technological processing and biofortification in different doses on pea plant improved in nutrition composition, antioxidant capacity, chlorophylls content and soluble sugars by several folds which can support developing attractive, convenient, ready-to-eat and tasty legume-based food formulations as per consumer demand. Thermal treatment (pressure cooker) increased the water absorption capacity in Bengal gram, black gram and lentil, while fat absorption and foaming capacities were significantly decreased in them. It also influenced the sensory scores for appearance, texture, flavour and overall quality for Seviya and 'Chakli', south Indian snacks. Hence use of dry pea in extruded products is useful in making value-added nutritious snacks. Extrusion cooking is one of the popular techniques for producing ready to eat snacks, having numerous processing conveniences over conventional processing method. It significantly decreases the concentration of the raffinose family of oligosaccharides and increased the dietary fiber. Rising incidence of food allergy, gluten allergy and rising demand for variety and convenient foods may make the pulses in the form of pulse flours and isolates. They can be effective and acceptable ingredient for value added food products.

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Conflict of interest

Author declares that there is no conflict of interest.

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