
The Eurasia Proceedings of Science, Technology, Engineering & Mathematics (EPSTEM)**Volume 1, Pages 336-338****ICONTES2017: International Conference on Technology, Engineering and Science****PULSE PROCESSING TECHNOLOGY**Hatice Pekmez
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Abstract: The year 2016 was declared "International Pulse Year" by Food and Agriculture Organization (FAO). Pulse is cheap, high quality source of vegetable protein, rich in starch and dietary fiber, high in digestibility, free of gluten, low in fat, low in cholesterol and low in glycemic index. When properly and regularly consumed, it is effective on many diseases. Cleaning, the first process in pulp processing technology, is carried out in fixed and mobile cleaning devices in order to improve the physical properties of the products and to remove foreign materials. Dry cleaning is applied as coarse separation, fine separation, magnetic separation, pod peeling and stone separation. In coarse separation, coarse sieve, aspirators (aspirator sieve, duo aspirators, classification aspirators), cylindrical sieves, scalperators (drum, vibro, circular) and selectors; in fine separation, silo aspirator purifier, mill aspirator purifier and trieurs are used. In magnetic separation, the metal parts in the pulses are caught by magnets. Rubbing and friction movements result in the outer pod of the product to be removed, while stone separators are used for removal of stone. Clean product is subjected to calibration which is carried out with screening machines to obtain a homogeneous structure and to standardize the product in terms of cooking time for the final consumer. Pulses then are subjected to sorting according to the color and hand sorting. A computer sorting system is used based on color while hand sorting is performed by selectors on both sides of the selection band to remove foreign and defective particles under hygienic conditions. Finally, the pulses are packed through a metal detector to remove metal parts. Cellophane, polyethylene (PE) pieced cardboard boxes, polyethylene bags are usually used as the packaging materials. Volumetric filling system and vertical type packaging machines are generally preferred. The shelf life of pulses is about two years.

Keywords: Pulse, cleaning, calibration, sorting, packaging

Definition and Importance of Legumes

Pulses are the common name of legumes given to the seeds of the dried vegetables such as beans, chickpeas, lentils, pods, peas and cowpea (MEB, 2011). Legumes are the mature seeds of plants belonging to the family Leguminosae which is the largest family of 700 families and 18000 species in flowering plants (Şahin, 2016). Legumes can have a herbaceous structure as well as a woody structure. Seeds have hard-shelled, usually kidney-shaped or rounded structure. Dry beans, lentils, chickpeas, beans, peas, cowpea are the most common types of pulses (MEB, 2011).

The year 2016 was declared by the Food and Agriculture Organization of the United Nations (FAO) as the "International Year of Pulses" under the leadership of Turkey and Pakistan. Pulses is an important food ingredient for more than 2 billion people in the world and about 69 million tons of beans, lentils and chickpeas are produced in about 78 million hectares of land in the world. Our country makes 1.5% of pulses production in the world, especially 3. in chickpea production and 4. in lentil production (Şahin, 2016; Uysal and Subaşı, 2014). Pulse production is spreading to the whole of our country, with Southeastern Anatolia, Central Anatolia and parcels and southern most regions of Marmara Region. Generally red lentils in the Southeast; green lentils, chickpeas and dried beans are mostly grown in Central Anatolia and in the passageways, while beans and peas are grown in Ege and South Marmara (MEB, 2011). Our country has an important place in the world in terms of consumption rates. Per capita consumption of pulses per person in the world is limited to 7 kg per person whereas per capita consumption in Turkey is 13.9 kg / year (Şahin, 2016). Besides, İstanbul Hububat, Bakliyat, Yağlı Tohumlar ve Mamulleri İhracatçıları (İstanbul Cereals, Pulses, Oilseeds and Products Exporters

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Association) declared Turkey's export value of pulses in 2015-2016 as 300,516 tons worth of 311,098 thousand dollars (İstanbul Hububat, Bakliyat, Yağlı Tohumlar ve Mamulleri İhracatçıları Birliği, 2016).

Nutritional Values and Uses of Pulses

Pulses are a cheap and high quality source of vegetable protein when assessed for nutritional value. Protein values are about twice as many as grain grains and are 18-31.6%. Their digestibility is between 69-90%. In addition, gluten inclusions are an important privilege in the nutrition of individuals with gluten intolerance. The fat percentage in pulses is generally very low (app. 0.8-1.5%) and the fat is as polyunsaturated structure. Moreover, it does not contain cholesterol. Pulses have low glycemic index, 16-32, and are rich in starch and dietary fiber. Besides, it contains folic acid, vitamins of group B, mineral substances (potassium, phosphorus, calcium and iron) and phenolic substances. It is also effective on heart and blood vessels, diabetes, obesity, cancer diseases when consumed frequently, regularly and properly cooked (MEB, 2011; Şahin, 2016). Besides human nutrition, it is important to contribute to the soil as a rare plant that can bind free nitrogen of the air, and to animal husbandry with high protein content (Uysal and Subaşı, 2014).

Different uses of pulses are available. Traditional consumption for pulses is as whole grain in meals, salads and soups. It is also used as snack (roasted chickpea) and canned (beans, chickpeas, green lentils ...) food. Apart from this, it is possible to use pulses in various kinds of product (bread, ready-made soup, baby foods, candies, breakfast cereals, snacks, meat products, diet products, gluten-free products ...) in the form of culture flour (chickpea flour, pea flour, lentil flour ...) as raw materials or additives, as well as in the form of fractions in the health sector as reinforcing agents (leguminous proteins, fibers, oil ...) (Erdil, 2016).

Processing of Pulses

Cleaning Process

It is essential that clean, healthy and high quality crops contribute to the provision of food safety, have a high level of nutritional value, encourage sustainable agriculture and contribute to the reduction of the effects of climate change. To get a good product, cleaning, cleaning criteria and cleaning methods are very important. Cleaning of pulses is done to improve the physical properties of the products and purify them from foreign substances.

The cleaning process involves fixed and mobile cleaning devices based on different principles to get the export of the product containing more than 3% foreign matter in pulses, to ensure compliance with the foodstuffs regulations, to prevent unnecessary transport of foreign matter to the consumption points or export ports and to use the maximum capacity of the storage (MEB, 2011).

Dry cleaning process; coarse separation, fine separation, magnetic separation, peeling and stone separation, is applied for pulses. Dry cleaning equipment usually makes the separation according to specific weight. The lighter powder, husk and other foreign materials are removed by airflow (MEB, 2011).

In coarse separation, generally rough sieves, aspirators (aspirator sieve, duo aspirators, classification aspirators), cylindrical sieves, scalperators (drum, vibro, circular) and selectors are used. The coarse cleaning products are then re-cleaned in the fine separation machines. In fine separation, silo aspirator purifiers, mill aspirator purifiers and trieurs are used. Magnetic separation occurs when the metal parts inside the pulses are caught by the magnets. While peeling, rubbing and friction movements are used to remove the outer shell of the final product, stone separators of different types but with the same functions are used for stone separation (MEB, 2011).

Calibration Process

The cleaned product is subjected to calibration process. Calibration process is done by screening machines. The purpose of calibration is to obtain standard groups by lowering the foreign materials to the desired level, and to improve and classify the quality for commercial purposes. Calibration is also carried out to obtain a homogeneous structure and to standardize the product in terms of cooking time for the final consumer (MEB, 2011).

On the sieves, usually dry beans, chickpeas, green lentils, dry beans are subjected to calibration. Peas and cowpea are not produced much in our country and calibration is not required in red lentils. While the caliber

values of the pulses presented to the inner market and the outer market are different, the price of the pulses plays a determining role in the price of the product (MEB, 2011).

Sorting Process

Pulses passing through the calibration are subjected to color sorting and hand sorting. In sorting process based on color, the main purpose in sorting is to separate the colored grains in the machine. In this way, a color sorting system based on computer technology is used and is especially included in production diagrams. In our country, the color sorting system in pulses production is used up to 90%. By the sorting machine, removal of foreign seeds and small stone particles escaping from the stone separator, homogenous color, clean and high quality pulses are obtained (MEB, 2010).

Products from the sorting machine are subjected to hand sorting. Manual selection is carried out by selectors on both sides of the selection band of lengths ranging from 5 to 7 meters to select foreign matter and defective particles under hygienic conditions. There are defective product separation channels on the selection bands. Bands have usually stainless steel body. There is a lighting and speed control system in the selection band. Hand sorting is directly affected by the factors such as light setting, band setting, speed setting, number of staff. Finally, the pulses passed through the hand sorting are passed through a metal detector to remove metal parts and then packaging process (MEB, 2010).

Packaging Process

Cellophane, polyethylene (PE) pieced cardboard boxes, polyethylene bags are used as packaging in order to protect pulses from moisture and insects. In addition to this, recently it has become widespread as paper / PE / foil / PE spectacle packaging material. In the packaging of pulses, generally volumetric full automatic filling system and vertical type packaging machines are used. The shelf life of pulses that have been cleaned, calibrated, sorted, packaged and served, is as long as two years (MEB, 2013).

Recommendations

Pulse consumption and production should be increased in our country for many reasons such as nutritional value, benefiting from health, promoting sustainable agriculture, reducing climate change effects, and pulse processing technologies should be developed accordingly.

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